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THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, *July 17, 1914.*

The Surveyor

And Municipal and County Engineer.

VOL. XLV.

JANUARY 2 TO JUNE 26, 1914.

35351
27/11/14

London:

THE ST. BRIDE'S PRESS, LTD.,
ST. BRIDE'S HOUSE, 24 BRIDE LANE,
FLEET STREET, E.C.

2
525
1.05



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The Surveyor

And Municipal and County Engineer.

Vol. XLV.

JANUARY 2, 1914.

No. 1,146.

Minutes of Proceedings.

New Year Resolutions.

Premature decay and early decease are the fate of the New Year resolution, and the graveyard of 1914 has already been opened. The pits were dug ere 1913 died, and quickly, far too quickly, they are being occupied and filled in. Ere February is with us there will be row upon row of pathetic mounds with scarce a break, and every mound will be in memory of some broken resolution. Happily, "great actions are not always true sons of great and mighty resolutions," and the world jogs along very well in spite of these betrayals of one's annual self-plightings. The failure of the New Year resolution may be traced to humanity's weakness for taking itself seriously, without a leavening of the saving grace of humour. Heroism is for the few; for the many life must of necessity be humdrum and unheroic, and happy is the man who, realising this, poods the beaten track with such content as his temperament will allow of. There is but one New Year resolution worth the making, and that is a resolve to make no resolutions at all. Still, resolutions are made yearly, by the hundred thousand, and a little advice as to their making will not be out of place on this the second day of a new year, when most of them will already have gone by the board.

The heroic resolve is always fatal. The early rise, the cold tub, the sunrise walk—none of these can be acquired on the strength of a bare resolve. The sluggard will return to his sluggishness on the third day; the unwashed will scrap his tub possibly while he first shivers on the brink of it; and with the failure of these the other becomes a physical impossibility. Rising may be accelerated, to some extent, year by year, and washing may progress downwards by slow inches—to decide on more is to court ignominious failure. Study falls within the same category; it must progress by degrees. The real student needs no incentive to further effort, for his work is his life, and only an increase of span can help him. The lazy man, who swots for ignoble ends, will quickly retrogress, no matter how fervid his resolve, and his only hope (if hope he has any) is in infinitesimal advance as the years roll on. There still remains the man who steers a mean course, who, really desirous of improvement, finds the distractions of life too much for him. He may put some curb upon his proclivity for pastime, and add at least some minutes daily to his working hours. For the diarist, it may be said at once, there is no hope. The entries in the first week will be voluminous, in the second less so. Then hiatuses will appear, a week's doings will go unrecorded, a spurt or two, in moments of self-examination, will follow, then complete disaster and silence of the utterest.

A New Year resolution must be moderate to be effective, as must all resolutions. Bad habits are seldom broken by sudden resolves, any more than good ones are broken by the lack of them. A slight improvement is all that should be aimed at, and the heavy smoker (to take a concrete example) will do better to cut out a couple of "pipes" or half-a-dozen cigarettes a day than to consign his smoking outfit to the flames on January 1st and purchase a

fresh stock on January 2nd. When quite a simple resolution is made, the difficulty of adhering to it may not be quite insurmountable; and this is important to remember, as any deviation from it will be fatal. Nothing deteriorates the individual more surely than resolutions made and broken. They weaken the will and bring about a self-contempt which, subconscious as it may be, works untold mischief on the character. How many of those who have resolved on great things for the New Year will be able to lay a grain of flattering unction to their soul on December 31st? The ardour of the aspirant to stern resolve will long, long have cooled ere that. "Think naught a trifle, though it small appear; Small sands make mountains, moments make the year, And trifles life," says the poet; but a New Year resolution is not a trifle. It is a big proposition to get up against, and big propositions are best left alone except by "big" men.

* * *

The Status of the Sewage Works Manager.

Among the papers read at the recent Annual Meeting of the Association of Managers of Sewage Disposal Works, one of the most interesting was that by Mr. J. Custance, as indicating the views held by some, at least, of the members of the Association as to the desirability of fuller recognition being accorded to them, and the important work in which they are engaged. In these times, when many bodies of men (and women) are striving to secure greater recognition of their rights and wrongs, there is no reason why the managers of sewage works should not take steps in the same direction. Indeed, those who are acquainted, as we are, with the admirable, unassuming manner in which these men, as a rule, carry out their arduous duties in the face of many difficulties and discouragements, will readily admit that they fully deserve any improvement in their position that they can secure. Among the suggestions made by Mr. Custance we think that the idea of the Local Government Board paying the whole of the salaries of the sewage works managers is impracticable. We cannot imagine that the employment by a local authority of a manager paid wholly by a Government department would work satisfactorily, and we believe that the manager himself would soon find his position insupportable under such conditions. On the other hand, when the proposed new rivers boards are formed there is much to be said for an arrangement by which the appointment of sewage works managers would be subject to the approval of the rivers board in control of the district in which their works are situated, the rivers board contributing one-half of the managers' salaries. In this way the rivers board would be in a position to ensure that the men in charge of the works under its supervision were competent, and at the same time it would, by its financial assistance, help to provide better remuneration, which, in many cases, is greatly needed.

The Association might well make an attempt to improve the status of its members on these lines in addition to the good work it has done and is still

doing on their behalf. On the other hand, the members themselves can do much individually to make their work better known in their own localities. Not more than one in a hundred of the ratepayers of any town has the faintest idea of the importance of the work done day and night, year in, year out, at their sewage works. In this connection we are reminded of the case of a district council which, not very long ago, had to consider the granting of an increase of a few shillings per week to the salary of the sewage works manager. During the discussion one of the councillors remarked that he did not see why any increase should be given, as the manager was already receiving more than they paid to their roadmen! Surely this is an indication that their efforts to secure fuller recognition should begin at home, and it has occurred to us that a very suitable opportunity for such efforts is to be found in Health Week, which was carried out in a number of places this year and is to be organised in the future by the Royal Sanitary Institute. If the managers could persuade their respective committees to arrange visits of the ratepayers to the sewage works during Health Week the visitors would acquire some knowledge of the value and importance of the work of sewage disposal, and in this way come to recognise the value of the manager himself. It is true that visits of this kind could be arranged at any time during the year, but Health Week would be a specially suitable occasion, for the reason that, during that period, matters pertaining to health and sanitation are discussed in quarters where they are, as a rule, almost entirely ignored during the rest of the year. Local authorities themselves should welcome the organisation of such visits as a means of bringing to the knowledge of the public some of the good work carried out in their interests. In any case, we offer these suggestions for what they are worth, and we shall be only too glad if we have, even in a small way, assisted the managers of sewage disposal works to secure that fuller recognition which they desire and deserve. In the foregoing remarks we have had in mind those managers who are directly responsible to their respective committees. The greater majority are, of course, on the staff of the surveyor, who is directly responsible to the council for the work of sewage disposal, but even in such cases we believe it would be to the advantage of the head of the department to have as manager of his sewage works an official who would be better paid and more competent than under present arrangements, and we do not think there would be many surveyors who would object to an improvement in the status of sewage works managers.

* * *

**An American
View of
French and English
Highway Engineering.**

In an article which appeared in a recent issue of the *Contract Record*, Toronto, Colonel W. D. Sohler, chairman of the Massachusetts Highway Commission, describes some of the most striking features of French and English practice in highway engineering, especially drawing attention to points which road engineers on the Western side of the Atlantic should take into consideration in their own work. The article, which is entitled "Lessons from the International Road Congress," is clearly the result of a study of the papers submitted to the congress as well as of Colonel Sohler's personal observations made in traversing the roads of France and England. The most important lesson to be learned from France is, Colonel Sohler considers, that proper location should be secured for highways, and he believes that France has the best roads in the world as far as location, lay-out, foundations, and drainage are concerned. The paved gutters, usually provided on grades of over 3 per cent, can be used by vehicles when necessary, being almost at the same level as the road, and Colonel Sohler's appreciation of this advantage is in accordance with views set forth in our own pages as regards the

importance of the principle, whatever be the precise nature of the emergency or drainage strip. The wide and shallow gutters across roads in French villages and in the parks near Paris allow of vehicles passing without inconvenience at speeds up to about 15 miles an hour, and this observation is worthy of note with respect to drainage as well as perhaps to automatic control of speeds. Especially noticeable, in England, was the large number of traction engines and trailers, but it may be remarked that a study of English roads in connection with a congress in London may, unless it be conducted under very careful guidance, tend to produce an erroneous impression in this connection, one way or the other. The crust thickness of 9 in., which Colonel Sohler seems to believe has been found to be necessary in order to meet the effects of such traffic, has, it may be remarked, been about the least thickness regarded as sufficient for important main roads in many European countries for the past forty or fifty years, and in many cases considerably greater thicknesses have been held to be, on the whole, economical. This does not apply, of course, to roads made directly on a very hard and firm soil. American engineers make their road crusts too thin.

Colonel Sohler considers that there is much to be learned from British practice in road maintenance, and the comparatively large sums per mile which we find it advantageous to spend on maintenance seem especially to have attracted his attention. As regards surface tarring, he noticed only 1 mile in all of roads the surface of which was being picked up, and he believes that the tar used in England is more sticky and more elastic than that used in America. The permanent employment of engineers and foremen leads, both in England and in France, to efficiency and economy, and the practice "in most of the cities abroad" of leaving the restoration of street surfaces to the highway authority, after excavations, is far more satisfactory than that of entrusting it to the various parties making the excavations. In American cities a street may be dug up two or three times in one year, and it is hardly ever properly repaired.

* * *

**Europe
and America:
A Comparison.**

Mr. George Janin, the chief engineer of public works at Montreal, recently visited several of the more important cities of France, Belgium and England, and in the course of his travels he was able to collect much valuable information in regard to the municipal engineering work which is being carried on in these places. This information was embodied in a memorandum intended primarily for the Board of Commissioners and members of the city council of Montreal, but Mr. Janin has very generously placed it at our disposal in order that the members of the profession generally may have the benefit of his observations. Accordingly we have great pleasure in publishing the memorandum, which will be found in another column in this issue. The greater part of Mr. Janin's time was spent in Paris, and it is interesting to note that this city was the scene of his earliest professional work some thirty-five years ago. Paris is justly noted for the magnitude and perfection of its public works, and visits of inspection have been made by many British municipal engineers; but the comparison which Mr. Janin draws between the respective administrations of Paris and Montreal shows that this perfection is not attained without a relatively large expenditure and the employment of a large staff of technical experts. Thus, the staff at Paris numbers about 1,100, whereas Montreal, with a considerably greater superficial area, has a technical staff of only about 350. In this connection, however, it must be remembered that the population of Paris is about five times as great as that of the Canadian city. In the matter of the construction of roads which have to bear very heavy

traffic, Paris favours the use of stone pavements, and the city owns and works profitably one of the finest quarries of paving material in the country. This quarry is but 20 miles distant, and is, of course, an incalculable boon to the department of highway administration. The use of asphalt is being restricted on account of its slipperiness in certain states of the weather coupled with the comparatively high cost of laying and repairing; but the experience of Montreal is different. The comparative noiselessness of asphalt, too, is a distinct point in its favour as a paving material for busy city streets.

Mr. Janin also has a good deal that is of interest to say regarding the various sanitary services of Paris, including street cleansing, refuse removal and disposal, water supply and sewerage—all of which are in a high state of efficiency. Dealing with the English cities which were visited, it appears from the memorandum that the Liverpool waterworks impressed the traveller more than anything else he saw in this country, and he draws the conclusion that the enormous expense of these works justifies the policy adopted by the Montreal Council in establishing their intake at some distance from the shore of the St. Lawrence. If it be true that intelligent travel is an important part of a liberal education, it is no less true that those who have not the opportunity of undertaking long and expensive voyages themselves can profit very considerably by studying the records of those more fortunately circumstanced. The thanks of British municipal engineers are thus due to Mr. Janin for placing at their disposal such an interesting and instructive account of the professional aspect of his recent European tour.

* * *

Cork City Engineer and the Question of Employment. The question of unemployment is one that usually meets with the sympathetic consideration of borough councillors, but there are limits beyond which abuses may creep in, with the result that some harm, as well as good, may be done. A discussion that took place recently at Cork Town Council on the allocation of money for the employment of workless men disclosed the existence of one of these abuses. Nothing is dearer to the heart of the ordinary councillor than the dispensing of patronage, but it is obvious that patronage may easily become a very undesirable factor in municipal life. One of the Cork councillors in the course of the discussion made reference to a supposed "right" which he claimed each member had of nominating two, three, or four men for work. Precisely how this impression came to be created does not appear, but the city engineer must frequently have had sad experience of the worries appertaining thereto. It was sought upon the particular occasion under notice to set out in a formal resolution a request that the city engineer should "give equal rights of nomination of labourers to every member of the council," but the city solicitor was quick to perceive the embarrassments of the situation. He told the council that such a resolution would not be in order, and he added that he was quite sure the city engineer would give due weight to the suggestions of councillors. He proceeded to say: "He could only repeat that the city engineer and the other officers would do their best to see that any money available for employment would be used between that and Christmas. No matter what recommendation was made, the money of the corporation should be expended under the direction of the responsible officers of the corporation. If the city engineer saw that twenty additional men were required he could employ them without any recommendation from the Public Works Committee or the council. He would repeat that if the matter were left to the officers they would do what he said." The prompt action of the city solicitor had the desired effect of bringing the members to a consciousness of the unreasonable position they were taking up, and the resolution was not persisted in. It would, of course,

be most unfortunate for a borough engineer to become the innocent victim of a position in which personal and party jealousies are exercised for electioneering purposes—for this, it was evident from a subsequent discussion, was the particular object which the city councillors had mainly in view.

* * *

Inland Waterways. The general interest in the possibility of improving our canals which was aroused by the Royal Commission's reports has by no means subsided. It is still maintained, and it is growing. This is noticeable particularly in the Midlands, where canals are largely used, and where the advantages of the improvement of the canal system throughout the country are most evident. Further, some fear is felt that, if better waterway communication is not afforded, industries must tend to leave the Midlands for the sea coast. While it is improbable that the whole of the general improvements and alterations outlined in the report, involving the expenditure of £17,000,000, will be carried out for many years to come, it is fairly certain that some of the work will be done in the near future.

Mr. R. B. Dunwoody's paper read lately before the Institute of Sanitary Engineers is one of a number of similar efforts which are being made at the present time to keep the matter before the public. It may be regarded more as an able summary of what has been said in the Royal Commission's reports than as a statement of anything new. Mr. Dunwoody laid considerable stress upon the fact that the four main canals connecting Birmingham respectively with London, Bristol, Hull and Liverpool for the greater part of their course presented no great difficulty as to the water supply. A considerable portion of the route was along the course of the great rivers, and the difficulties attending the work of improvement in such parts of the system were not great. When it is considered that the manufacturer of Mannheim or Cologne, 200 miles or so inland, can compete for the London trade with the manufacturer in Birmingham owing to the excellence of the continental canals, it is clear that a very strong argument exists in favour of making a good canal connection between London and the Midlands. The sanitary engineers present naturally raised the question of the possible insanitary condition of canals. Mr. H. Percy Boulnois pertinently instanced the Manchester Ship Canal, which is, without doubt, an object lesson, and it cannot be said that the question was answered very convincingly. Whether the new method of barge propulsion by means of aerial propellers has any bearing upon the question of canal improvement was not considered.

* * *

The Goole Council and their Surveyor. At a meeting of the Goole Urban District Council on December 12th there was an echo of the recent proceedings at the Leeds Assizes which arose out of an assault on a councillor by the engineer, Mr. C. G. Bradley. It will be remembered that the assault took place in the council chamber in consequence of the offending member's persistence in making defamatory statements about the engineer, and that Mr. Justice Darling, at the assizes, said the prosecutor had made a false charge and had done the defendant a wrong, and as a gentleman he ought to have apologised; moreover, the learned judge refused to order the defendant (the engineer) to pay the costs of the prosecution. At the meeting above referred to a councillor who was a witness for the prosecution moved the resignation of the engineer, but failed to obtain a seconder. We congratulate the surveyor on this evidence of the fair view taken by the council of the incident, and their recognition of the fact that their officer, though technically in the wrong, acted under extreme provocation. A report of a forthcoming presentation to Mr. Bradley, we may add, appears in another column of this issue.

Mechanical Engineering Aspects of Road Construction.

COLONEL CROMPTON AT THE INSTITUTION OF MECHANICAL ENGINEERS.

A very interesting paper was read before the Institution of Mechanical Engineers on December 19th by Colonel R. E. Crompton, M.I.N.S.T.C.E., consulting engineer to the Road Board. In this paper, an abstract of which follows, Colonel Crompton briefly reviewed the development of self-propelled road vehicles, described the waving of road crusts and the conditions which cause and accentuate it, and explained his views as to the most promising methods of road-crust construction intended to prevent or minimise such action. He pointed out that there is a great tendency for modern motor vehicles of the heavier classes to have nearly the same percussive and rounding effects—to be similar, that is, with respect to rhythmic movements—and that the frequent passage of motor vans, and particularly of lines of omnibuses, along a road tends to produce a regular wave formation of equal wave lengths. He also pointed out that initial waving is produced in the process of rolling, and advocated the use of the three-axle roller which he has devised with the object of reducing this initial wave formation to a minimum. It may be noted, in passing, that in his Manchester paper Colonel Crompton pointed out that the rhythmic action of a vehicle is started by inequalities in the crust, such as manhole covers or hard places. This, in our view, is a more important factor than the initial waviness produced by rolling, for the simple reason that it leaves the vehicle free to continue to beat the road at its own period of rhythmic percussion, while in the case of initial waving due to rolling the wave lengths are likely to be quite different from those which the vehicle produces. It may also be pointed out that the wave length must vary with the speed of the vehicle, since the natural rate of vibration of the wheels on their springs, and the natural rate of heave and fall of the vehicle on its springs, cannot change very much, while the length of road covered in each rhythmic movement varies with the speed. The wave lengths produced by rolling are often fixed by the effects of concentration of the run-off of surface water, and, in such cases at any rate, the wave lengths due to the passage of vehicles can only be superimposed on the initial waves, like those of a sudden storm on a heavy Atlantic swell.

ROAD VEHICLES AND CRUST DEFORMATION.

It may also be pointed out that the effects of slow vehicles in rolling down a road are much more effective than Colonel Crompton supposes, and slow, heavy, horse drawn vehicles—and, in some cases, heavy motor wagons and trailers—often exert such effects. Further, there is, under some weather conditions, a rolling out of the road surface under mixed traffic, including a large proportion of swift motor cars, and this rolling not only destroys lengthwise rutting and tracking, but also reduces and even annihilates all but the longest and least objectionable of the crosswise waves. This applies to unrolled water-bound crusts, to tarred crusts from which some of the tarry skin has been worn, and, under steady temperature conditions at moderately high temperatures, to fully tarred crusts. Generally, Colonel Crompton's ideas on this subject, though useful with respect to important main roads leading out of very large towns, must, before they can be applied to a large mileage of main roads, be much diluted with other considerations. At the same time, it may be pointed out that his three-axle roller is a machine well worth the attention of surveyors, not only on account of its probable superiority as regards initial waving, but also because it permits of the use of a considerable range of pressures. In his book "The King's Highway," published in 1908, Mr. Reginald Ryves suggested that initial waving under rolling was caused by the use of a roller too heavy for the particular piece of work, and added: "Probably, on the whole, the rollers used in Great Britain are too heavy, except when used on roads with naturally firm beds or good foundations." He advocated, however, the use of high-pressure rollers for the final consolidation of the upper course or of the whole crust. Years before the same engineer pointed out that one puddle in a road "breeds a string of puddles," and since then, if not before, the rhythmic effect of vehicles has been the subject of remark in several quarters. It was pointed out in a technical journal, in 1900, that the period of the lurches of the motor omnibus plying between Kennington Gate and Vic-

toria Station were longer than those of other vehicles, and the kind of rhythmic motion referred to by Colonel Crompton was indicated as "vibrations . . . the period of which is too short for the motion to be a swaying, and not short enough for it to be in the region of sound." Generally, surveyors have long recognised the percussive effect of wheels with springs, and were fully aware of the fact that the deformation of road surfaces is only partly caused by removal of material. It is most unfortunate that Colonel Crompton should have said in his paper that, with respect to deformation, "no one assigned the waviness to what the author believes is the chief cause—that is, the repeated action of vehicles closely resembling one another in their harmonic action." We give the consulting engineer to the Road Board full credit for being the first to realise the importance of this similarity, and the significance of the running of lines of vehicles and motor vans of a similar character upon important main roads leading out of large towns, but he might have informed himself more fully as to general appreciation of facts and principles.

THE CARPETING PRINCIPLE AND ITS APPLICATION.

There are in the paper several other passages which might seem, to those who have not realised Colonel Crompton's singleness of purpose, to disclose an attitude of mind by no means satisfactory to those members of the profession of civil engineering—in its wider sense—who are entrusted with the management of our roads. We consider unfortunate the expression "that branch of mechanical engineers who are the modern road constructors." Again, take the following passage: "It is the author's opinion that for some time to come the work will be carried out by responsible contractors, although in some cases existing road authorities may elect to provide themselves with their own plant, and to train their own staff." This can hardly be pleasing either to surveyors or to consulting engineers, who are the persons usually entrusted with the engineering control of works carried out by contractors and with contractors' plant.

Colonel Crompton's enthusiastic pursuit of the study which, for the time being, engages his attention is doubtless, and indeed obviously, productive of useful results; but it leads him to take too narrow a view. The particular application of the carpeting principle which he so zealously advocates is of quite limited range, especially as regards gradients, and in putting it forward Colonel Crompton seems to be unaware of the true character of the mixed traffic of to-day. He does, in fact, speak in the past tense of vehicles which are present on our roads in numbers which have hardly decreased during the past fifteen years, and he seems to overlook altogether the valuable features of certain kinds of road pavement—such as wood blocks, to take a conspicuous instance. A wood pavement has the great advantage that it can be armoured with fragments of grit, and its period of slipperiness during certain weather phases is shorter than that of several other kinds of pavement. Even in his advocacy of large-diameter wheels Colonel Crompton fails to satisfy the student of rhythmic effects, and actually suggests that "when rubber tyres are used, the shocks imparted to the road are so cushioned by the tyre itself that increased wheel diameter is not of great importance." Does he really believe that the dwarf wheels of motor vans and motor omnibuses are *not* among the chief causes of the rapid wear and deformation of certain classes of main roads? The thumping action of wheels in producing waves and, be it noted, wear also, is largely due to the fact that they roll over the humps smoothly and bump into the hollows. This effect is inversely proportionate to the diameter of the wheel.

THE TREND OF COLONEL CROMPTON'S INVESTIGATIONS.

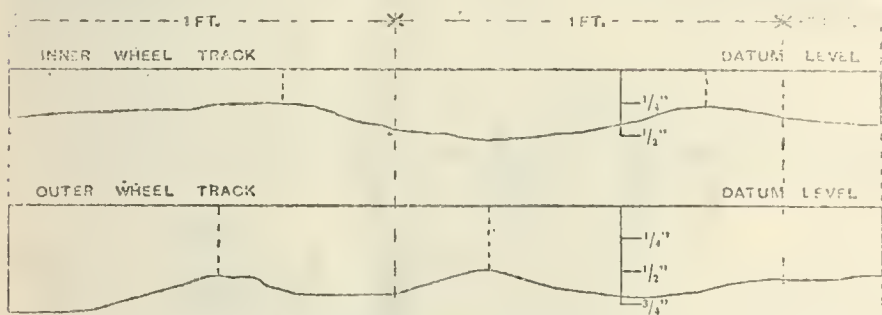
Colonel Crompton's paper is a really important contribution to the study of road-crust deformation, and the specifications for asphaltic carpets and the details of the methods employed in laying them are worth careful study. He has also shown that his road machine at Teddington is likely to furnish some useful comparative data, and he sets a splendid example to younger men in the matter of energetic pursuit of the study of the moment. Far from being deceived by his apparent opinion of types of road crust other than those the features and merits of which at pre-

sent occupy his attention, we feel sure that other forms of crust, such as asphaltic macadam, will, in turn, come within the range of his careful study and experiment. The profession as a whole is bound to recognise, too, the advantage of being able to count upon the presence at headquarters of an engineer so well versed in experimental work and in mechanical engineering.

We have prepared for the present issue an abstract of Colonel Crompton's paper, with long passages of special technical interest quoted in full, and trust that, in spite of the compression necessitated by the heavy demands on our space, we have given a fairly adequate presentation of most of this valuable paper.

ABSTRACT OF COLONEL CROMPTON'S PAPER.

The author believes that the time has come when the development of road locomotion must be jointly studied by designers of vehicles and by "that branch of mechanical engineers who are the modern road constructors." Like a railway and its rolling stock, the



ENDURANCE TEST IN MODEL TAR-MACADAM ROAD: LONGITUDINAL CONTOUR AFTER TEST (2-IN. MATERIAL).

vehicle and the road should be treated as a whole. "The development of road vehicle design is well advanced. The science of preparing the road surfaces to suit these vehicles is comparatively new, and requires careful attention." The author's successful work with the Indian road train, described in a paper read before the Institution of Mechanical Engineers in 1879, was followed by valuable work done by French engineers, and by 1901 there was already a great development in the use of the pleasure motor car. During the period of development of traction-engine design their chief features were so far fixed and standardised that the traction engine of to-day has been but little altered from that of 1871. The engines were necessarily heavy, and it was not until Thomson, in

water which had to be carried, added to the restrictions imposed by legislation, confined the benefits of road locomotion as it then existed to farmers and the few who used traction engines for transporting heavy weights.

The adoption of the internal combustion engine by Panhard, De Dion, Benz and others gave such an impulse to road-vehicle design that constructors were able to lighten their machines, and to avail themselves of a knowledge of framing developed in experience with the bicycle, and learned, from the same source, how to deal with the vibrations occurring at high speeds. When the "Red Flag Act" was repealed, it was not long before some of the problems entailed by the increased speed demanded the attention of designers. Solid rubber and pneumatic tyres minimised the difficulties experienced from shock and vibration in the case of the lighter vehicles, but with the heavier commercial vehicles the case was otherwise. Up to this time full loads were necessary to enable traction engines to pay their way, and this was against door-to-door delivery; but it was soon evident that there

would be a great opening for the carriage of smaller loads at higher speeds. Distribution up to 100 miles from a seaport or manufacturing centre is now found to occupy about a third of the time occupied by railway transport. For goods in small consignments it is a great advantage to be able to use vehicles which can run up to a speed of 20 miles an hour, and to deliver goods up to a radius of 50 miles within a few hours of the order being received. Modifications of pleasure vehicles

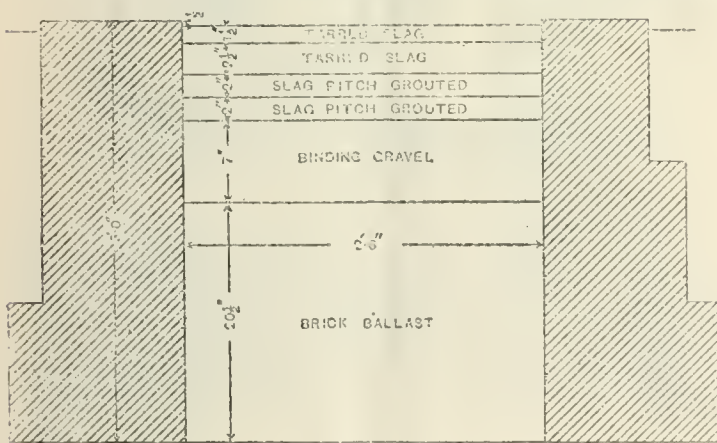
proved unsatisfactory, and designers then sought to reduce repair bills by a study of the stresses introduced by the road shocks, and they were able to do this without materially increasing the tare weight. Improvements were followed by a reduction of the cost of maintenance, and the demand for vehicles increased, their use extending rapidly. Nearly all the business houses in our large towns now distribute a considerable proportion of their output by motor vehicles.

There are now in London nearly 3,000 motor omnibuses dealing with the rapidly increasing passenger traffic, which has been created solely by the speed facilities, the regularity of service, and the comfort of the passengers. The saving of time has added nearly

10 per cent to the use of the lives of many persons. Many roads previously deserted by all but local or farmers' traffic now carry quite a large fraction of the passenger traffic and of the tonnage of goods previously carried by the railways. The increasing number of the lighter vehicles and their higher speed produced the dust nuisance, and it was found that heavy vehicles caused extensive deformation of road surfaces, and "a tax has been levied on road locomotion" in the form of a licence tax on the vehicles themselves and a petrol tax on the fuel they consume. The Road Board was formed to administer grants in aid of road improvement, and the funds raised from the vehicle and petrol taxes cannot, as is often supposed, be applied to the maintenance of roads.

"The author, in his position as consulting engineer to that board, has had considerable opportunity of noting and studying the whole question of the deterioration of road surfaces, as far as it appears

to be due to modern traffic, and lays some of the results of these investigations before the institution. Road surveyors and others, when discussing the effect of the new traffic on roads, are accustomed to talk of the unevenness of the surface wear—that is, by the actual removal of the road material by the rolling of the wheels or impact of the horses' feet from parts of the surface so as to wear down the depressions or low places; but although this was partly true when water was used as the binding material for macadam roads, the mud being scraped away in the winter or the dust blown off the road in the summer, this actual removal of material from the surface almost entirely ceased after



ROAD CONSTRUCTION MACHINE, NATIONAL PHYSICAL LABORATORY: CROSS SECTION THROUGH PATH.

1868, fitted solid rubber tyres to the driving wheels of vehicles, which he called "road steamers," that it was found possible to reduce the weight of these tractors to one half that of the traction engines then in use on account of the increased adhesion. One of the author's Indian engines, weighing 8½ tons, or with a separate tender carrying fuel and water 12 tons 14cwts., drew behind it a train weighing 64 tons 6cwts., with a nett paying load of 42 tons, or 55 per cent of the total moving load. But everyone seemed to combine to oppose the development of road locomotion; or, at any rate, before the development of the internal combustion engine in France, the weight of fuel and

the roads had been tarred or rendered waterproof; so that the deformation of the road surface, which continues to show itself wherever traffic is heavy, must be put down to other causes."

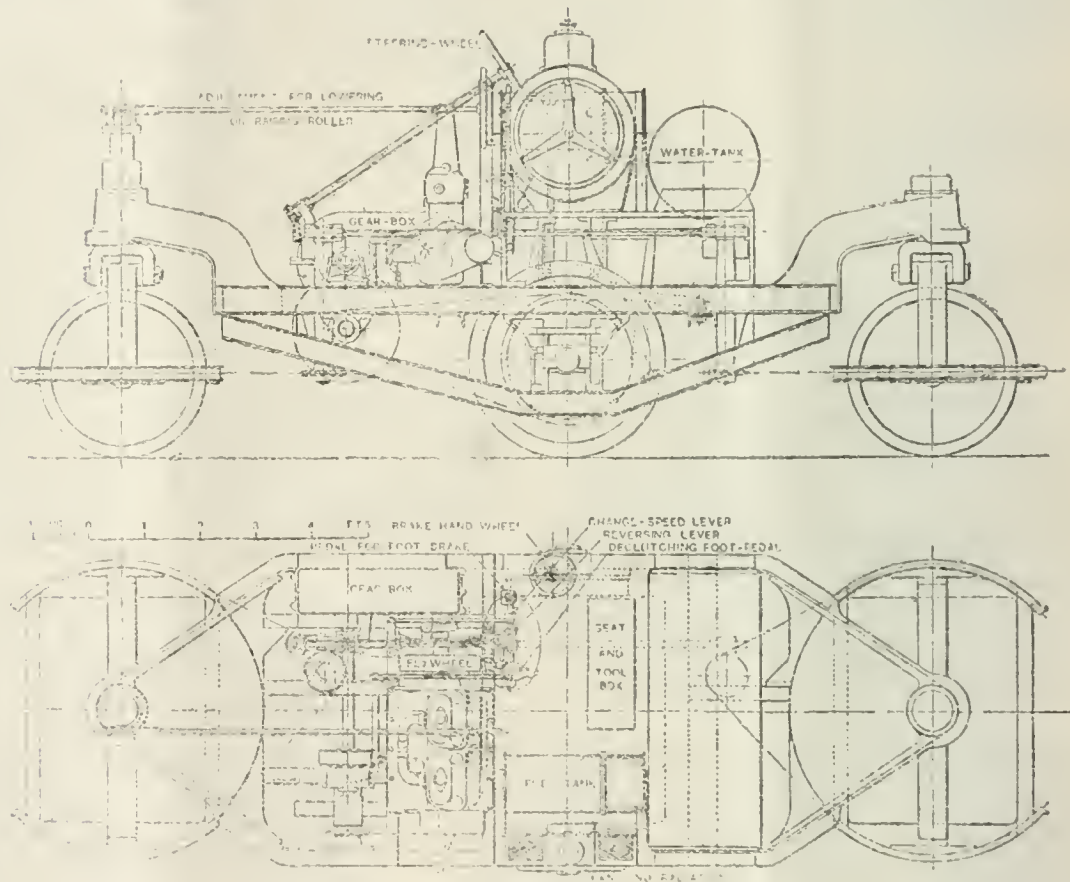
TRIALS OF ROAD-SURFACING MATERIALS.

"Soon after the formation of the Road Board the author was engaged in preparing specifications for a number of trial lengths of road-surfacing material to be tested, in competition, on the main Folkestone road at Sidcup, in Kent, on the London and Kingston road in the borough of Wandsworth, and within London itself on certain streets in the borough of Fulham." These trial lengths were intended to be, as far as possible, comparable as regards traffic. For measurements of wear the author adopted the stretched-wire instrument used by Mr. J. A. Brodie, city engineer of Liverpool, and notes were taken at regular intervals—at first every month, and afterwards every six months. There were unexpected results, for although, in most cases, the cross contour was lowered, in other parts the surface had actually risen. Measurements considered doubtful were repeated, and the first measurements were confirmed. The raising of the surface was due, the author found, to the fact that

action, passing over the road at a speed sufficient to transform the smooth rolling of the wheels into bounding or pulsating motion."

Prof. Archibald Sharp came very near to this conclusion in discussing a paper read by the author on the subject of road vehicles before the Institution of Automobile Engineers in 1903. In 1907 Mr. Lanchester pointed out that, logically, highway traffic moving below a certain speed limit ought to counteract the wave-forming effect of high-speed traffic, but considered that it was not probable that speeds low enough to produce this beneficial effect are ever observed.

"The next point requiring investigation was to determine, if possible, the manner in which the materials forming a road surface are moved into new positions when the wave formation is in progress or complete. When a wheel rolls over any surface the individual particles of which that surface is composed must be rocked to and fro by the rolling action of the wheel. . . . Rocking action must take place, whatever the form of the particles may be, and it is practically certain that it is greatly intensified when pulsating or percussive action of the wheels is sub-



THREE AXLE MOTOR ROLLER (CROMPTON & TAPP)
(Barford & Perkins)

the point coincided with the crest of a wave which had been formed. It was "deformation," and there was really a transfer of material in the direction in which the traffic was rolling. "These observations, added to many others taken on other roads in various parts of the kingdom, have led the author to reconsider the question of road wear, or, as he prefers to call it, of 'road deformation.'"

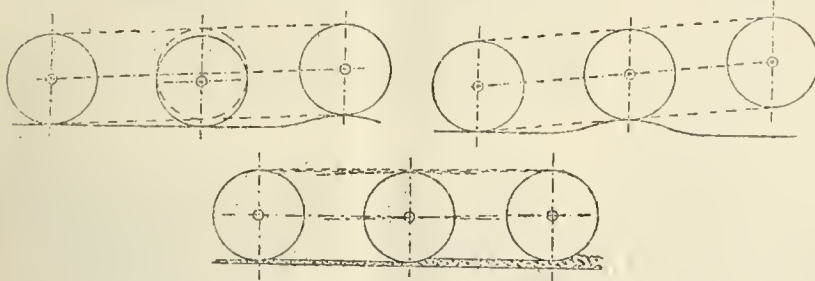
The author believes that the deformation caused by modern traffic is due to the action of the wheels being rhythmic percussion rather than true rolling, tending to reform the original flat surface into one having well-defined waves. This wave formation may be so intense as to cause the road to break up.

"This tendency towards wave formation had already been often noticed by road surveyors, but the causes of it in the past were put down to original unequal spreading of the road material, to unskilled rolling, irregular consolidation, insufficient or irregular foundations, excessive watering—in fact, to many causes other than the one now brought forward by the author. Everyone knew the roads were wavy, but no one assigned the waviness to what the author believes is the chief cause—that is, the repeated action of vehicles, closely resembling one another in their harmonic

stituted for "smooth rolling." The particles must, in the action of rocking, upbraid one another and gradually lose their angular form. "In a well-designed newly made road of the existing type, angular pieces of stone of a definite size or gauge are used, the voids between these stones are partly filled with smaller angular pieces, and with sand and fine material, so that when the whole is consolidated by the roller, the rocking action of the wheels of the traffic is resisted, to some extent, by the angular interlocking of the stones and sand." A time comes when the stones can "actually roll over, and thus transfer themselves to new positions, being propelled to these new positions by the percussive action of the wheels. This has a greater effect on the larger than on the smaller stones, so that in practice, when one examines the cross sections of a crust of any roadway that has been subjected for some time to the action of traffic, and that has acquired a waved surface, one finds the smaller rounded stones underneath the troughs, and the larger stones underneath the crests of the waves." The author's observations on this matter have been made on a very large number of cross-sections of roads exposed by trenching. The wave-forming action of the modern self-propelled vehicle is far more intense than

that of horse-drawn traffic, one reason being that, the speed being greater, the change from true rolling to pulsating action is also greater. "The wheels, as a rule, are of smaller diameter, are more equal in size, and the general harmonic characteristics of the

at speeds from 3 to 20 miles per hour. The wheels at present in use are 1 metre in diameter, 3 in. wide, and can be loaded up to 1 ton per wheel, or about 800 lb. per inch width of tyre. Each wheel has a positive end-traverse of 1 in. inwards and outwards from its radial position, and makes the complete traverse of 2 in. in $1\frac{1}{2}$ revolutions of the frame. The wheels are spring loaded. It is intended eventually to vary the diameter of the wheels, and to test wheels fitted with various forms of rubber tyres. The path itself is to be heated, cooled or wetted to imitate weather conditions. "All the tests that have been hitherto carried out show a marked tendency to produce wave deformation. The machine itself has a harmonic period, and this reduces the time necessary to test a surface and to compare its merits with others in resisting this wave deformation."



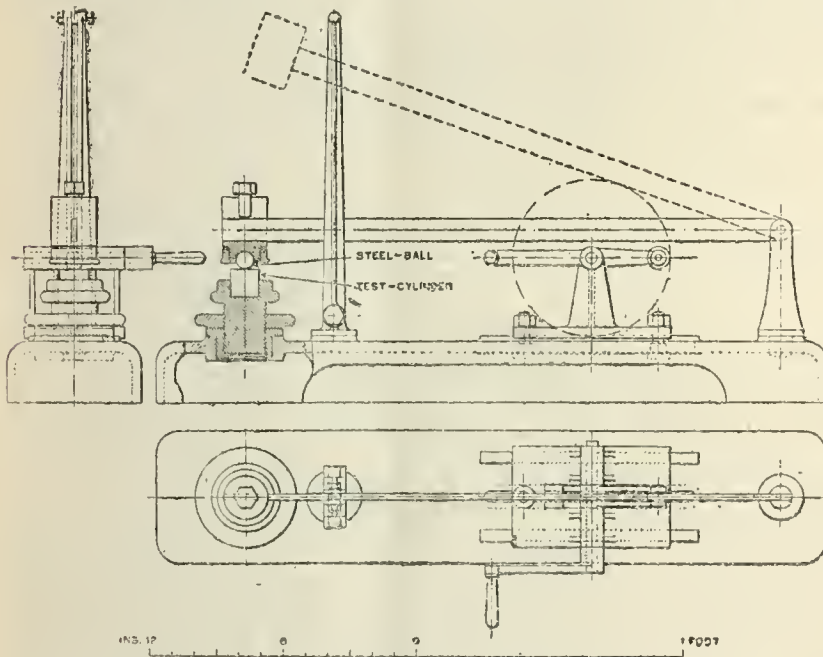
DIAGRAMS SHOWING ACTION OF THREE-AXLE ROLLER. (Lower diagram illustrates rolling of freshly laid material.)

mechanically propelled vehicles resemble one another far more closely than was the case with horse-drawn vehicles, for of the latter many were slow-moving two-wheeled springless carts with wheels of large diameter, others were light carts or four-wheeled wagons with unequal-sized wheels. There was also the blow of the horses' feet, which must have considerable modifying effect on the road surface; therefore, in all essentials the conditions of horse-drawn traffic were far more heterogeneous and non-harmonic than the new traffic."

time necessary to test a surface and to compare its merits with others in resisting this wave deformation."

INITIAL WAVES ON NEWLY FORMED ROAD SURFACES.

"In considering what might be done to improve the vehicles so as to minimise their tendency to deform the road by wave formation, the author's ideas were first directed to the original initial waves, which are always found, to some extent, on newly formed road surfaces. The chief reason why no surfaces but those of wood pavement, or of the sheet asphalt laid with a trowel and adjusted by hand beaters, are free from initial harmonic waves is that the road roller used when, as is usually the case, the rolling is carried out in the direction of the line of traffic—however skilfully the operation of rolling is performed—always produced waves which eventually are intensified by the traffic, for when an ordinary two-axle roller is first brought on to newly spread road material, it alternately pushes the material forward until a certain resistance to forward movement is encountered, and then rolls over the accumulation thus formed in front of it. This alternate action is periodic, and the wave length depends on the diameter of the roller wheels, the total weight, the distance between axles, and to some extent on the speed at which the rolling is carried out; but in all cases the finished surface is waved. It is found to be much easier to roll to a surface of small-wave



HAMMER FOR TESTING ASPHALT MATERIAL FOR TOUGHNESS.

Again, fleets of vehicles, practically identical in their harmonic features, run regularly over the roads, and have a severe harmonic effect, and the wave formation produced is very regular and definite in wave length.

MACHINE FOR COMPARING EFFICIENCY OF METHODS OF ROAD CONSTRUCTION.

Confirmation of wave formation has been obtained from the working of the road machine at the National

height certain soft road materials—such as blast-furnace slag or some of the limestones—than is possible with the harder and more incompressible granites and basalts, but in no case is the finished surface ever truly flat and waveless. When the traffic comes on to the road there is little doubt that the small waves left by the rolling serve as a starting-point for the shorter-period waves eventually formed by the traffic itself, and as it appeared to the author that all two-axle vehicles must cause this action, it occurred to him that it would be better to commence by modifying the design of the rollers themselves so as to produce a non-wave-forming roller. He has succeeded in doing this by adopting the three-axle principle, and it is probable that the same three-axle principle might be with advantage extended to all vehicles carrying heavy loads.



IMPROVED 18 FT. STRAIGHT EDGE.

Physical Laboratory. The length of time needed for the development of wear or deformation in actual road crusts led to the setting up of this machine, in the design of which the author collaborated with Dr. Stanton. It was set to work early in 1913. On a circular path a frame carrying eight wheels revolves

The idea of designing the three-axle roller (illustration herewith) was suggested to the author by a study of the Renard train, these being "the only vehicles

THREE-AXLE ROLLER.

which the author has seen in use which have a real tendency to correct the wave formation caused by the ordinary two-axle vehicular traffic." The rolling resistance to the Renard train is small, and the author believes that much might be done by the designers of vehicles developing the three-axle principle. The three-axle roller "has certainly produced surfaces freer from waves than has heretofore ever been the case." The weight taken by the three rollers must constantly vary, so that it can exert maximum pressure on the high places and the minimum pressure on the low ones. The central, driving roller must be weighted sufficiently for adhesion. It is therefore mounted on springs, so that it can fall below but cannot rise above a fixed point relative to the front and rear rollers. On freshly laid material there is a very light pressure during the first time of rolling; but as the road surface becomes less yielding, the weight is concentrated on the centre roller, just as if a light roller was first employed and followed by a heavier one, but more gradually. The difference in the levels of the rollers is adjustable, and by raising the rear roller clear of the ground 90 per cent of the weight can be concentrated on the central roller. The front roller has always sufficient weight for steering. The wheel bases are unequal as a further proportion against the production of waves.

"In the present design the diameter of the centre roller is 3 ft. 6 in., and that of the end rollers 3 ft., but in the new design the centre roller has been altered to 4 ft. The width of the rollers over all is 4 ft., the long wheel-base 8 ft., and the short wheel-base 6 ft. 6 in. The distribution of weights can be varied by the hand-wheel adjustment between the limits given in the table below, with corresponding rolling-pressure variation of from 160 lb. up to 500 lb. per inch width of roller.

Front axle.		Centre axle.		Rear axle.		Total.		
Tons.	Cwts.	Tons.	Cwts.	Tons.	Cwts.	Tons.	Cwts.	
0	17	8	10	—	—	9	7	Without water ballast.
3	8	3	8	2	11	—	—	
0	17	10	13	—	—	11	10	With water ballast.
4	2½	4	2½	3	5½	—	—	

LARGE WHEEL DIAMETERS.

"When rubber tyres are used, the shocks imparted to the road are so cushioned by the tyre itself that increased wheel diameter is not of great importance; but when the problem of carrying considerable weights at a paying rate of speed—say up to 8 miles an hour—at the lowest combined cost of the vehicle and the road is attacked, it will be found that much can be done with steel-tired wheels by a very considerable increase in the diameter of the driving wheel." By adopting the suspension principle, large-diameter wheels may be used with only a small increase in weight, and the author has designed a tractor, which he believes is the first of its kind, to utilise 7-ft. wheels with a comparatively light axle weight. It has given very successful results.

IMPROVEMENT OF ROAD SURFACES.

"We now come to consider what are the chief features of road design, to enable the surface to carry the wheeled traffic of the future at a minimum cost with the least deformation of the surface, and therefore with the greatest comfort to passengers, and at the lowest cost of maintenance of the vehicles that roll over it." Already the effects of climate are minimised by rendering the road surface impermeable by dressing it with bituminous substances, and such roads are practically dustless for eight months in the year, but the action of the tar does not go deep enough to hold the surface together in winter. The author for a long time believed that this was due to want of strength or mechanical causes, "but he now believes it is also due to surface tension properties of the tar used. He has also noticed that no such action occurs in the most perfect impermeable and durable surface of all, the asphalt pavement, which stands the effect of traffic of all classes just as well in the wet and cold days of winter as in the dry days of summer."

Road stones and similar material held together with bituminous binders form a partially elastic concrete, "these bituminous binders taking the place of the Portland cement of an ordinary concrete." Success in the use of this method has been considerable and progressive, and has been largely due to the employ-

ment of machinery. Tar-slag surfaces, blast-furnace slag being employed, have been very successful, but the expectation of further advantages by treating high-class granites and basalts in a similar manner have not been fully realised. "The tarred slag macadam of Hooley still holds its own; there have been fewer failures by its use than with any of the other road stones when such previously coated material is used." The second class of deep treatment is by the grouting or penetration method. Both systems have their advocates.

SHEET ASPHALT OR DOUBLE-COAT WORK.

A system largely adopted in America is that of "producing artificial asphalt by covering a concrete foundation with a sheet asphalt artificially formed from a graded sand aggregate held together by a bituminous binder, or, as the Americans call it, an 'asphaltic cement.'"

"If we take the heavily trafficked streets and roads of the world, there is probably now under traffic a larger area of this class of sheet asphalt pavement than of any other form of surface, and the latest efforts of road engineers appear to be in the direction of extending this method of surfacing to all classes of roads which have to bear considerable traffic. Already much machinery has been designed to produce such surfaces at the lowest cost.

"When the author began to examine the road surfaces which resisted the harmonic wave-forming action of modern vehicles in the most satisfactory manner, he found that the sheet-asphalt pavements of the towns were the best and most durable, and were least deformed under traffic. They are now used in many forms. Sometimes the original and hitherto expensive arrangement of supporting the sheet-asphalt surfaces by concrete foundations has been used, but in many cases successful attempts have been made to utilise the existing macadam roadways as a supporting crust, and to lay on them a bituminous-bound new surface in one or two layers. Many examples of this have been laid in various parts of London, and the surface of the Thames Embankment from the Westminster Bridge to Blackfriars may be noted; here the method adopted has successfully resisted for several years exceptionally heavy traffic with but little deformation and at a low cost. During the past year or so similar surfacing has been carried out on many of the great omnibus routes, and has certainly justified itself by the successful way in which the harmonic effect of this most difficult type of traffic has been successfully dealt with, the wave deformation being very small and not appearing to increase to any marked extent.

"In considering the cost of surfacing, perhaps the important question is that of the carriage of the material. The cost of railway and road haulage, taken together, forms a large fraction of the total cost of resurfacing a road. It is therefore most desirable to use local material wherever this can be done without affecting the quality of the work. For this reason the author suggests that the bulk of the material forming a road wearing surface should consist either of local sand (the distribution of which throughout the United Kingdom is very wide, so that, as a rule, the cost of suitable sand delivered at the roadside is only half that of good road stone), or that an ideally perfect aggregate for the wearing surface should be provided by crushing sandstone or any similar local stone which is composed of hard sand cemented together by binding matter."

In some cases the material of the existing crust can be partly utilised and crushed at one operation into part of the aggregate required. In both cases portable machinery, placed as close as possible to the point where the road material is to be laid, is necessary. Artificially produced sand is better than natural sand. "Speaking generally, only about one-tenth of the weight should consist of grit or granular particles passing a 6-mesh sieve and retained on a 10-mesh sieve, about 40 per cent should pass the 10-mesh and be retained on the 36-mesh, another 40 per cent passing the 36-mesh and retained on the 100-mesh, with 10 per cent only passing the 100-mesh. In order that such a graded aggregate may be cemented by the binder into a solid rock-like sheet to form the road surface it should have added to it about 10 per cent of fine limestone powder or Portland cement as a filler, and about 12 per cent of pure bitumen as the binder." The author then describes, with illustrations, a fixed or semi-portable plant (Lightning Crusher Company) for crushing the desired aggregate to any size, or

grading, heating it, and coating and mixing it with the binder. The crushers are of the high-speed rotary type; each piece of stone is struck twice in the air, the hammers rotating with a high velocity in an enclosed chamber. The number of blows per second and their force can be regulated to a nicety, as the crusher is driven by an independent electric motor. The crushed material is very cubical. By an arrangement of flues with an exhaust fan the fine dust can be separated to be used if required. The dried and heated aggregate falls through shoots into the buckets of the mixer-elevators, and after being weighed or measured close to the foot of the elevators, it is dumped into the mixers in the quantity required for each batch. The binding material is stored in melting kettles, fluxed from the flux tank, measured off in measuring drums, forced through pipes by compressed air, and delivered at the surface of the aggregate already in the mixer. In a day of ten hours 200 tons of hot mixture can be delivered on the road. The author considers that "the modern road engineer should test his road material as an engineer would test steel or other materials of engineering construction," taking frequent test pieces from the batches of hot material. He should therefore be provided with portable testing apparatus. Moulds for moulding the test pieces will be required, and a test hammer and press (herewith illustrated). The author then describes a portable straight edge (herewith illustrated) which he has devised for testing the truth of the road surface as finished. The actual contour of the road is drawn to full size by the recording pen of this instrument. The author prefers the placing of hot material directly on to the road

aging 1.75 tons each, and that the one-third balance is in the form of 24,000 heavier vehicles between 2½ and 7½ tons, averaging 5 tons.

(3) It is assumed that the damage done to roads by 1 ton of traffic carried on steel tyres is 1½ times that carried on rubber tyres.

(4) That the cost per vehicle-mile for the lighter class, the bulk of which use pneumatic tyres, may be taken at 8.25d., and that of the heavy 5-ton vehicle be taken at 16d., both of which are well-ascertained average figures.

(5) That the cost of the roads as they are is the common case where a main road, 18 ft. wide, requires re-coating every three and a-half years at a cost of £800 per mile, or £223 per annum, which, with the annual cost of trimming and share of lengthsman's wages, brings the total cost to £300 per annum; the reconstructed road to be resurfaced with double-coat work, 4 in. thick, at a cost of £3,400 per mile, having a life of twelve years, which, with the item for lengthsman's wages, also comes out at £300 per mile per annum.

(6) That the reduced vehicle costs shown are those now obtainable from vehicles running most of their mileage on well-surfaced urban roads, and are due not only to savings in fuel and repairs, but to the greatly increased speed and increased mileage run by each vehicle on the improved roads.

The large saving shown, amounting to upwards of £800 per annum, to the owners of the vehicles using this mile of road brings forcibly before the members the case which the author has attempted to make—that the time has arrived that this problem of the new industry of road locomotion should be most carefully considered by all classes engaged in it—not only the

TABLE SHOWING HOW RUNNING COSTS ARE REDUCED BY ROAD RECONSTRUCTION ON ONE MILE OF ROAD CARRYING 1,000 TONS A DAY.

Traffic.				Costs as they are.				Costs as they will be.			
				Vehicle.		Road.		Vehicle.		Road.	
Class.	No. of vehicles.	Average weight.	Total.	£	d.	£	d.	£	d.	d.	d.
Light	137,000	Tons 1.75	Tons 240,000	4,700	8.25	180	0.316	4,280	7.5	1.0	0.316
Heavy	24,000	5.0	120,000	1,600	16.0	120	1.2	1,200	12.0	120	1.2
Total	161,000	2.25	360,000	6,300	—	300	—	5,480	—	300	—

to the other method of previous coating and cold rolling, in which the setting process is slow and the risk of damage greater.

The author then refers to the portable plant of the Ransome ver-Mehr Machinery Company, which can be worked on the roadside on the batch principle. In this machine an excess of heated air is forced over the stone contained in the rotary drier, the size and weight of which can therefore be reduced. Cylindrical driers, batch mixers, conical rotating mixers, rotating hand mixers, and combined heating and mixing machinery are then described, with illustrations of machinery constructed by Messrs. Ord & Maddison and Stothert & Pitt.

ECONOMICAL CONSIDERATIONS.

"As it is obvious that, if we wish to obtain the best results, using any of the various forms of road-making machinery herein described, the plant should be worked by trained labour under skilled engineering superintendence, it is the author's opinion that, for some time to come, the work will be carried out by responsible contractors, although, in some cases, existing road authorities may elect to provide themselves with their own plant and to train their own staff."

The author concludes by showing, in tabular form, the extent to which the running costs of vehicles as they are will be reduced by well-considered reconstruction of road surfaces. In order to bring into comparison the data which are obtainable from the old type of roads with those obtainable from reconstructed roads, in the preparation of this statement he has adopted the following assumptions:—

(1) That we take the case of a mile of road carrying a traffic of 1,000 tons per day, or 360,000 tons per annum.

(2) That it is assumed that of this traffic two-thirds will be in the form of pleasure vehicles or light commercial vans weighing from 1 up to 2½ tons, or aver-

aging 1.75 tons each, and that the one-third balance is in the form of 24,000 heavier vehicles between 2½ and 7½ tons, averaging 5 tons.

Mr. A. DRYLAND, county surveyor of Surrey, was among the speakers in the discussion which followed the reading of Colonel Crompton's paper. Mr. Dryland said that he was in agreement with some of the views expressed in the contribution, but disagreed with others, and he proposed to touch upon some of the points in which he was at variance with him. Colonel Crompton had observed in opening that the design of self-propelled vehicles had reached a very advanced stage. That was quite true, as far as the power of conveying loads was concerned, but he should like mechanical engineers to devote some of their attention to the effect which those vehicles had on the roads, and endeavour to modify those effects. Colonel Crompton seemed to think the deformation he had spoken of had not been noticed much in the past, but it had always been a bugbear with him (the speaker). The remark had also been made that materials laid hot had an advantage in that they were less likely to form waves; but the diagrams accompanying the paper showed the opposite effect, and in all the Road Board trials of material laid cold the deformation was less than with material laid hot. He did not say that would be the case in the end,

because some of the materials laid hot would recover by reason of their elasticity. His experience had been that hot laid material generally had more corrugations than the other, and as there was likely to be a considerable development of materials laid in a hot condition, one of the problems would be to obtain an even surface. He did not know how far the three-axle roller which Colonel Crompton had described would meet the case, but from what he had seen of its working up to the present it did appear to produce a more even surface than the ordinary tandem roller. Weight was undoubtedly the greatest factor in the deformation of roads. He considered there was a great deal in the point about rhythm of the wheels, and mechanical engineers ought to see whether that could be varied by making wheels of a different size front and back. Colonel Crompton's view was that where rubber tyres were used the shocks imparted to the road were so cushioned by the tyre itself that increased wheel diameter was not of great importance, but that could scarcely be regarded as accurate when applied to motor omnibuses, which, of course, had rubber tyres. Personally, he should like to see self-propelled vehicles provided with larger wheels. He agreed that, so far, slag had produced admirable results and held its position well with other materials. He had tried bituminous coats on the ordinary macadam crusts, and up to the present with very promising results, the idea being where one had sufficient strength of metal to carry the weight it was not necessary to have what Colonel Crompton called a strength crust. He realised there were possibilities in regard to the connections between the two coats, but he had some work in his mind where there was no evidence of parting between the surface and base, nor any deformation. Colonel Crompton was rather sanguine in his estimate of the amount of material—200 tons per working day of ten hours—which the bituminous mixer he had described could deliver on the road, and he did not think he need say it was necessary for a plant of that kind to be very near the work—although it was desirable—for, as a matter of fact, these bituminous mixtures could be laid 30 miles from the works. He did not want to criticise closely the figures with regard to cost in the future. He thought that some of the author's assumptions were assumptions only, and would not be justified by results. Colonel Crompton had assumed twelve years as the life of his road. He did not think he would prove to be correct in that—although he hoped so—or that the saving, both to vehicles and road, would be as great as was anticipated. Concluding his remarks, Mr. Dryland said the question of deformation was a serious one for those in charge of roads. It was going to be a difficult matter to remedy without reconstruction, and if that reconstruction was to be a frequent occurrence it would prove so costly to local authorities that the good roads that were so desirable would not be possible of attainment.

Following remarks from other speakers, Colonel Crompton made a short reply. One could not, he observed, go on to a modern road without seeing the harmonic waves to which he had alluded, and roads had to be remade simply because of that deformation. Surely it was an object that ought to be followed up. For his own part, he felt confident that he would be able to stand by the opinions he had expressed, and that his claims for the system of road making he advocated were, considering the nature of the traffic on which his figures were based, quite moderate in their character.

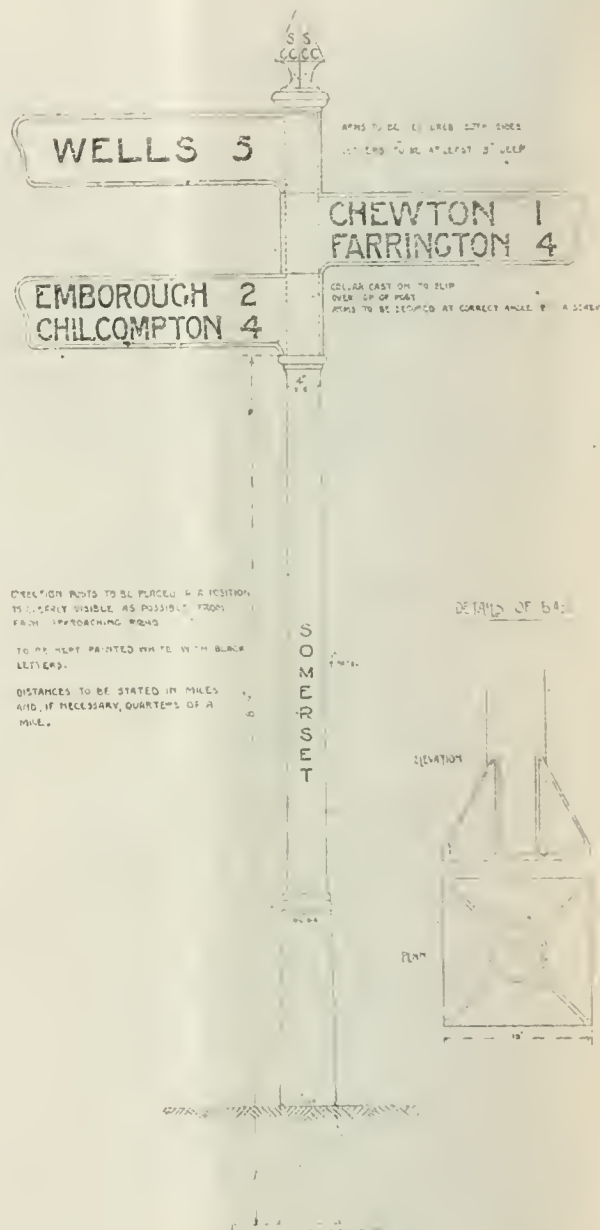
Wall Calendars.—Messrs. John Smith & Co., Grove Works, Carshalton, Surrey—engineers, millwrights, iron and brass founders—have issued their usual annual hanging calendar; and we have to acknowledge one also, with tear-off monthly slips, from the Union Assurance Society, Limited, of Royal Exchange Buildings, E.C.

Business Announcement.—Messrs. Browett & Taylor, auctioneers, valuers, architects and surveyors, 9 Warwick-court, Holborn, W.C., announce that they have taken into partnership their manager, Mr. T. Alfred Cordery, A.A.I., M.C.I., who has been associated with them for upwards of twenty years, and has had the control of the surveying department of their practice. The business will be carried on as Browett & Taylor, as heretofore.

DIRECTION POSTS.

THE SOMERSET COUNTY TYPE.

Mr. H. T. Chapman, the county surveyor of Somerset, to whom we are indebted for the original of the accompanying drawing, has from time to time been in receipt of requests for particulars of the direction posts in use on his roads—which have already been adopted by the authorities of several other counties—and we reproduce the design for the



benefit of readers of this journal who may in the near future find it necessary to give attention to the provision of improved means of sign-posting the highways in their charge.

A model of a four-armed direction post of the type illustrated was, it may be recalled, shown at the International Road Congress Exhibition in June last.

Institute of Sanitary Engineers.—On February 16th a paper on "The Significance of Colloidal Matter in the Problem of Sewage Disposal" will be read by Mr. F. R. O'Shaughnessy, F.R.C.E., at a meeting of the Institute of Sanitary Engineers to be held at Caxton Hall, Westminster. The chair will be taken at 8 p.m. by Mr. John D. Watson, the president.

War Office Contract.—A notification has been issued by the War Office that the tender of Bell's United Asbestos Company, Limited, of Southwark-street, London, has been accepted for the supply during the three years from December 17, 1913, of asbestos-cement ("Poilite") roofing slates, wall and ceiling sheets, &c., made at Bell's United Asbestos Company's "Poilite" factory at Harefield, Middlesex.

An Engineer's Report on Some Features of Municipal Engineering Works in Europe.

By MR. GEORGE JANIN, Chief Engineer of Public Works, Montreal.

[By the esteemed courtesy of Mr. Janin, we are enabled to present the report made by him to the Board of Commissioners and Members of the City Council of Montreal concerning his recent visit to Europe. Some of its details are further referred to in "Minutes."]

During a trip to Europe which I recently took for the benefit of my health and for other personal reasons, I profited by my stay in a number of important cities to devote as much of my time as possible to obtaining information, both documentary and otherwise, relating to the public works administration of these cities.

I remained for a longer or shorter period in each of the following important cities: In France—Paris and vicinity, Versailles, Melun and Fontainebleau; in the West—Poitiers, Angoulême and Rochefort-sur-Mer; in the North-West—Rheims, Charleville and Givet; in Belgium—Charleroi and Namur; in England—London, Birmingham, Liverpool and Bristol.

I began my career in Paris thirty-five years ago, and during this trip I spent more time there than anywhere else. It was through the kindness of a number of the leading officials of the city government that I was enabled to secure fuller data in Paris than in any other city I visited. In this connection I would refer specially to the courtesy of Mr. Barratte, chief engineer of bridges and roadways, in the water and sewer department; and also to that of Mr. Lirman, the assistant of Mr. Labordaire, engineer of highways, who was away on his vacation during my visit. This gentleman has charge of the workshop for treating wooden pavements.

I will therefore begin my memorandum by communicating to you the results of my observations in the capital of France—a city celebrated for the magnitude and perfection of its public works.

LIST OF DEPARTMENTS AND STAFF COMPOSING THE MANAGEMENT OF THE PUBLIC WORKS OF PARIS, GIVING COMPARISONS BETWEEN THEM AND THE SAME IN MONTREAL.

PARIS.		MONTREAL.
2,800,000	Population	568,000
34½ sq. miles	Area	406 sq. miles
\$ 0,000,000 (£2,000,000)	Budget as per last published statement.	\$8,720,000 (£1,744,000)
\$800,000 (£ 60,000)	Salaries of managing staff	\$315,000 (£63,000)

The composition of the staff is as follows:—

1 Inspector-General of Bridges and Roadways, Director of Public Works	1 Chief Engineer, Director of Public Works and Railways.
1 Chief Engineer of Highways, Lighting, Cleansing, Planting and Railways.	1 Engineer of the Road Department.
1 Chief Engineer of Water, Sewers and Drainage.	1 Waterworks Engineer. 1 Sewer Engineer.
1 Chief Engineer of Quarries, Paris underground.	(This office is not required in Montreal.)
31 Chief section-Engineers of social works and technical studies.	52 Engineers, 12 of whom are employed for the Department of Geography, which in Paris is not under the control of public works, but under the title of the Paris Plan Service, employs 9 geometers, draughtsmen and chainmen.
815 Overseers and checkers.	220 Works inspectors. 30 Checkers.
7 Head gardeners.	This service comes under Parks and Ferries.
10 Chief clerks.	4 Chief clerks.
155 Clerks.	38 Clerks.
10,000 Men approximately.	12,000 approximate.
Workmen and foremen (both permanent and temporary).	

The above figures speak for themselves, and show that the administration of the public works of Montreal, compared to that of Paris, one of the model

cities, is beyond all criticism from the point of view of economy, because on a considerably greater superficial area, and with an annual budget of expense nearly equal, it gives employment to about 350 technical officers, as against 1,100 such employees in Paris.

NOTES MADE ON THE OPERATIONS OF THE VARIOUS SERVICES OF THE MANAGEMENT.

I.—SERVICE OF PUBLIC HIGHWAY (under the higher orders of a chief engineer under the direction of public works).

1ST. PAVEMENTS.		PARIS.	MONTREAL.
8,500,000 yds.	Permanent sidewalks	2,000,000 yds.	
10,000,000 yds.	" pavements	2,600,000 yds.	

This area is split up into the various kinds of pavements in the manner shown in the annexed schedule, which is an exact copy of that of the official report of the civic administration of Paris.

1	twentieth Asphalt.
3	" Macadam (water and tar bound).
5	" Wood
11	" Stone or artificial blocks.

In Paris, as in Montreal, the proprietors pay for the first pavement laid, and the city keeps it in order. The same applies to the sidewalks.

Stone Pavements.—As shown by the above statistics, pavements of stone and artificial blocks still predominate (the latter furnishing the smaller proportion). These are considered by authorities on public works as most suitable for heavy, dense traffic, as well as being the cheapest in the end, in view of the wearing qualities (40 years), and of the re-utilisation of their materials in making repairs. Moreover, the administration of Paris states that the reason for the very extensive use of the stone pavements in that city is because Paris itself owns and works profitably, at only a short distance (about 20 miles), one of the finest quarries of paving material in the country. This material is extracted from extensive beds of silicious sandstone, slightly resembling the products called "sandstone," of which we have used a certain quantity in Montreal during the last few years. Its principal feature is that it is less slippery and less noisy than the granite pavements which are also used in Paris, though in smaller quantities.

Artificial Block Pavements.—Artificial block pavements occupy only a small area in Paris. This, it would appear, is on account of its high cost; but tests are being made in the use of a new product which was briefly explained to me, and which, according to its promoters, would fulfil the conditions of durability, economy, and the least amount of noise, which would make it, if desirable, a suitable substitute for stone or scoria block pavements. I shall keep myself informed of the further progress of these tests.

Asphalt Pavements.—The excessive noise from stone pavements has induced the administration to look for less noisy substitutes for paving level residential streets. For this purpose the use of smooth asphalt was favoured at first; but, as shown by the foregoing statistics, its use is not progressing to any extent. The principal reasons given are its slippery surface and the high cost of laying and repairing. For my part, while respecting the opinions of the Paris administration, I still believe that this pavement suits Montreal well for level streets which have no tramways. Moreover, its cost here is in no wise prohibitive, seeing that we do not use rock asphalt, as in Paris.

Wooden Pavements.—The most frequently used substitute for stone, so far, is the wooden pavement. Trials of this pavement had already been begun over twenty years ago, when I belonged to the Paris administration; but these trials had been far from giving results which were expected from them, particularly in respect to the rapid deterioration of these pavements. On a small scale, Montreal formerly

underwent the same experience. After repeated researches, a remedy seems to have been found for this serious drawback. Until quite recently the various selections of woods, and treatments of these woods, had raised the hope of obtaining a practically incorruptible, and at the same time sufficiently resistant, material to be effectively and economically used. The installation and recent improvement in Javel's manufactory, and the new treatment applied there appear to have brought about the solution of the problem. I visited this factory and received valuable information from the manager. The details of the apparatus and of the method of treating would be too lengthy for this memorandum, but I have taken the necessary notes, and this information will be completed on request, and at a suitable time and place I will give you my opinion as to what opportunity there might be for imitating the city of Paris in this direction. I may now inform you, nevertheless, that the principle of this treatment consists in mechanical freeing of the wood of nearly all the materials it contains which are readily liable to decay, and replacing them by heavy mineral oils at a slight cost, and thus to render the wood durable and resistant at the lowest cost. Pavements in this way now cost the city of Paris from \$1.90 (7s. 11d.) to \$2.30 (9s. 7d.) per yard. I shall receive shortly a document giving the analysis of this cost price, by means of which I hope to be able to calculate with sufficient exactitude the cost of a similar plant in Montreal. The kinds of wood which the Paris authorities prefer are those of the maritime pine of the Landes and the Norway pine, which much resemble the "long-leaf yellow pine," the tamarack, and the hemlock of the American countries. The duration of the wooden pavement is given by the Paris authorities at about ten years. This pavement is generally condemned for tramway strips and sideways.

Macadam.—There are at the present time about 1,300,000 sq. yds. of macadam on the streets and avenues of Paris. This macadam has been put down and is kept in repair by the city. All the stone thus used is of a very hard kind, partly of volcanic origin, porphyry or granite, little or none being calcareous, which, although considered suitable for constructing good roadways for traffic, is too apt to be broken up by frost.

Tar-macadam.—Since the year 1904 the direction of works has begun to follow various methods, among which I have noted the superficial tarring of macadam. In 1912 this method covered a surface of about 600,000 sq. yds. Its success, as far as the suppression of dust and mud is concerned, is recognised, but it appears that it does not last over one year.

Asphaltic Macadam.—On account of the short duration of these coating processes, the administration has been induced to begin the use of so-called penetrative processes, and especially those of coating with bituminous or asphaltic concrete, which are nearly all patent processes. The most extensive test which has so far been made is that of the "Bitulithic" system, which was used on about 15,000 sq. yds., principally on one of the most beautiful avenues of Paris—viz., the Avenue de l'Alma, where I noted its fine appearance. This composition, if not exactly identical, appears to me to be similar to what is submitted to us in Montreal under the name of "Bitulithic," but I am awaiting fuller information before deciding this point. Other compositions of asphaltic or bituminous concrete are also in the trial stage—such as Tarvia, Pix Road, Gutrin, &c. The authorities consider it advisable before venturing further to await the results of practical tests after those in the laboratories have been completed. It will probably be interesting to note that the opinion of the municipal authorities of Paris confirms my own in this respect—viz., that until further experience with these compositions, it is preferable to have such paving experiments conducted under guarantee by the contractor, rather than for the city to start a testing school to test, at its own risk, processes which are still in the experimental state. In the connection I should like to draw your attention to the importance of the work done by the Paris municipal laboratories in experimenting with and analysing the materials to be used in public works. The latest budget published shows an expenditure of almost £4,000 for the maintenance of these laboratories. I shall later submit to you a scheme for the organisation of a similar branch based on our new and increasing requirements in this respect.

II.—TREE PLANTING.

The systematic planting of trees in the highways of Paris is directed and carried out under the depart-

ment of public works. I will not enter into the details of this system, which appears to give the very best results. In Montreal this service is under the department of parks and ferries, and is not under my control.

III.—CLEANSING, SPRINKLING AND SNOW REMOVAL BY WAY OF CARTS OR SEWERS.

This service has an admirable organisation in Paris, and I have the necessary documents for a thorough study of those features which might with advantage be adopted in Montreal. The rolling stock—consisting of sweepers, sprinklers, dump carts, &c.—is still, to a large extent, horse-drawn; but these vehicles, as in the case of Montreal, are being replaced by automobiles.

At the time the latest report was published there were in active service about 500 horse-drawn machines and 30 automobiles, of which several were of the Durey-Sohy type, the same as that selected by you recently to be tested in Montreal. Apart from these, thirteen other automobile machines have been ordered from four different manufacturers for a competitive test before placing an order for forty machines.

During my stay in Paris I was greatly interested by my visit to one of the factories of the firm of Durey-Sohy, from whom we have ordered three sprinkler-sweepers, and was assured by them that our machines would be delivered to us without delay. M. Durey, jun., will be in Montreal personally at the time of their delivery in order to satisfy himself that they are in perfect working order, and also to furnish a complete stock of duplicate parts to effect any possible repairs. At this factory I examined various machines for municipal requirements, such as wagon for manure removal, portable boilers for asphalt and bitumen, &c., which, in case of need, might prove useful in Montreal.

IV.—REMOVAL AND DISPOSAL OF HOUSEHOLD REFUSE.

This important service, which in Montreal is not under the control of the department of public works, comes under that department in Paris. It is being completely reorganised on the principle of absolute municipalisation. I have in my possession a document setting forth, at the disposal of the Board of Commissioners, any information they may desire on this subject.

V.—PUBLIC AND PRIVATE LIGHTING.

In Paris this service is under the management of the department of public works; in Montreal it is an adjunct of the department which I administer. I have therefore not considered it necessary to go minutely into the subject of its operation in view of the small amount of time at my disposal.

VI.—RAILWAYS.

In Paris the metropolitan and cable (funicular) railways are city property, and their construction and operations are under the direct control of the department of public works. The other railways are under the control of the municipality, which exercises such control through the agency of the said management.

I have brought back with me documents which will give you full information about the system, and likewise about those of cities in other countries I visited, where the street railway and autobus systems are owned by the city. I intend to carefully work out this important question, and if you desire, will at a later date lay before you a special memorandum on this subject.

VII.—SERVICE OF WATER, SEWERS AND DRAINAGE (SANITATION)

(under the higher order of the chief engineer, who is under the control of the department of public works).

Water.—The drinking-water supply of Paris is furnished by aqueducts 321 miles in length, and is drawn from the waters of four different rivers, which are afterwards distributed by gravitation unfiltered. These aqueducts furnish nine-tenths of the water consumed, the other one-tenth being pumped out from the river and then distributed, after having been filtered by the works at Ivry and St. Maurice, which I visited on my last trip. The average consumption in Paris per capita is 198 gallons. In Paris the water used is measured by meters. The average number of bacteria per cubic centimetre as found by analysis of the rivers which have been diverted is 830. In Montreal the average found by analysis of the water of our conduits, which have been extended into the St. Lawrence, was, last year, 650 bacteria, before the sterilisation by hypochloride of lime. The water-pipe system of Paris has about 8,000,000 ft. of pipes, that of Montreal about 1,315,000 ft. On the total length of the water pipes of Paris, about 7,000,000 have been placed in the sewers

or special underground passages, and only 1,000,000 in the ground. The first system is that which I have long recommended for Montreal, for economical and practical reasons, and which the Board of Commissioners has begun to adopt as it has been possible to do so.

Sewers.—The total length of the Paris sewers is about 1,300,000 yds., that of Montreal being about 602,178 yds. The style of sewers is much larger than that used in Montreal, to enable water conduits and other services to be placed within them. Nearly all the sewers are made of concrete mixed on the spot.

Sanitation.—Purification fields and works for treating sewage from the sewers. The City of Paris empties little or no sewer water into the Seine. Purification by means of sewage farms and cultivation, which was begun on a small scale over thirty years ago, is now of great extent, and occupies an area of 12,644 acres. The difficulty in procuring the additional ground which would be necessary in order to treat the ever-increasing volume of sewer water, has induced the administration to establish separating basins and percolating beds capable of purifying on small surfaces the excess sewer water which the sewage farms can no longer receive. I visited the most recent installation—viz., that of Carrières-Friel, which is situated 12 miles from the city—and found the system to be so practical and so much superior to anything I had heard of before or recently seen elsewhere that I shall not hesitate to recommend, with the changes necessary for the Montreal climate, the application of this system to the plant which we are now constructing for the treatment of the water at the collector in Notre-Dame-de-Graces. I have all the latest documents dealing with the treatment of sewer water in Paris, which I shall place at the disposal of Mr. R. S. Lea, in order that we may make profitable use of them when we are dealing with the question which Mr. Lea has been instructed to investigate, with my assistance.

OBSERVATIONS AND STUDIES IN THE OTHER CITIES OF FRANCE AND IN OTHER FOREIGN COUNTRIES.

The limited time at my disposal for attending to personal matters and for collecting professional information has, I very much regret to say, only enabled me to gather certain information in a hasty manner in cities other than Paris on matters which might be of interest to the departments under my direction. I shall therefore give the following brief notes which I consider to be especially noteworthy.

FRANCE.

Tar and Asphaltic Macadam.—At Versailles I examined the great Paris highway, where traffic of all kinds is enormous, especially that of automobiles. This road was partially paved in 1912 with a composition of crushed stone and liquid Trinidad asphalt, and seems to be now in good condition. At Melun and Fontainebleau, on the national highway between these two cities, where both heavy and automobile traffic are considerable, a test of tar-macadam was made in 1908; but, from what I have seen of this route, it is now, after five years, completely broken, and its appearance does not argue favourably for the system used, which, according to information I have received, is, nevertheless, one of the systems generally recommended for penetrative tar-macadam.

Stone Pavements.—At Poitiers and Angoulême, which I visited for purely personal reasons, stone paving is most in use, and there is little or no macadam, either with or without the application of bituminous products. The use of stone pavements appears to be completely justified by the situation of these two cities on hills, which are only accessible on nearly all sides by steep gradients. At Rochefort-sur-Mer, which is built on perfectly flat ground, there is about as much macadam and asphalt as stone pavement. This macadam is made of pebbles without tar. At Rheims, Charleville and Givet, whose streets are fairly level, the amount of paving appears to be about equally divided between stone and macadam. I did not notice whether there was any tar-macadam in these cities, but some highways which meet at Rheims and Charleville have been coated with tarry or bituminous preparations which appear to be in good order, and which, moreover, are perfectly dustless, in spite of the heavy traffic.

Purification Field (Sewage Farm).—In the outskirts of Rheims there is a field for purifying the sewer water. This has been much improved since I visited it at the time of its installation, over twenty years ago. I noted certain features of this system which might with advantage be made use of in Montreal.

BELGIUM.

Pavements.—In Belgium—where I made a short stay some of the important cities, especially Charleroi and Namur—I noticed, as far as pavements are concerned (and this was substantiated by what I was told by those authorities whom I met), that the coating of streets and roads with asphalt, tar-macadam, or asphaltic compositions, was hardly ever resorted to, if at all.

Scoria Concrete Pavement.—The ordinary macadam itself, considered as being too dusty, is being gradually replaced by concrete composed of lime, cement and pulverised scoria (slag). The last, being a by-product of foundries, is so common in the country that it is also almost exclusively used for paved roads.

Scoria Block Pavement.—Many of the streets in the cities which I visited are paved with artificial blocks, similar to those used by us in Montreal, but which cost much less there.

ENGLAND.

Wooden Pavement.—In England I made short visits to London, Liverpool and Bristol. As regards the paving of streets or roads, I found that wood, asphalt and stone are almost exclusively used. I was told that the cost of wooden pavements, including foundations, is from \$2.50 (10s. 5d.) to \$3.30 (13s. 9d.) per square yard.

Tar-macadam.—Numerous tests of special tar, or asphaltic macadam, are being made, but I could not obtain much information in this connection. The few experts which I had time to consult informed me that the ordinary water-bound macadam is still being used at the present time for the paving of most of the rural roads and streets of small towns.

Bituminous Macadam.—At Liverpool trials of tar or asphalt macadam are being made, but with a layer of not less, in every case, than 3 in. thick on concrete foundation.

Aqueduct.—The water supply of Liverpool is now secured by such an extensive and remarkable civil engineering work that I took the time and trouble to make inquiries, as far as possible, in connection therewith, and I even travelled, partly by rail and partly by automobile, over the distance of about 65 miles as far as the dam and the large artificial basin which supplies the municipal aqueduct with 70,000,000 gallons of water per twenty-four hours, the population being about 750,000. The dam, which bars the valley of Vrnwy, is 1,172 ft. long, 84 ft. high, and 127 ft. thick at the base, with foundations 60 ft. deep; the masonry weighs over 500,000 tons. This dam forms an artificial lake, having an area of about 1,200 acres. The area of the water basin is about 23,000 acres. The aqueduct is 70 miles long, being tunnelled over a distance of 24 miles under the mountains. The cost of these works, which were begun in 1881, exceeds \$20,000,000 (£4,000,000). Liverpool had not, like Montreal, the powerful and limpid St. Lawrence within its reach; it only has the sea and polluted and muddy rivers. Is not the enormous expenditure incurred for bringing from the mountains the water (which will likely have to be filtered later on) a glaring justification for the preference which you have given to our scheme of establishing the intake at some distance from the shore of the St. Lawrence?

Stone Pavement. At Bristol, as regards the pavements, I have ascertained that several streets without any slope were paved with wood, but the city being partially built on hills the stone pavement prevails.

I am proud to be able to say that, generally speaking, the remarks which I above submit to you, and which are almost all corroborated by the documents in my possession, tend to justify the professional policy which I have followed in the recommendations which I have had the honour to make to you concerning roadworks, as well as waterworks or sewers.

Water Supply Statistics.—The Local Government Board report that the preparation of the return ordered by the House of Commons in 1910 as regards each water undertaking and the water supply of every district in England and Wales was considerably advanced during the year. The forms which were sent out for the purpose of obtaining the information required for making the return are necessarily somewhat complicated, and much difficulty has been experienced in getting them correctly filled up. On March 31, 1913, some 3,000 forms had been received from local authorities, companies and private proprietors, and very few were outstanding. In many cases, however, more especially in rural areas, full information is unavailable.

Institution of Water Engineers.

WINTER GENERAL MEETING IN LONDON.—(3.)

At the recent winter meeting of the Institution of Water Engineers in London the following paper was submitted for discussion:—

THE PORTLAND URBAN DISTRICT COUNCIL WATERWORKS.

DESCRIPTION OF FRIAR WADDON BOREHOLE SCHEME AND PUMPING STATION.

By R. STEVENSON HENSHAW,
Surveyor and Water Engineer.

Mr. Henshaw commenced his paper by enumerating briefly previous attempts made by the Portland Council to obtain a sufficient supply of water for the inhabitants of Portland, including the Naval Station of the Admiralty. The author was appointed engineer to the council at the end of 1902, and after careful investigation of the conditions reported in August, 1903, to the following effect—viz.: (1) That in a dry season the council would not be in a position to supply the Admiralty with any water at all, but, in order to supply their own consumers, would have to work the temporary machinery in a well near the churchyard day and night; and (2) that in the autumn of a dry season the council could not expect to obtain more than 160,000 gallons a day from the new well in the chalk. As, however, the suction pipes had been fixed some 7 ft. or 8 ft. from the bottom of the well and above the headings, the author recommended the lowering of the pumps to within 4 ft. of the bottom, by which means he estimated that a total of 175,000 gallons per day might be obtained. He further estimated that the consumption in twelve months' time would be 323,500 gallons per day, and that a new scheme was therefore imperatively necessary.

This report naturally created considerable surprise, but no definite steps were taken until the following year, when it was found that, although the pumps had been lowered to the lowest possible level in the new well, the average yield for the six days ending December 7, 1904, was only 154,076 gallons per day.

The author suggested the sinking of a small borehole in what is known as the Portisham Valley, and as some members of the committee were in favour of deepening the new well and increasing the length of the adits or driving fresh ones, Mr. C. E. Hawkins, who had previously studied the geology of the district, was engaged to report upon the matter. Early in 1905 he reported that he did not recommend the council either to execute any further work at the new well or to sink another shaft in the chalk in the immediate neighbourhood, but advised the sinking of a trial borehole on a site to the east of that selected by the author, where he thought that water from the Portland stone would be obtained at a depth of 150 ft., and would rise to within 70 ft. of the surface. This report did not, however, meet with the unanimous approval of the committee, and they decided to take further advice.

In the meantime the author took the levels and temperature of the water in the various springs and wells for several miles round, and prepared a chart showing the rise and fall of the "Wishing Well" spring, and its relation to the rainfall. This spring rises in the centre of the village, and flows at a rate varying from 17,000,000 gallons to just under 2,000,000 gallons per twenty-four hours; the water has a fairly uniform temperature of about 51 degrees, and appears to represent the drainage from an area of about 12 square miles, the greater part of which is in the chalk area, the area of the Purbeck and Portland beds in the immediate neighbourhood being comparatively small and quite insufficient to account for the large volume of water which this spring yields; moreover, the analyst, when reporting on a sample of the water, termed it "a chalk water."

The nearest chalk outcrop is about $\frac{1}{2}$ mile north of the spring, the southern boundary being formed by the Ridgway fault, so that this water is bound to cross the intermediate valley or trough formed of the Purbeck and Portland beds before reaching the spring. The problem was, however, to ascertain where it did cross.

The author formed the opinion that a borehole or

well in the centre of this valley would tap the chalk water flowing over the edge of the Kimmeridge clay at the point where, owing to the dip of the strata south of the fault, the top of the clay was below the line of saturation in the chalk. . . .

Finally, he was instructed to prepare the necessary plans and specification in order to apply to the Local Government Board for a loan of £250, covering the cost of a 6-in. trial borehole, 175 ft. deep, on the site previously recommended by him. . . . The loan was sanctioned subject to repayment within a period of five years.

Boring operations were commenced in November, 1909, and on January 17, 1910, at a depth of 280 ft., the boring, which was 10-in. diameter, had passed through 16 ft. of hard blue shale, which was thought to be Kimmeridge clay. The boring was then enlarged for a depth of 75 ft. to 11 in. in diameter for the purpose of inserting 10-in. lining tubes, the author having previously arranged to continue the hole 10 in. in diameter instead of reducing to 6 in. at a depth of 175 ft., as had been proposed. While this work was in progress it was ascertained that what had been considered to be Kimmeridge clay was, in fact, the Portland clay overlying the Portland sand, which proved to be about three times the usual thickness. The identification was due to the discovery of the fossil *Modiola autissiodorensis*, which is characteristic of the Portland clay, but not of the Kimmeridge clay. The boring was continued, 3 in. in diameter, for a further depth of 75 ft. 3 in., well into the Portland sand, the thickness of the Portland clay proving to be 31 ft. At a depth of 355 ft. 3 in., the presence of a considerable number of clay pockets seemed to indicate the proximity of the Kimmeridge clay, and it was therefore decided to cease boring.

The results of the boring as regards water supply were as follows:—

When the boring had reached a depth of about 89 ft. the water rose until it overflowed at the surface at a rate of 1,450 gallons per twenty-four hours, reaching a maximum of 17,140 gallons at a depth of 219 ft., but after the Portland clay had been pierced the water level suddenly dropped 90 ft., gradually, however, rising again and overflowing the top at the rate of 2,400 gallons per twenty-four hours. The cost of the boring, lined with steel tubes to a depth of 68 ft., was £319.

With the object of ultimately substituting two boreholes for a well, the author recommended the committee to test the yield by means of an air-lift plant. This was done, and one installation being unable to properly test the yield, the plant was duplicated and a test made in May, 1910, proved a yield of 351,000 gallons per day, the water level being lowered to a depth of 134 ft. 6 in. from the surface, and on the last day of the test, by driving at an increased speed, it was found possible to obtain 400,000 gallons per day. The cost of this test was £207.

Although the author was satisfied with the result, the committee were advised that, as the "Wishing Well" spring was then flowing at the rate of 5,364,900 gallons per day, whereas in the November of a dry year it had been as low as 1,970,200 gallons, they might expect to obtain under similar circumstances a yield of only 147,000 gallons per day from the boring.

The temperature of the water taken at every 50 ft. in depth on August 26, 1910, and compared with the temperature of the water that had previously overflowed the borehole, seemed to indicate that the water was flowing into the boring at a depth of about 150 ft. from the surface. The author, however, insisted that the water came in at the 310 ft. level, and, still contending that the yield was satisfactory, suggested to the committee that if they were not satisfied they could again test the yield in November, which they eventually decided to do.

This test was commenced on November 30, 1910, and was continued for fourteen days. The result proved an average yield of 380,570 gallons per day for the fourteen days, but on the last day, when the engines were driven at full speed, it was found possible to obtain 452,000 gallons, with the water level

reduced to 145 ft. 9 in. from the surface. The cost of this test was £303 10s.

The author, in order to prove once for all whether the water entered the borehole at a depth of 150 ft., or (as he contended) at a depth of 310 ft., advised the committee to plug the hole at 280 ft., in the centre of the Portland clay, and test again for a few hours.

Owing to the static head of the water from above the Portland clay being superior to that of the water under the clay, the plug was forced down to a depth of 311 ft. below the surface, incidentally proving the author's contention, but the boring being effectually plugged at a depth of 280 ft., a further test with the air-lift plant proved that the supply available from above the Portland clay was only 195,740 gallons per day at a depth of 185 ft. below the surface, and therefore that the larger supply came from below the Portland clay and not from above it.

The committee were, however, still advised that the test was not satisfactory, owing to the fact that the flow of the "Wishing Well" spring had increased from 4,500,000 gallons on the first day of the test to 11,000,000 gallons on the last day, and that the only way to obtain a sufficient quantity of water on that site was to sink a well about 150 ft. in depth with adits driven in easterly and southerly directions; but, nevertheless, it was decided to adopt

A BOREHOLE SCHEME,

the author's estimate for which amounted to £15,600, compared to the estimated cost of a well scheme, with an adit of the length mentioned, amounting to £32,500.

In the first instance it was decided to deal with the borehole only, so that the question of a borehole scheme *versus* a well scheme could be fought out at the earliest opportunity.

The local inquiry of the Local Government Board was held on March 9, 1911, on the council's application for sanction to a loan of £1,450 for sinking a borehole 30 in. in diameter for a depth of 100 ft., 24 in. down to 312 ft., and 12 in. to 355 ft., and for enlarging the trial boring from a depth of 280 ft. to the bottom.

In view of the opposition to the borehole scheme, the committee consulted Mr. Percy Griffith, M.INST.C.E., F.G.S., on the matter, and were advised by him to proceed with the boring. In the course of his evidence at the inquiry, he stated his opinion that 800,000 gallons would be obtained with the water level reduced to 185 ft. below the surface, and it is interesting to note that in the result it has been proved that 744,000 gallons per twenty-four hours are obtained when the water level is depressed to 152 ft. below the surface.

The consent of the Local Government Board having been obtained, the boring was commenced in August, 1911, but, owing to the varying bands of rock, clay and shale found in the Purbeck beds, the first 100 ft. of 30 in. diameter boring was not completed until November 17th. Cast-iron flush-jointed tubes, 24 in. in diameter, 1 in. thick, were then lowered and bedded into 3 ft. of neat cement. The tubes were kept slung until the cement had set, when the annular space between the tubes and the boring was run in with cement grout. The boring was then continued through the tubes 24 in. diameter to a depth of 208 ft., which depth was not reached until April 4, 1912.

As the council had to be in a position to supply the Admiralty with a maximum quantity of 300,000 gallons per day, and 2,000,000 gallons per week by September 29, 1912, the author decided to reduce the diameter of the hole from 24 in. to 16 in. in order to expedite the work, and a depth of 355 ft. 3 in. was reached on May 31, 1912.

In the meantime the 10 in. trial boring had been enlarged and sunk a further 5 ft. to a total depth of 360 ft., and the cement plug removed.

Unfortunately an injunction had been obtained by the owners of a house adjacent to the old well in Upwey Village to restrain the council from pumping at this well after March 25, 1912. As it was presumed that the council had no other alternative, the petitioners offered to waive their claim for a period of three years on payment of £100 a year as rent for the house, £150 as costs and legal expenses, £30 as out-of-pocket expenses, and on the council undertaking to supply a farm and the fields adjoining with water in perpetuity, and to lay the necessary pipes free of charge, involving a total cost of, roughly, £500.

The author, however, advised that, the rainfall in the previous six months having been in excess of

anything previously recorded, he considered it would be possible to keep up the supply from the new well until the middle of June, and in the meantime the machinery at the lower (village) well should be removed to the trial boring and there be used in connection with an air-lift plant until the permanent pumps were fixed in the 24-in. new borehole.

The whole of this temporary machinery and plant was completed and ready for testing on June 10th, at which date the yield of the new well had fallen below the consumption and the storage in the reservoir had consequently got rather low.

On starting the plant it was unfortunately found that the water could not be lifted at a greater rate than 65,000 gallons per day. The position of affairs was then serious, and the supply of water to the island was only maintained by making the most of the air-lift plant in the trial boring, and going forward with all speed the fixing in the new boring of the large test pump, which was fortunately on the site. A large boiler had been previously placed in position, so that within a period of ten days the new pump (a direct-acting steam-driven vertical pump with a 15½ in. working barrel and 3 ft. stroke) was started to work, and utilising the fourteen days test pumping, together with an additional week, saved the situation.

In order to increase the yield of the trial boring the author decided to fire a cartridge containing a charge of 19 lb. of blasting gelatine in the 10-in. hole at a level of 311 ft. or 312 ft. from the surface.

It was decided to raise the 6-in. tubes some 30 ft. or 40 ft., so as to bring them above the scene of the explosion, and this being done the charge was lowered and fired. The result was somewhat unexpected and peculiar; although there was no sound or concussion, and no water was driven above the top of the hole, the tubes themselves (some 280 ft. in length and weighing about 3 tons) were gradually lifted out of the hole, carrying everything before them, including the 9-in. delivery pipe from the large steam pump, to a height of about 25 ft. above the surface, and, in falling back, straightened out a 3-ton hook at the top of the shear legs, smashed two pairs of large clips supporting the tubes on the top of the boring, and careered to the bottom of the hole, thus leaving the upper end about 75 ft. below the surface.

The tubes were duly brought to the surface full of water, the reason being that the two bottom lengths had been telescoped for a length of 4 ft. and completely jammed with silt from the bottom of the boring. The tubes having been again lowered, another start was made with the air-lift plant, this time with complete success, 12,500 gallons per hour having been pumped from this boring, very often night and day, for a period of over fourteen months. The 24-in. borehole, although only about 6 ft. away, had not been damaged to the slightest extent by the explosion, the only effect being that the water in it was discoloured for a few hours afterwards.

The test pumping from the 24-in. borehole, with the suction strainer 198 ft. from the surface, showed a yield of 600,000 gallons per twenty-four hours with a good pressure of steam in the boiler, the average working out at 555,000 gallons per day. The cost was £430. On testing both holes together for a short period the delivery was increased to 900,000 gallons per day without lowering the water in the 10-in. hole beyond 152 ft. 6 in. from the surface.

The author has since proved that the copper-wire gauze placed over the suction strainer of the pump—to protect the working barrel from the steel shot left in the borehole—had checked the inflow to an appreciable extent, and he has arranged for the permanent plant to have a capacity of 650,000 gallons per twenty-four hours with the suction pipe extended 7 ft. lower.

A loan to cover the cost of the 10-in. rising main for a distance of 3,300 ft. was sanctioned in October, 1911, and the work carried out concurrently with the sinking of the 24-in. borehole; this main was therefore ready for use by the time the temporary plant was completed.

On April 12, 1912, a Local Government Board inquiry was held on the council's application for a loan of £11,250 for the permanent work, and the loan was sanctioned on September 20, 1912, subject to the test proving a yield of 600,000 gallons from the 24-in. borehole.

The pumping station and cottage are completed, and the fixing of the machinery, which has been supplied by Messrs. J. Simpson & Co., London, is approaching completion. The plant for the 24-in. borehole has

been fixed, and a preliminary test made on September 6th gave a favourable result, the water, after 2½ hours' pumping, being lowered to only 172 ft. below the surface and rising 62 ft. in five minutes on stopping the plant in the 24-in. boring. The water delivered was greatly in excess of the specified quantity, being at the rate of 708,000 gallons per twenty-four hours, although at the same time the water was being raised from the 10-in. trial boring by the air-lift plant at a rate varying from 300,000 to about 220,000 gallons per day.

A second test of sixty-six hours' duration was made with the 24-in. plant running alone, and the lowest point then reached was 153 ft. from the engine-room floor (which is 15 in. above the former ground level) with the low-lift pump raising 31,000 gallons per hour.

The approximate cost of the whole scheme since the 10-in. borehole was tested on the second occasion is as follows:—

	£	s.	d.
24-in. borehole to 355 ft. 3 in. in depth, including test pumping for fourteen days, and enlarging the 8-in. borehole	1,160	0	0
Machinery, including oil engine	5,940	0	0
Venturi meter and water-level recorder ...	268	0	0
Pumping station, cottage, roads, drains, irrigation area, &c.	2,900	0	0
10-in. rising main and cable	1,050	0	0
Fencing	183	0	0
Land and expenses in connection therewith	3,669	0	0
Legal expenses, printing, &c.	85	0	0
Consulting engineer	250	0	0
Clerk of Works	160	0	0
Sundries	120	0	0
Total	£15,785	0	0

The author's original estimate was £15,600.

DISCUSSION OF MR. HENSHAW'S PAPER.

Mr. H. PRESTON (Grantham) said the paper was of importance to those interested in geology. Unfortunately he was not well acquainted with the district dealt with, and therefore he craved indulgence if he made any little mistakes in the remarks he would make. The author had referred to a well sunk 206 ft., and said that there was a lot of decomposed sewage in it, but he did not tell them where it came from, and it was certainly curious to find it in a well of that depth. Then he told them that a well was condemned because it was near a churchyard, but on the opposite side of the valley. Was the pervious strata between the well and the churchyard continuous? Because very often a stream would come down the valley and cut any drainage from the churchyard. With regard to that extraordinary spring, the "Wishing Well," seeing that it fluctuated between 17,000,000 and 2,000,000 gallons in the twenty-four hours, he would like to know where the water came from. Did it come from above the Portland shale or below, from the sands? His idea was that it would be coming from the sands, and his further references would be based on that assumption. He thought the author was correct in the statement that a borehole or well in the centre of the valley would tap the chalk water flowing over the edge of the Kimmeridge clay at the point where, owing to the dip of the strata south of the fault, the top of the clay was below the line of saturation in the chalk. He thought that the subsequent remarks and the tests made showed that the supply really came from that. Still, the author pointed out that the committee were not satisfied, and advised the driving of an adit 2,000 ft. in length. It seemed strange advice that an adit should be driven southward through the fault, because he thought they would have cut through the fault in the valley. They generally expected the water to be on the top side of a fault, but in this case they had the interesting example of a fault bringing a large quantity of water on the lower side. Then followed that extraordinary result where, after the blue shale had been penetrated, there was a drop in the level of the water of 90 ft. He had been trying to think out the reason of this, and it appeared to him to be as follows: First, the water in the Portland stone was possibly fed by the chalk water—that was on the top of the fault—and it was under full pressure, due to the water in the chalk, and hence the overflow got up to something like 17,000 gallons per day. The "Wishing Well" he assumed to be fed by the chalk water also, but it passed through the

sand, and the outlet at the "Wishing Well" was more free than the water which passed through the sand in consequence of the friction. Consequently that would cause a partial vacuum underneath that impervious shale. This stream passing through the Portland clay would let the higher water down into a partial vacuum, and would cause the water to fall until it had balanced the pressure, and the result established itself as a flow of a little over 2,000 gallons a day. If this was correct, incidentally the boring had helped the supply to the "Wishing Well," and would increase its degree of fluctuation, because the water held up above the Portland stone was let down to the sands below, and would get to the "Wishing Well" more quickly than it did before. Finally, he would like to know if the depth of the chalk had been proved north of the fault. Would it not be the fact that if the boring had been continued at the higher well a more certain reservoir of water would have been reached which was held up by the fault below on the edge of the Kimmeridge clay?

Dr. H. LAPWORTH (Westminster) said that the point of the change of water level during the process of boring was a fairly common occurrence, and unfortunately sometimes they lost the water altogether in passing through some impervious body. In Gloucestershire there was a curious experience in an exceptionally dry year, when many of the wells were deepened, with the result that in boring into the red sandstone they lost the water altogether, and never had been able to recover it. He thought that Mr. Preston's explanation was probably a correct one. It was difficult to understand why the water rose again to such a height, and it seemed to him it must have resulted in a large increase, or some increase, in the "Wishing Well" spring. With regard to the point as to the relation of the flow of the "Wishing Well" spring and the rainfall, as a matter of fact, the diagrams showing flows as comparable with the rainfall or water levels in wells as compared with the rainfalls were rather unsatisfactory, for the reason that they were comparing two things not strictly comparable. For instance, in the summer time very little of the rainfall really did reach the underground reservoirs at all. A much more satisfactory thing to do was to construct a percolating tank in the district and find what the percolation was month by month, and distribute that throughout the year, and plot the percolation against the water levels. In that case they would find a distinct relation between the two, although perhaps they could not express it mathematically. In plotting the water levels in reference to the percolation tanks at Rothhampton, they found there was a distinct relation between the two, and here came the very interesting result that in the chalk there was something like a lag of several minutes between the percolation which took place from the surface and the water in the wells. He would like to ask the author one question in relation to the "Wishing Well" spring as to tests. It was a question which had never been thrashed out by the institution, and it was whether the tests really did test the yield of the well at all. He did not think the tests really did in a great many cases. He was inclined to think that the test of a fortnight, or even a month, was rather a test of the percolation into the well, and not its true yield. They had many cases all over England where there were copious yields at the time of the test, but as years went on, with the same amount being pumped, yet the water level had gone gradually down and down. It seemed to him that it took years to find out what the real yield of a well was, and he doubted very much whether these tests told them more than whether the flow into the well was free or not. Lastly, he saw the author quoted Mr. Percy Griffith about the probable yield with the water level reduced to 185 ft. below the surface. He did not know whether Mr. Griffith meant that the height was proportionate to the water level in the well, because he thought that was generally agreed. Some engineers assumed that it was proportional to the square foot, but he thought it was generally accepted as being proportional to the lowering of the water level. As to the sinking of the trial boreholes, was it not an advantage in some cases to sink a borehole to its final diameter instead of starting it with a small diameter?

Mr. W. MATTHEWS (Westminster) said he agreed with the last speaker as to the effect of percolation. As the result of some twelve months' experiments in South Hampshire, it was found that, except in excep-

tional years, from May to September there was absolutely no percolation at all. The returns came in month after month "zero" with regard to these five months. Therefore, any diagram showing rainfall in that time, with an endeavour to plot it in connection with the rise and fall of the well must clearly be totally misleading. Coming to the boring part of the business, he was greatly interested in the effect which was created by firing a shot in the bottom. It rather showed the danger of doing these things without some little consideration of what was likely to be the result. It was perfectly impossible that a column of water should have been shot up, and it was equally impossible that nothing should have given way. He understood that 19 lb. of gelatine explosive was used. This, on explosion, would increase thirty times in volume, and, as a fact, would have displaced, without a 6-in. pipe, 70 ft. head of water. The explosion might be taken as practically instantaneous, the result being that, to get a column of water flying up without anything else being displaced, would mean putting the column of water at a speed of 250 ft. per second. They must know that the water could not go through the pipe. If the water had started at all—which, he considered, was doubtful—it could only have had the effect of carrying the pipes up with it. He thought that, although the effect of the borehole itself on the column of water was very little, yet the explosion did act as an expanding force on the strata, and created a more or less bellows action, because he assumed that the shot was fired under water, and that the soil round about was in a completely saturated state, and therefore the shot was fired in an incompressible medium, except as to the rock and clay which was there. What probably happened was that an expansion of the soil took place, and was brought back again, and it would be very interesting to know whether there was any measurable interval between the time the shot was fired and when the tubes appeared on the surface. As to the machinery, he considered it was a pity, and an example not to be followed, that the whole of the power for driving the pumps should be taken off in one direction off the engines. The effect of the arrangement they had had described was that 100 per cent of the work was passed through one crank and one shaft from the gas engine. With these internal combustion engines the trouble was at starting, and the strain thrown on the engine was very considerable, and unless the very greatest possible care was taken in the upkeep of the engine, and keeping the brasses of the inner rods very close and true, that was where difficulties were going to arise. In his opinion, it was a much better plan to put the gas engine central, and take the power for their two pumps off the other side. To start with they divided the forces acting upon the crank-shaft of the engine better, and they had two clutches. Another defect in taking power off in only one direction was that it limited the speed of their high-lift pumps. In this particular case the low-lift pumps had to be run at twenty-two strokes per minute. Twenty-two for a deep-well pump of that sort he considered rather too high a speed. Personally, he did not adopt a speed of more than eighteen for well pumps. On the other hand, it limited the high-lift pumps to twenty-two, which he thought was an unnecessarily low speed, and might be carried up to thirty or even more. In the last plant he had been associated with, which had passed through its trials, they had got the low-lift pump to eighteen, and the high-lift pump up to thirty-four and a-half with excellent results, and they could not wish anything to run better or quieter. As regarded the pump slip, it was stated that it was only 1 per cent; but he did not understand that any very detailed trials had yet been made, and he would rather like to know how the figure of 1 per cent had been arrived at, because in his experience, although they might get it off a trial for the first week, they were not likely to maintain it for long, and so to give figures which were not maintainable was rather misleading. If they could be furnished with the figures of any trials made since the paper was written it would be a great advantage. Members might be interested to know that, in the case of some trials which had recently been carried out on a plant of 50,000 gallons capacity per hour, they got these over 1.45 lb. of coke per pump horse power, which was, he believed, one of the best results which had been obtained by suction gas plant. Doubt had been thrown on the desirability of using coke instead of anthracite coal, but his experience was that with a properly designed producer there was no more trouble with coke than with anthracite. One little thing which would, doubtless, interest the author was that of the lubricant. He had recently had some trouble

owing to pre-ignition in gas engines where, apparently, everything was right, and ultimately they traced the cause to the fact that a heavy oil was used which had a tendency to carbonate and stick on the interior of the cylinders, and remain incandescent after the exhaust had taken place and ignited the incoming charge. It was a warning in the case of internal combustion engines not to use unsuitable material.

Mr. A. TOWLER (Leeds) said he was rather at issue with the last speaker's views as to driving the well pumps and the high-lift pumps by a separate gearing, except in one particular—viz., that it enabled them to run the well pumps at a lower speed and the high-lift pumps at a high speed. The well pumps must run slowly to be satisfactory; of course, the speed depended on the size and upon the stroke. He did not think it would matter very much with regard to the starting up of the gas engine, provided they had a very powerful clutch which could be put in gradually so as to allow a considerable amount of slip without jerking action. But it was very difficult to get such a clutch to have quite an even action, and a very good plan was to put in a by-pass on the force pump, which was usually more powerful than the well pump, so that the by-pass valve could be opened and closed at a gradual rate. Where they were driving one kind of gearing, he thought it was a better arrangement and slightly more effective, while in the arrangement suggested by Mr. Matthews, of separate gearings for each pump, it gave the advantage of either set of pumps being run separate from the other, which, in certain cases, was rather a desirable thing.

Mr. MATTHEWS remarked that the efficiency of the plant he had spoken of, where the power was taken off on both sides, came out at 53½ per cent. There was nothing in Mr. Towler's point as regarded the question of mechanical efficiency.

Mr. TOWLER said that two sorts of efficiency had been spoken of. In the paper there was a pump efficiency which was 1 per cent. It was very high, and was very difficult to measure. When they came to mechanical efficiency he supposed Mr. Matthews referred to actual horse power of the gas engine as against indicated power.

Mr. MATTHEWS: Pump horse power at the time as against indicated horse power, and that gave 55 per cent.

Mr. TOWLER: That would be rather a poor result. I could get 70 per cent.

Mr. C. H. ROBERTS (Aberdeen) asked where the Weymouth waterworks were. He remembered seeing the works there, and he thought it was in the neighbourhood of Frier Waddon.

Mr. PERCY GRIFFITH (Westminster) said the question which Dr. Lapworth put him was certainly very interesting—more interesting, perhaps, in its form than in its substance—because he rather implied that he (the speaker) should have, as a matter of course, adopted the more or less standard method of deducing the relationship between the yield and the depth. He had had sufficient experience to avoid any such definite method of procedure in any circumstances whatever. He had found that it was impossible to dogmatise on the probable yield of a boring, and therefore he certainly adopted no hard-and-fast standard method of arriving at the estimation that he made. He really adopted the much more simple plan of plotting a curve formed by a number of readings. He was not quite sure, for the moment, how many readings he had, of a more or less reliable character, of tests made in the trial borehole, but he had sufficient data to enable him, with great care and hesitation, to plot out a curve. The fact was, he had several readings very close together, and he had a prolongation of the curve of considerable length before he arrived at the reading which he wanted. He meant by that that he had a very small proportion of "known" and a very large proportion of "unknown," and, as one often did in dealing with problems of this sort, he had to speculate very largely; but, as a matter of fact, the evidence available was, of course, not limited alone to that particular question of the tests already made, and, without saying that he could dogmatise, a general consideration of the local circumstances and a careful study of the geological conditions enabled him to prognosticate, as he did with some confidence, that successful results would be obtained by the work. He was also interested in the subsequent remarks of Dr. Lapworth with regard to the relationship between tests made under conditions like those referred to in the paper and the ultimate yield from a given source. It was perfectly true that one could not even dogmatise and prophesy here from the data obtained over short

periods, but he thought, with a fairly large and increasing experience of underground water, he would hesitate to adopt the view which, he thought, was suggested—that the yield of underground water generally, if not invariably, fell very much below the results obtained by the earlier tests. It would be quite an erroneous impression for one to assume that that was generally the case. Of course, no experienced engineer would deduce his figures from a short period of test. He would not go so far as to say that the underground water level would invariably fall through continued pumping.

Dr. LAPWORTH: If I said "generally" I did not mean that. I thought I said "often," which is very different from "general."

Mr. GRIFFITH said one did not know of cases where the yield was increased by continued pumping, which, perhaps, adjusted the balance of these cases where it was reduced. The geological problem in the case before them was, of course, of very great interest, and he was sure the author would, with him, acknowledge the value of the remarks made by Mr. Preston upon that point. Perhaps neither the author nor himself were sufficiently expert in that as to say definitely where the water came from and how it travelled, either from the point of the "Wishing Well" or to the boring, but Mr. Preston's careful study of the circumstances was certainly extremely interesting, and, personally, he should be disposed to accept his theories as being very reliable indeed. He would like to make a general remark with regard to pumps driven by gas engines. They were always faced with the difficulty of the high-speed engine and the low-speed pump or machine. It was the difficulty of designing a satisfactory and economical (separating the two things for the moment) method of connecting the two and driving the one from the other. So far he was convinced of the wisdom of being old-fashioned, and he had himself so often successfully used belting instead of clutches that, while he saw his competitors—not only the younger men, but the older men—adopting the more modern patent friction clutch, he himself was not yet convinced that it was a desirable method of coupling a gas engine to a pump. He had seen both at work, and had been much struck with the fact that with a belt one had just that elasticity in the form of slip which enabled the engine to start the pump without undue strain. The friction clutch might do that or it might not. The only disadvantage he could see to it was that it did require more space to take the lengthy belt; but, seeing that the extra space was useful for other purposes, he was not disposed to restrict the size of the house, and so give the room for what he considered the far more preferable method of driving, which was the old-fashioned belt.

Mr. HENSHAW, in reply, said there was a difference of opinion whether the "Wishing Well" water came from the top of the Portland clay or the outcrop of the Kimmeridge clay. He thought it came from the latter, and that there was an overlapping deposit which hid the Kimmeridge clay at that point. It was rather peculiar that the water level in the borehole should be 1 ft. lower than the "Wishing Well" spring, and it was a point he could not very well understand. It showed that the "Wishing Well" spring could not be increased from the boreholes, as it was 1 ft. higher than the water level in the borehole. The depth of the chalk in the higher well had not been tested, so far as he was aware. As to the decomposed sewage getting into the old well sunk on the island, he took it that it got down some of the numerous quarries there and also from the churchyard, and came through the fissures in the Portland clay until it got into the well. As to the water regaining its level again in the borehole after the Portland clay had been pierced, he was rather of opinion that was caused through the choking up of the fissures through the boring operations. Some silt, or something of that description had got into the fissures, so that the water from the higher level did not escape as freely as at first, but subsequently it rose again and overflowed the surface. Before the cartridge was fired in the hole the matter was discussed rather fully, and the advice of Messrs. Curtis & Harvey was taken, and it was their opinion that if the tubes were raised 30 ft. or 40 ft. above the explosive there would be no damage done to them. They were so raised, but he thought it would be better to take the tubes out altogether another time. He had a photographer to take the column of water, but he only took the pipe. He did not think it took many seconds. The pump slip, as a matter of fact, was 1.07, which was

calculated by the Venturi meter. He sent to the makers, and they sent down an expert to test the meter, and he said it was in order. The fuel consumption for gas generators appeared to be 1.50 lb. anthracite, and the cost of raising 1,000 gallons 100 ft. was 1.3d., with anthracite delivered at the works at 3d. 7d. The efficiency was guaranteed to be 70 per cent after six months' running, so that he hoped it would be considerably more than the 50 per cent mentioned. The engines at present had not been indicated, so that he could not give any information as regarded that. The Weymouth Water Company was supplied from Sutton, and the water came from the greensand. It would be 3 or 4 miles from Portland. The friction clutch did start the pumps rather suddenly, as some members thought it might.

(To be concluded.)

LONDON COLLEGE OF MUNICIPAL AND SANITARY ENGINEERING.

There was a large gathering at the inaugural meeting of students of the above college in the new home at 18 Nightingale-lane, Clapham Common, London, on Saturday, the 20th ult., when Sir Krishna G. Gupta, K.C.S.I., presided and delivered an address.

Mr. Nandy Hoskins, the principal, in the course of a statement at the outset of the proceedings, mentioned that the formation of the college was due to the request of a number of Indian students, a commencement being made early in 1910 in Victoria-street, Westminster. It was pointed out that much could be done to better existing insanitary conditions throughout India if facilities were afforded for Indian students to receive a practical training in modern methods of sanitation. During its brief existence the college could claim to have done some good work. Of the past students, twenty-eight were holding appointments under various governments (twenty-four in India), five were holding civil appointments or were in private practice, and seventeen students were completing their training. After taking the complete course and passing their final examination, the students were given a diploma and elected associates of the college, by which means they were kept in touch with the college and with one another. The course extended over two years, the last six months of which period could be spent with a municipal engineer, should the students so wish, arrangements having been made with some engineers to take the students for short or long periods after the course. Students were also encouraged to enter for the examinations of the various sanitary institutions in this country, including the Royal Sanitary Institute, Institute of Sanitary Engineers, and the Institution of Municipal and County Engineers.

In his address Sir Krishna Gupta urged upon the Indian students present the importance of gaining a good practical knowledge of sanitary engineering, to learn all they could in this country, so that when they returned to India they could apply their knowledge to the benefit of their own country.

A vote of thanks, proposed by Mr. W. J. Dibdin, was afterwards afforded to Sir Krishna Gupta.

INSTITUTION OF MUNICIPAL ENGINEERS.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District of the Institution of Municipal Engineers will be held at Manchester on Saturday, January 31st.

PROGRAMME.

- 1.30 p.m.—Business meeting at the Mitre Hotel, Cathedral-close, to elect district chairman and hon. district secretary, and to arrange programme.
- 3 p.m.—Visit to the Stuart-street station of the Manchester Corporation electricity works, by kind permission of Mr. S. L. Pearce, M.I.N.S.T.C.E., M.I.E.E., the chief engineer. Members are requested to assemble at 3 o'clock sharp.

Surveyors' Institution.—The annual dinner of this body will take place on Monday, February 23rd, at the Whitehall Rooms, Hotel Metropole.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. M. INST. C. E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

The premium for December is awarded to

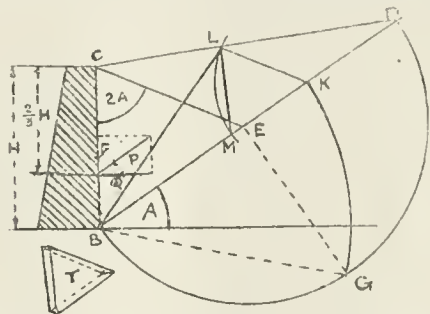
MR. T. W. PHILLIPS,
Town Hall,
Bexhill-on-Sea,

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

365. Retaining Wall Stability.—Give a proof of the following graphical method of determining the magnitude of the earth pressure behind a wall (Prof. Rehbann's method): In the accompanying sketch BC



represents the back of the wall, and CD the upper surface of the earth. Draw BD, making an angle A with the horizontal, equal to the angle of repose of the earth. On BD describe a semi-circle BGD. From C draw CE, making an angle = 2A with the back of the wall. At E draw EG perpendicular to BD to cut the semi-circle in G. With centre B and radius BG, cut BD in K. Draw KL parallel to CE, cutting the upper surface in L. Make KM = KL, and join LM. The triangle KLM is called the earth pressure triangle. Suppose it to represent a triangular prism of earth 1 ft. thick, as shown at T. Then the resultant pressure P per foot-run behind the wall, including the effect of friction between the earth and wall, is given by the weight of this prism of earth, or P = area KLM in square feet \times 1 ft. \times weight of earth per cubic foot. (H. K., *Ramsbottom*.)

369. Tree Guards.—Give sketches of an economical and slightly tree guard, suitable for good-class residential roads, with details of cost of same. Ordinary iron guards are barred because of "stiff" appearance and high initial cost. (Togun.)

370. Temporary Building Design.—A temporary building is required, 50 ft. long, 30 ft. wide, and 10 ft. to eaves. Design a suitable structure, with steel trusses and stanchions, to be covered with corrugated iron on boards and felt, the bays to be filled in with 4-in. reinforced brickwork. (J. M. N., *Hitchin*.)

371. Testing Stoneware Pipes.—What is the maximum head of water which may safely be applied in the testing of stoneware pipes? Does the diameter of the pipe affect the safe head? If the head be excessive will failure occur first in the pipes themselves or at the joints—ordinary cement or Stanford and cement? Give references to publications, &c., where details of tests are set out. (Togun.)

REPLIES TO QUESTIONS.

368. Water Supply.—What is the maximum amount of water in gallons per hour that can be pumped through a 3-in. cast-iron water main, $\frac{3}{4}$ in. thick, from a reservoir into a tank 190 ft. higher, with the most economical expenditure of power, the distance being 3,750 ft.? (T. G. P., *Barrow-in-Furness*.)

The maximum amount of water that can be

pumped per hour is readily obtained from the following formula, which is due to Hawksley. It is—

$$G = \sqrt{\frac{(3d)^5 h}{L}}$$

wherein

G = discharge of pipe in gallons per minute.

d = diameter of pipe in inches,

h = available head of water in feet,

L = length of pipe in yards.

Squaring both sides of the equation gives—

$$G^2 = \frac{(3d)^5 h}{L}$$

$$\text{Now, } d = 3 \text{ in., hence } (3d)^5 = (9)^5$$

$$L = 3750 \text{ ft.} = 1250 \text{ yds.}$$

$$\text{Hence, } G^2 = \frac{(9)^5 \times 190}{1250}$$

$$= \frac{59049 \times 19}{125}$$

$$= 8975.448$$

$$\therefore G = \sqrt{8975.448}$$

$$= 94.74 \text{ gallons per minute.}$$

\therefore Discharge of pipe = 5,684 gallons per hour.

It should be noted that the velocity of flow in the pipe is obtained from

$$v = \frac{5,684}{6.25 \times 3600 \times (\text{area of 3 in. pipe})} \text{ ft. per sec.}$$

also that the total head H, inclusive of that lost in friction and in pumping is given by

$$H = 190 + \frac{4fL}{d} + \frac{v^2}{2g} + 4 \cdot \frac{v^2}{2g}$$

$$\text{where } f \text{ may be assumed} = .07$$

$$= 190 + \frac{4v^2}{2g} \left(\frac{fL}{d} + 1 \right) \text{ feet.}$$

The weight of water raised per minute

$$= \frac{5,684 \times 10}{60} \text{ lbs.}$$

hence, h.p. required to pump this amount of water

$$= \frac{\frac{5,684 \times 10}{60} \times 190 + \frac{4v^2}{2g} \left(\frac{fL}{d} \times 1 \right)}{33,000}$$

All the values are known in this formula, and hence the horse-power required can easily be deduced.

However, if for d we substitute 4 in. or 6 in., it will be found that considerably less horse-power is required to pump the same quantity of water in the same time, and, hence, if the main has not already been laid, it would be more economical to lay a 4-in., or possibly a 6-in., water pipe. (T. W. P., *Bexhill-on-Sea*.)

NOTES.

The following correction should be made in the answer to question 366, which appeared in our issue of December 19th:—

In the cross-section given in Fig. 2 (p. 945) the top plate of the boom is shown as 12 in. \times $\frac{3}{4}$ in. \times 11 $\frac{1}{2}$ ft. This should be 12 in. \times $\frac{3}{4}$ in. \times 23 ft. Similarly, the next plate, instead of reading 12 in. \times $\frac{3}{4}$ in. \times 15 ft., should read 12 in. \times $\frac{3}{4}$ in. \times 30 ft.

Birmingham's New Building By-laws.—At their meeting on Tuesday next the Birmingham City Council will have before them a report of the Public Works Committee recommending the approval of supplementary by-laws. Provision is made in these by-laws that every person who erects a new building must submit to the city surveyor complete plans and sections of every roof and floor, together with detailed plans and sections illustrative of the construction drawn to scale, and a description in writing of the materials of which it is intended that such roof and floor shall be constructed, and of the manner of support of such roof and floor.

The Surveyor

And Municipal and County Engineer.

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CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2.

DEFINITIONS OF ROAD TERMS.

To the Editor of THE SURVEYOR.

SIR,—In your issue of the 12th inst. you state on p. 896 that "the long-awaited decision of the committee as to the meanings of the terms 'asphalt' and 'bitumen' amounts to this: 'Asphalt' is 'limestone naturally impregnated with bitumen.' This is definite enough as far as it goes—but 'bitumen' is not defined." The definition given of "asphalt"—viz., "limestone naturally impregnated with bitumen," is meant, I presume, for rock asphalt, which is, of course, a very different thing to those materials that come under the classification of asphalt.

I gather from your remarks that some new definitions are to be given by "the committee" to the words "asphalt" and "bitumen," and do I understand that it is proposed to dictate, say, to old-established city merchants, many of whom are members of the London Chamber of Commerce, as to what terms they are in future to give to goods they have imported and marketed for a considerable number of years? The suggestion is, of course, absurd, and is not likely to be tolerated for one moment.

I have heard of certain steps being taken to obtain the classification of petroleum pitch as bitumen, and I hope those steps will not eventually lead the interested parties beyond the spot they wish to reach, and if the definition, &c., of "asphalt" as given above is an example to go by, it would be interesting to learn who is responsible for this. It is either ignorance or there must be some motive in giving these new and incorrect definitions to materials like petroleum, pitch and asphalt. In this case the rose with another name is doubtless intended to smell sweeter.—Yours, &c.,

M. SOAL.

107 Bradgate-road,
Catford, S.E.

December 30, 1913.

[In reply to our correspondent, we may say that, in our view, there is a necessity for some agreement

being come to as to the use of the terms "asphalt" and "bitumen," and that, failing a general agreement acceptable to all parties, it may be necessary to invoke professional and scientific authority in order that confusion may be avoided in the future. Well-established usage must certainly be taken into account, and we are fully alive to the necessity for preventing interested or badly-informed parties from exerting an influence likely to be prejudicial to those who have used these terms for many years; or, on the other hand, such an influence as may result in the use of definitions which will leave us in a worse confusion than before. At present there are some who desire that the word "asphalt" shall apply only to the natural product; others would allow a wider use of the term, and distinguish the natural product by calling it "rock asphalt," or "natural asphalt." A like difficulty arises as regards the term "bitumen." If it is to be allotted to certain natural products we shall want a general word when referring, for instance, to bituminous-bound roads. We might use the term "pitch" as a general word in this sense. At present there are not enough words to go round. It is evident that, like ourselves, the committee referred to have not come to a definite conclusion in the matter. We have kept our pages open to discussion and expressions of opinion for more than a year, and have not yet gone fully into all the letters and papers in which the subject is referred to. This we are now about to do, and we should be glad to add our correspondent's own definitions of "asphalt" and "bitumen" to those which we are collecting and comparing. Later, we hope to publish definitions which will be acceptable both to the profession and to traders.—Ed. SURVEYOR.]

SHREWSBURY BOROUGH SURVEYORSHIP.

To the Editor of THE SURVEYOR.

SIR,—It will be gratifying to know that, with regard to the above appointment, there was absolutely no canvassing allowed, either directly or indirectly, and I understand that none of the six selected candidates knew anyone connected with this town; further, the Finance Committee entrusted with this appointment went thoroughly into the applications, and when the selected list was reduced to three—viz., Mr. Fellowes (Willenhall), Mr. Ward (Stockport) and Mr. Wilkinson (Wimbleton)—a sub-committee visited the towns where these gentlemen came from.

Without doubt the Shrewsbury Council have selected a gentleman who has great abilities, and will fulfil the position in a very worthy manner.—Yours, &c.,

AN UNSUCCESSFUL CANDIDATE.

December 22, 1913.

[We print the above with considerable pleasure, and with a feeling that the example set by Shrewsbury is one that might be followed by many other authorities. The eminently fair and business-like methods of the committee concerned with this appointment will have the approval of all public officials.—Ed. SURVEYOR.]

SOMERSET COUNTY SURVEYORSHIP.

COMMITTEE'S RECOMMENDATION.

Mr. Edward Stead, ASSOC. M. INST. C.E., has been unanimously recommended by the County Works Committee for the position of county surveyor of Somerset, with a commencing salary of £550, rising to £800, and the recommendation will come up for confirmation by the county council on the 6th inst.

Mr. Stead, who was formerly assistant county surveyor for Somerset, has since February been county surveyor for the Northern Division of Devon, and has resided at Barnstaple, where he established the county surveyor's office. He has had under his charge in North Devon a considerable amount of road remaking under the Road Board scheme.

To Manufacturers.—Mr. L. W. Wynne-Roberts, B.Sc., of Regina, Canada, who is engaged in connection with various public works of importance in that city, and who is at present on a visit to England, is desirous of obtaining manufacturers' catalogues and other information referring to heating, lighting, ventilation, water softening and sewage disposal. Communications should be addressed to Mr. Wynne-Roberts, c/o The Editor.

"THE SURVEYOR" SPECIAL ISSUE.

CHIEF FEATURES.

In the Special Annual Issue of THE SURVEYOR to be published on January 30th, the customary comprehensive list of the works projected by the various local authorities for 1914 will, as usual, be preceded by a series of

ARTICLES CONTRIBUTED BY SPECIALISTS

reviewing the progress which has taken place during the past year in connection with sewerage and sewage disposal, road work, water supply, refuse disposal, street lighting, electricity supply, bridge construction and the provision of public buildings.

LAW AND LITERATURE.

The legal precedents and legislation of 1913 in relation to municipal engineering will be reviewed by the Law Editor, Mr. J. B. Reignier Conder, while another valuable feature of the issue will be a survey of the year's literature of municipal engineering.

In addition there will be the customary Law Notes, Reports of Municipal Work in Progress, Local Government Board Inquiries, Personal News, and the fullest information relating to Vacant Appointments, Municipal Contracts and Competitions.

WORKS PROJECTED.

As stated in our last issue, those of our readers who propose to comply with our request for particulars of works projected in their districts will greatly oblige us and facilitate the production of the Special Number by forwarding their returns without delay.

The form which these should take is now generally understood, but the exact nature of the information sought can be seen by reference to our issue of January 31st last, over thirty pages of which were devoted to the publication of these official forecasts.

We would repeat what we have said in previous years—that any other material which readers may consider sufficiently interesting for inclusion in the issue will be welcomed, and this matter also, particularly if its use involves the reproduction of drawings or photographs, should likewise reach us at the earliest possible moment.

To non-subscribers, it may be added, the price of the Special Issue will be 1s., but subscribers will receive their copies without extra charge.

Ilkley's Open Spaces.—The Local Government Board have refused to sanction the application of the Ilkley Urban District Council for power to borrow £9,500 for the purchase of 44 acres as a pleasure ground. The board state that, having regard to the fact that the council already possess an extensive area of moorland and a number of pleasure grounds in the town itself, the site seems unnecessarily large, and the proposals for providing access to and laying out the area very costly.

The Reconstruction of French Roads.—It is flattering, says the Paris correspondent of the *Daily Telegraph*, to hear M. Fernand David, French Minister of Public Works, talking of "the network of English roads, which to-day are admirable." On the other hand, French roads have gone to rack and ruin in the last six years. The reason is, as every motorist and expert knows, that in England the high roads have been remade scientifically to suit motor traffic, whereas French roads have been left to old-fashioned engineers and old-fashioned methods, and the new motor traffic has ruined them. What the French roads want are new methods and go-ahead men, and the Minister says that young engineers no longer care for small positions in the State Roads Department, preferring more promising positions in private undertakings. In order to remake French roads to suit modern motor traffic the Minister estimates that £1,000 per kilometre will have to be spent, and France possesses 600,000 kilometres of roads of different kinds, of which 40,000 kilometres are national high roads. To remake a quarter of the national roads of France for motor traffic, £10,000,000 would be wanted.

WATER SOFTENERS.

A PROMISING AMALCAMATION.

Intimation of an important combination of leading makers of water softeners in the United Kingdom is contained in the announcement that arrangements have been concluded under which the two concerns of Lassen & Hjort and Water Softeners, Limited, will henceforth operate in the British Isles as a joint concern under the title of United Water Softeners, Limited.

Messrs. Lassen & Hjort are well known as the patentees of one of the most successful modern systems of softening water by means of lime and soda, carried out in a plant which has achieved a wide and well-founded reputation for efficiency, while Messrs. Water Softeners, Limited, are the proprietors of the recently introduced "Permutit" regenerative process, which, even in the short time it has been before the public, has, to a large extent, revolutionised accepted methods of treatment, and certainly possesses a future of brilliant promise.

Experience and comparison of the two methods working in competition have established the remarkable fact that, so far from being mutually exclusive or antagonistic, the two processes are, in a very large number of cases, essential complements one of the other, and while, in many instances, neither system alone could yield perfect results, by combining the best features of both it has been possible, in those cases, to evolve a process which affords the ideal treatment for the particular purpose in view.

This being so, the joining of interests on the part of the two firms is a natural consequence, and one which should considerably benefit the user of water-softening plant in this country, who will now be able to depend with certainty on obtaining the process best suited to his individual needs.

For some waters and for some purposes the lime-soda process remains the most suitable treatment, for other waters and other purposes the "Permutit" process (by which method alone can the hardness be reduced to zero) is more particularly appropriate. There is also a large class of waters which can be most effectively and economically dealt with by a combination in one plant of lime and "Permutit" treatments. The two processes together cover the whole field of water purification—bacteriological, chemical and mechanical.

The management of the new company will be in precisely the same hands as was that of the two original concerns, and pending the acquisition of new and more commodious offices in which both staffs will be brought together under one roof, the business of the new company will be carried on at the existing offices of the two concerns jointly.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times*.

Essex Road Improvement Scheme.—A scheme for resurfacing the main roads of Essex, which has been prepared by the county council, has received the approval of the Road Board, and when the work is completed it is believed that the chief arteries of traffic leading from London into East Anglia will, so far as Essex is concerned, be the finest in the country. The problem, which has been under consideration for some time, has been forced to the front (says the *Telegraph*) by the steady increase of heavy motor traffic, and in order to remake the roads so that they may be able to stand the tremendous amount of wear and tear to which they are now subjected, the Road Board has decided to earmark the entire funds available, so far as can be foreseen at present, for the administrative county during the next five years. In other words, no grants will be available for any other class of road improvement—such as widenings or diversions—before the close of 1918, at which date it is expected the great scheme which has just been officially approved will be completed.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Basingstoke T.C. (December 18th. Mr. T. C. Ekin).—£14,000 for new electricity undertaking.—The town clerk stated that the Provisional Order had been granted this year, and it was desired to lay down the works so as, if possible, to be in a position to supply by September, 1914. The London and South-Western Railway Company had agreed to take a minimum supply of 50,000 units for power and lighting at 2d. per unit. Their probable consumption was, however, about 80,000 units per annum. The borough engineer, Mr. F. Reginald Phipps, ASSOC. M. INST. C.E., explained his scheme, which comprised two Diesel engines of 150-b.h.p. direct coupled to 100-k.w. dynamos, balancer, booster, battery of 300-ampere hours at the four-hour rate, capable of being enlarged to 500-ampere-hours, paper insulated armoured cables and switch-board. Provisional contracts had been entered into for all the sections, and the amount of £14,000 asked for was amply sufficient for the scheme as at present designed. The public lighting would be taken over in the streets where mains were laid, the number of lamps to be immediately taken over being fifty-nine; the same illumination would be given at the price paid to the gas company—viz., £3 5s. for all-night lamps, and £2 5s. for midnight lamps. The system of supply was direct current at 460-230 volts. A very suitable site had been acquired in a central position for £300 from St. Mary Magdalen College, being part of the rectory meadow.

Blofield R.D.C. (December 22nd. Mr. W. A. Chapman).—£750 for the purpose of erecting four dwelling-houses in the parish of Acle under Part III. of the Housing of the Working Classes Act, 1890.—Mr. King (sanitary inspector) explained plans of the dwelling-houses which he had prepared. On the ground floor there would be a large-sized living room and a small parlour or sitting-room. It was thought in that district people would have a small parlour, and if they made a small scullery in the back and a large living room they would not live in the large front room but in the small scullery, and keep the large front room shut up. The council thought it better to make the large room at the back to be used as a living room, and a small room in front to be used as a parlour. The plans provided for that. There would be three bedrooms on the first floor—viz., 15 ft. 6 in. by 9 ft. 6 in., 12 ft. 9 in. by 8 ft.; and 10 ft. by 7 ft. 3 in. The ground floor rooms would be 8 ft. 6 in. high, and the first floor rooms 8 ft. high, and there would be a coal place and a small wash-house at the back for the copper, to keep the steam from coming into the cottage.

Chertsey R.D.C. (December 12th. Mr. M. K. North).—£1,663 for street improvements.—It was stated by the assistant clerk, Mr. L. Porter, that the making up of the road was a necessity. Referring to the disposal of the surface water, he said plans had been prepared but did not show any surface-water scheme, and therefore after the preparation of the plans they had to consider the making of arrangements for the disposal of the surface water. The scheme for dealing with the surface water in Byfleet had been prepared, and was of a comprehensive character, the cost of which would be £1,200. That scheme went forward to the parish meeting in March last, which seemed somewhat alarmed at the expense, and they accordingly vetoed it, the scheme being now in abeyance. The council then amended the scheme so as to deal with the streets mentioned. They suggested that the water should be sent into the foul water sewers. Mr. H. Beency, surveyor, gave other details relative to the streets. The inspector asked whether other parts of the district had separate or combined systems for dealing with the surface water. The surveyor replied that there were separate systems in all the other parts. The inspector: You are creating a dangerous precedent by this. The surveyor: That is so. The inspector said that in view of the fact that they wanted to discharge into the foul water sewers it would be necessary to go into the question of disposal works as to whether they were able to take the extra flow.

Goole U.D.C. (December 30th. Mr. W. O. E. Meade-King).—£8,000 for the purpose of building municipal

offices in the centre of the town and in front of the Goole Market Hall.—The plans had been submitted by Mr. E. E. Fetch, of Westminster, who, out of seventy-eight competitive designs, was awarded the first and second prizes. The chairman of the council, Mr. G. E. Hill, in supporting the application, said the site belonged to the town. The offices would hide the Market Hall front, which was an eyesore and gave visitors the impression that there was a large tranway shed in the centre of the town.

Hayes U.D.C. (December 8th. Mr. F. H. Tulloch).—£5,700 for making up a number of streets under the Private Streets Works Act. The clerk, Mr. C. Dudley Lewis, stated that complaints had been received with respect to the condition of the roads, whereupon an objector asked whether the complaints were sent direct to the clerk or to the members of the council. The inspector said the question was not material. The roads wanted making up, complaint or no complaint. He had seen the roads, and considered they wanted making up. Whether there was a complaint or not did not affect the question at all. If anybody was of opinion that the roads did not require making up he would be willing to make a further inspection. The surveyor, Mr. Douglas C. Fidler, stated that his experience of tarred channels in other districts was that they were unsatisfactory. He did not think any road was complete without a proper channel—except, of course, sett or wood-block roads. A tarred macadam road without a channel was not satisfactory. As a surveyor, he should strongly object to a tarred pavement in such a locality as this. In a residential area it would be quite suitable.

Huddersfield T.C. (December 12th. Mr. W. H. Maxwell).—This was an inquiry relative to an application for a Provisional Order authorising the town council so to vary their powers in regard to disputes as to the apportionment of the charges for new streets that the disputes should be referred to a single arbitrator under the Arbitration Act of 1889.—The town clerk (Mr. J. H. Field) said that in the absence of the power sought, secs. 27 and 35 of the Lands Clauses Act applied to the settlement of disputed apportionments. The procedure at present was that each party had to appoint an arbitrator, and the arbitrators had to appoint an umpire. If they could not agree upon an umpire the Board of Trade had to appoint one. Power was sought to appoint a single arbitrator, to be appointed, failing agreement between the parties, by the Local Government Board, and that the provisions of the Arbitration Act should apply so that the arbitrator would have full power to deal with the costs in his discretion.

Isle of Wight R.D.C. (December 15th. Mr. A. W. Brightmore).—£4,371 for works of water supply to the parishes of Shorwell, Kingston and Chale.—The council have carried out experiments in the neighbourhood of Shorwell and Limerstone in an endeavour to find a supply, but without success, and they now propose to purchase a supply from Shanklin Urban District Council, and to run a 4-in. main through Kingston and Shorwell, and at the same time give an auxiliary supply to Chale.

St. Annes-on-the-Sea U.D.C. (December 30th. Mr. F. H. Tulloch).—£1,114 for street improvements.—The chief feature of the scheme, it was stated, will be the demolition of garden walls, and replacing them with ornamentally arranged spar rockeries, banked behind with shrubberies.

Scarborough T.C. (December 31st. Mr. H. Shelford Bidwell).—£3,262 for various public improvements.—It was explained by the town clerk (Mr. Sidney Jones) and the borough engineer (Mr. H. W. Smith) that £1,150 was required for the purchase and abolition of the North Pier premises, and the alteration and improvement of the adjacent roadway and sea wall: £1,000 for the erection of conveniences, shelter, and shops in Clarence-gardens in place of those done away with at the North Pier; £520 for tennis courts and a pavilion in Clarence-gardens; £1,972 for improvements in the South Cliff rose garden and terraces; £1,450 for the erection of public conveniences in the South Cliff Gardens; £490 for the erection of a bowling green on land adjoining the Royal Albert Drive; £1,580 for the erection of a shelter, refreshment rooms, and conveniences in Pasholme Park; and £100 for the making of a tennis and bowling pavilion in Alexandra Gardens.

Sheffield T.C. (December 12th. Major J. Stewart).—£7,123 for works of private street improvement in

Vulcan-road, Tinsley. The road is situated between Weedon-street and Sheffield-road, Tinsley, and it was pointed out on behalf of the city council that an increase in the already heavy traffic from many of the big works was anticipated, and it was proposed to have the work substantially done.

Torquay T.C. (December 30th. Mr. W. M. Cross).—£15,000 for the extension and improvement of the bath saloons, including the provision of swimming and medical baths; £250 for the extension of the refuse destructor; and £5,000 for laying a new water main from Totliford to Hennock, in the parish of Hennock.—With respect to the extension of the baths, the town clerk, Mr. H. L. Parry, stated that the principle had been conceded by the Provisional Order which was granted after an exhaustive inquiry in 1912. Fourteen reliable firms sent in tenders for the work, with the result that, subject to the sanction of the Local Government Board, the lowest tender of £14,912 had been provisionally accepted. This showed that the work could be done within the limits of the amount applied for. Mr. Alfred John Taylor, architect, of Bath, explained the plans, and gave details of the scheme. Mr. H. A. Garrett, borough surveyor and engineer, said the refuse destructor was erected and first used in 1897, and that it had been working continuously ever since. There was an average of 45 loads of refuse per day consumed, but at certain periods of the year this was increased to 60 loads. The quantity of refuse to be collected increased as the town increased, and therefore the present four cells were found to be inadequate, and two more were necessary. When the destructor was designed provision was made for future extension. The application for £5,000 for the proposed new water main was taken next, the town clerk stating that the reason for the application was that, although the corporation had three very large storage reservoirs on Dartmoor, with a plentiful total capacity of nearly 500,000,000 gallons, there were only two mains which were available for the purpose of bringing this water from the reservoirs to the places to be supplied.

Weston-super-Mare U.D.C. (December 16th. Mr. W. M. Cross).—£11,000 for the erection of new abattoirs in Longford-road; £2,120 for works of wood paving in Waterloo-street and Regent-street; and £1,600 in respect of the construction of a new road as an extension of the Lower Milton-road to Worle.—Mr. S. C. Smith (clerk to the council) explained that the present slaughter-house dated from 1860, and the necessity for the proposed new buildings arose from the fact that the present accommodation was not only objectionable on account of being situate in grounds adjoining the Statutory Hospital, but was defective, inconvenient, and ill adapted to meet the growing requirements of the district. Formal evidence was tendered with respect to the other proposals.

Whitby R.D.C. (December 16th. Mr. H. R. Hooper).—£5,700 for a sewerage scheme for Sleights.—The period asked for repayment of the loan was sixty years for the land and thirty years for the purpose of the works. Mr. Ough, who had prepared the scheme, explained the details. Sewering of the whole of the village, about 1 mile in length, is provided for. The inspector said he considered that a reduction of tanks and filters could be effected, thereby reducing the cost, and that an open channel instead of pipes and less costly concrete work would suffice. He raised objection to the council undertaking the whole cost of connecting Lowdale Hall and Esk Hall, and said he considered the expense would have to be borne by the township and not by a special area. The inspector asked if the cost of the land, at £250 an acre, was not excessive? Mr. Gray thought not, considering that practically compulsory powers of purchase were instituted. The engineer said it was the only suitable site.

APPLICATIONS FOR LOANS.

Cookstown (Ireland) R.D.C.—£400 for a water supply for Pomeroy.

Crediton U.D.C.—£17,000 for a sewage disposal scheme.

East Grinstead U.D.C.—£2,900 for the erection of a dust destructor, and £800 for the purchase of the land.

Hawarden R.D.C.—£500 for building two workmen's cottages at the sewage works.

Ledbury R.D.C.—£250, further loan for building cottages.

Llandudno U.D.C.—£736 for reconstructing sewers.

Newbury T.C.—£1,000 for a wood paving scheme.

Ripon R.D.C.—£2,012 for alterations at the isolation hospital.

Saltash T.C.—£500 for the extension of the recreation ground.

Walton U.D.C.—£200 for the purchase of land for a depot.

LOANS SANCTIONED.

Erampton R.D.C.—£540 for street works and the erection of a public convenience.

Bridlington T.C.—£1,340 for workmen's dwellings, and £1,500 for sanatorium extension.

Cheadle R.D.C.—£500 for the purchase of additional land for sewage disposal.

Fareham R.D.C.—£14,725 for works of sewerage.

Kidderminster T.C.—£13,500 for sewage farm extension.

Porthcawl U.D.C.—£1,300 for surface-water drainage.

Rotherham R.D.C.—£1,197 for sewerage works.

St. Austell U.D.C.—£5,062 for workmen's dwellings.

Stoke Newington B.C.—£6,000 for the electricity undertaking.

Twickenham U.D.C.—£3,000 for school extension.

York T.C.—£5,478 and £2,400 in respect of the purchase by the Asylum Committee of Naburn Lodge Farm, the latter sum representing the apportioned value of the buildings. The Local Government Board have allowed sixty years for the repayment of the loan on the land, and twenty-five years for that on the buildings.

FORTHCOMING INQUIRIES.

	£
3.— Southend-on-Sea. For the purchase of the nursery ground (Mr. Edgar Dudley)	4,350
5.— Cardiff. For the erection of a fire brigade station (Mr. R. H. Bicknell) ...	18,707
5.— Hatfield. For private street works (Mr. F. H. Tulloch) ...	2,200
6.— Finchley. For private street works (Mr. M. K. North) ...	6,770
6.— Llandaff. For works of sewerage (Mr. R. H. Bicknell) ...	3,040
6.— Reigate. For the purchase of land for a police station, and street improvement (Mr. Edgar Dudley) ...	2,700
6.— Shipley. For electricity purposes (Mr. T. C. Ekin) ...	27,000
6.— Wembley. For sewerage and laying out a recreation ground (Major J. Stewart)	10,845
7.— Briton Ferry. For works of water supply (Mr. R. H. Bicknell) ...	2,650
7.— Richmond (Surrey). For the erection of public conveniences (Major J. Stewart)	1,000
7.— Spalding. For sewage disposal purposes (Mr. F. O. Stanford) ...	29,550
7.— Tunbridge Wells. For laying out the burial ground (Mr. P. M. Crosthwaite)	2,900
7.— Wakefield. For electricity purposes (Mr. T. C. Ekin) ...	—
8.— Bridlington. For the provision of working-class dwellings (Mr. W. H. Collin)	3,150
8.— Ely. For works of sewerage (Mr. F. O. Stanford) ...	3,000
8.— Hastings. For works of water supply (Mr. P. M. Crosthwaite) ...	2,444
8.— Southgate. For private street works (Major J. Stewart) ...	2,333
9.— Brentwood. For sewage disposal works (Major J. Stewart) ...	532
9.— Felixstowe. For surface drainage and other works (Mr. F. O. Stanford) ...	—
12.— Grays. For street widening purposes (Mr. R. H. Bicknell) ...	1,100
13.— Littlehampton. For laying out a recreation ground (Mr. R. H. Bicknell) ...	1,000
13.— Newquay. For the purchase of premises for a sanatorium (Dr. F. St. George Mivart) ...	—

TOWN PLANNING.

11.—**Wrexham.** (Mr. Thomas Adams) ...

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works, of which particulars appear below: Buildings—Berwick, Ilford, West Riding £12,000; housing and town planning—Docking; roads and materials—Deptford £23,000, Middlesbrough, Penge, Rotherham; sewerage and sewage disposal—Branston £21,000, Crediton £16,487, Hale; water, gas and electricity—Dublin, Forfar. Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Airdrie T.C.—It has been agreed to build a local sanatorium instead of joining a county scheme. The precise nature of the scheme has yet to be determined.

Berwick T.C.—It is reported that the Road Board have prepared a scheme for the building of a new bridge in place of the old bridge, which is unsuitable for modern traffic. The new bridge would cost £80,000, and of this the Road Board were prepared to pay 80 per cent, and it was proposed that the Berwickshire and Northumberland County Councils should each contribute its quota, so that the share payable by Berwick would be small. The new bridge will be built of stone, and the site will be near to the present structure, which, in view of its historical associations, will be untouched.

Bodmin T.C.—A new fire station is to be built at an estimated cost of £250.

Brynmawr U.D.C.—The new municipal offices, erected at a cost of about £1,150, were formally opened on Monday last.

Chester-le-Street R.D.C.—The council have agreed to the proposition of the Houghton-le-Spring Council to re-open negotiations for the construction of a bridge over the Wear between Cox Green and Washington.

Dumfries C.C.—Sanction has been given to the construction of a joint sanatorium for the counties of Dumfries, Kirkcubright, and Wigtown, and the burghs of Dumfries and Maxwelltown.

Hitchin R.D.C.—The surveyor, Mr. J. C. Hooper, has received instructions to prepare plans for a mortuary.

Horsham R.D.C.—The question of establishing an isolation hospital is under consideration.

Huddersfield T.C.—Alterations and additions are to be carried out at the office of the borough engineer, Mr. K. F. Campbell.

Ilford U.D.C.—A hospital for consumptives is to be built at an estimated cost of £1,400.

Kent C.C.—Plans have been sanctioned for a new school and special subjects centre at Broadstairs at an estimated cost of £4,850.

Nairn T.C.—The council have decided to purchase the local swimming baths, and spend £1,200 in renovating the buildings.

Rochdale T.C.—Alterations estimated to cost £1,100 are to be carried out at the town hall.

Thirsk R.D.C.—An extension scheme is to be carried out at the isolation hospital at an estimated cost of £1,000.

West Riding C.C.—It has been decided by the Education Committee to build a school at Stainforth at an estimated cost of £12,000.

HOUSING AND TOWN PLANNING.

Coventry T.C.—The purchase of property for temporarily housing tenants ejected by the operation of closing orders has been considered by the Sanitary Committee, and the town clerk has been instructed to enquire whether the Local Government Board will sanction a loan for this purpose.

Docking R.D.C.—Plans are to be prepared for a housing scheme at Branceaster.

Huddersfield T.C.—Five and a-half acres of land are to be purchased at Broadlands for the purpose of a housing scheme.

St. Austell U.D.C.—With respect to the application for sanction to borrow £5,062 for the purchase of land and the erection of working-class dwellings, a letter has been received from the Local Government Board stating that while they were satisfied as to the need

of working-class dwellings, they could not approve a scheme which contravened the by-laws in force, and had no power to suspend the operation of those by-laws as suggested. The board were, however, prepared to approve the scheme on condition that it was amended as suggested in an interview between the chairman of the council and officers of the board—by setting back blocks A and E so as to comply with the by-laws, the council to proceed at once to amend their by-laws in respect of streets, parapets, height of chimneys, &c., and carry out the scheme in compliance with such amended by-laws as the board approved. The council have agreed to comply with the request of the Local Government Board. In the course of the proceedings Mr. Bellamy said great credit was due to their surveyor, Mr. E. D. Groves. If plans that went before the Local Government Board did not come back pulled to pieces it was very remarkable, and congratulation was due to Mr. Groves for the able manner in which he had discharged his part of the work. The chairman endorsed this tribute, and said they were also indebted to their clerk for the capable way in which he had prepared the financial scheme. Resolutions of thanks to these officers were passed.

Settle R.D.C.—As a result of pressure by the Local Government Board it is expected that the council will have to arrange for housing schemes, in some of the large townships at all events.

PARKS AND OPEN SPACES.

Coventry T.C.—The Baths and Parks Committee recommend the purchase of 23½ acres of land opposite St. Paul's cemetery, Holbrooke-lane, Foleshill, for £3,700, as a new park.

Harrogate T.C.—It has been agreed to establish an 18-hole golf course on the corporation farm, provided sufficient support is accorded the scheme by the public at an annual subscription of 25s. a year.

Horbury U.D.C.—It has been agreed to purchase a property known as Low Park, of 11 acres, for £3,204, for the purpose of a public park.

Newport (I. of W.) T.C.—It has been decided to lay out a bowling green on the recreation ground at a cost of £66.

Penzance T.C.—The mayor, Mr. A. K. Barnett, has subscribed £100 towards the cost of laying out the serpentine works, and the work is to be carried out provided an additional £400 is subscribed voluntarily. The borough surveyor, Mr. Frank Latham, estimates the total cost of the scheme at £800.

St. Austell U.D.C.—The council have accepted from Sir Charles Graves-Sawle, the gift of a playground for children.

REFUSE COLLECTION AND DISPOSAL.

Lewisham B.C.—Five additional dust vans are to be provided at a cost of £329.

ROADS AND MATERIALS.

Cardiff T.C.—At a meeting of the Cardiff Public Works Committee last week, the tender of Messrs. Adams & Sons Monk Meadow Dock, Gloucester, for the supply and stacking of Archangel red deals for the relaying of the main streets of the city was accepted. The firm quoted £13 15s. per standard of 9 by 3, and £12 15s. per standard of 8 by 3. It was stated that the tender worked out approximately at £15,000.

Deptford B.C.—A scheme for repaving some of the principal roads is to be undertaken at a cost of about £23,000. The roads to be improved are New Cross-road, Deptford-broadway, Deptford Bridge, and Queen's-road, and the present granite setts are to be replaced with wood blocks. Application is being made to the Road Board inquiring what assistance it will give, and the London County Council is being asked to allow the granite setts in the tramway tracks to be superseded by wood paving.

Gnosall (Staffs) R.D.C.—The surveyor, Mr. H. V. Heath, at the recent council meeting, stated that the condition of the highways was the result of the continued wet weather, and the constant softening of the surface of the roads. The haulage of farm produce also damaged

the roads in the vicinity of farms, and the supply of material being inadequate bad roads were the result. The time was close at hand when the highway rate would have to be increased, as the traffic had increased, and the weights hauled by mechanical power were beyond the strength of the roads. Mr. J. R. Ball thought it was impossible to keep the roads in proper condition on the amount of money they were spending. The chairman pointed out that their roads cost about £14 per mile, as compared with £95 per mile spent on the county roads. Mr. J. R. Ball said the wear of the district roads had increased by 50 per cent, and at the present time the roads were a disgrace to the council. They could not blame the surveyor; the money spent on the roads was judiciously expended. It was a serious matter, and the time had come when they would have to spend more money on the roads. The matter was not pursued further.

Haslingden T.C.—It has been decided to carry out an improvement scheme in Waterside-road.

Mansfield T.C.—A further step in the scheme for the Belvedere-street improvement has been taken by the purchase of property at a cost of £1,075.

Middlesbrough T.C.—The Local Government Board have approved the scheme of the borough engineer, Mr. S. E. Burgess, M.INST.C.E., in connection with the paving of streets at Newport, the cost of which has to be paid by the frontage-owners. The streets concerned were Tarran-street and Cunningham-street, which the corporation decided should be paved with whinstone setts. An objection was taken by the frontagers that the work demanded was excessive, having regard to the requirements of the neighbourhood. An appeal was made to the Local Government Board, and a local inquiry was held by one of the board's inspectors. The board have now made an order under sec. 268 of the Public Health Act, 1875, confirming the decision of the Streets Committee, and ordering the appellants to pay the sums apportioned on them for road work charges.

Newry No. 1 R.D.C.—It has been agreed to adopt the Road Board scheme for steam rolling main roads in the rural district. The share of the board's contribution to the work in the county (£10,700) allotted to the rural council is £906.

Penge U.D.C.—It has been decided to pave several thoroughfares with artificial stone paving.

Rotherham R.D.C.—The county council have agreed to make a grant of £3,440 to the rural council for the cost of constructional works on the main roads at Maltby and Bramley.

Roxburgh C.C.—The Jedburgh District Committee have received from the Road Board an offer of a grant of £6,000 for the improvement of the roads and the construction of suitable bridges, on condition that the district road authority impose an additional road rate of 1d. per £1 for the next ten years. No definite decision has yet been come to, but the offer is regarded by members of the committee with favour. It is suggested as part of the scheme of improvement that the old bridges should be allowed to remain, and that the new ones should be erected in a more direct line than the existing road.

Salford T.C.—The question of road improvement work and the expenditure upon it by the Highways Committee, which has been referred to a special committee of the corporation for report to the council, has had its sequel in the application of the committee for a supplementary estimate of £3,715 to enable them to complete the present year's work. The deficiency which the first six months' work has shown was not at all unexpected, for, in spite of a number of economies which have been effected, the cost of the work done has exceeded the half year's estimate by £2,163. The Highways Committee are at present in communication with the Road Board on the question of a grant from that authority.

Wigtownshire C.C.—The county road board have agreed to a scheme promoted by the Rhins District Committee to tar-macadam and reconstruct 50 miles of the main roads in the Rhins district, at an estimated cost of £25,000, the Road Board having agreed to give a free grant of £8,500, and a loan of £16,500, free of interest, repayable in eight years.

Wirral R.D.C.—The surveyor, Mr. T. Davies, has been requested to prepare plans for widening Mill-lane.

SEWERAGE AND SEWAGE DISPOSAL.

Branston R.D.C.—A drainage scheme for Boultham, North Hykeham, and Skellingthorpe, estimated to cost nearly £21,000, is under consideration.

Crediton U.D.C.—The council have adopted the plans for the sewage disposal scheme prepared by Mr. Jasper. The total estimated cost is £16,487.

Croft (Yorks) R.D.C.—Sewage disposal works are to be established at Barton, the initial cost of the main drain and septic tank being estimated at £270.

East Grinstead R.D.C.—As a result of the surveyor, Mr. C. Turton, having prepared the Groombridge and St. John sewage disposal schemes, the council have effected a saving of £273, and it has been decided to pay Mr. Turton £136, in accordance with the agreement made with him.

Hale U.D.C.—A scheme for new sewage disposal works is being considered by the council.

Holsworthy R.D.C.—Mr. F. Gamble, surveyor to the Tavistock Urban District, who had been called in to advise the rural council in the matter, has submitted a report in which he gives his opinion in favour of the adoption of a comprehensive scheme of sewerage and sewage disposal for Halwill.

Llandilo R.D.C.—At the meeting held recently a proposition was made that the surveyor, Mr. Evan Jones, be instructed to prepare an alternative scheme for the drainage of the parish of Quarterbach, as the ratepayers were strongly opposed to joining the combined scheme for the Amman Valley. They would then be prepared for the Local Government Board inquiry, as it was to the interests of the parish they should be heard. Mr. D. Davies pointed out that the rural district council had bound themselves to the joint scheme. The surveyor declined to prepare a local scheme for the treatment of the sewage of Quarterbach separate from Llandilofawr. He would be acting for the district council in one part and for the parish of Quarterbach in another. It would be fooling the council themselves. The motion to instruct the surveyor was defeated by a large majority.

Rotherham R.D.C.—The tender of Mr. R. Snell, at £202, has been accepted for sewerage works at Bramley, and the tender of the same contractor, at £1,100, for the Thurcroft sewerage scheme.

Wantago R.D.C.—A report is being prepared with respect to the suitability of the land at Harwell for a filtration plant and for an irrigation scheme.

WATER, GAS, AND ELECTRICITY.

Barnstaple R.D.C.—The Combemartin Parish Council have forwarded to the rural council a resolution pressing upon that body the necessity of providing a water supply for the district. They urge the acceptance of the Sherrcombe scheme, with respect to which the engineer reports that the watershed is upland moor, quite open, and with no woodland high in elevation, meeting all needful conditions, and yielding an abundant supply of pure water, where no filtration would be required. The soil is partially clay, an ideal soil for a reservoir. The land has little or no agricultural value, and the waters at present are serving no useful purpose. Moreover, it could, if necessary, be made possible to include all the water from Bearn in this scheme. It would, however, be a rather more costly scheme than either of the two schemes previously suggested.

Blaenavon U.D.C.—The tender of Messrs. Webb & Son, Abercynon, has been accepted for the water-works extensions.

Chorley R.D.C.—The surveyor, Mr. A. Jolly, has prepared a scheme for the extension of the water mains at Bretherton, the cost of which he estimates at £750.

Cookstown R.D.C.—A scheme for a water supply for Pomeroy village, prepared by Mr. W. J. O'Neill, Lurgan, and estimated to cost £356, has been forwarded to the Local Government Board.

Dublin T.C.—The Electricity Supply Committee announce that it is their intention from time to time, gradually to replace the old arc lamps of the city, which are becoming inefficient, with the best type of the new flame arc lamps. Two firms agreed to the conditions laid down—the General Electricity Company and Messrs. Johnson & Phillips—and a trial of the new lamps was made on the Grafton-street, Westmoreland-street, and O'Connell-street circuits. A separate trial was also made of two lamps from Messrs. Crompton & Co. The city engineer now reports that the extended trials of the lamps have proved satisfactory, and he recommends the taking over of the lamps from these two firms.

Forfar T.C.—Consideration is being given to a scheme for an extensive development of the gasworks.

Leyburn R.D.C.—A scheme of water supply at Middleham is to be carried out at an estimated cost of £250.

Menai Bridge U.D.C.—The Marquis of Anglesey, who owns the land required by the council for the construction of a reservoir, is impressed favourably by the scheme prepared by Mr. W. Owen, the surveyor, subject to some slight modifications suggested by Mr. T. B. Farrington, the expert engaged by Lord Anglesey to examine the site and the plans. This is the third or fourth scheme submitted by the council, and it is now hoped that, as water is scarce in the parish, the present scheme will be sanctioned and carried into effect quickly.

Newport (Mon.) T.C.—In consequence of the expeditious manner in which the new installations were erected at the corporation electricity works recently, the Electrical Committee have recommended that Mr. Nicholas Moore, the borough electrical engineer, be given a bonus of 25 guineas, and Mr. W. L. Thain, the deputy engineer, 11 guineas, 25 guineas to be divided among the workmen.

Stockton T.C.—It has been agreed to charge the Thornaby gas consumers the same price as Stockton, instead of 2d. more per 1,000 cubic feet as heretofore, upon condition that the Thornaby Corporation withdraw their proposal to apply for power to construct their own gasworks.

PERSONAL.

Mr. Ernest C. Bond, assistant surveyor to the Foleshill Rural District Council, has had his salary increased from £62 to £85 per annum.

Mr. E. W. Turner, of the city engineer's office, Sheffield, has been appointed deputy building surveyor under the Birmingham Corporation.

Mr. W. Keith Leslie, of the city engineer's office, Edinburgh, has obtained an appointment as assistant engineer on the staff of Mr. A. Fidler, M.INST.C.E., borough engineer of Northampton.

Mr. H. P. Maybury, chief engineer to the Road Board, has now left Maidstone, and letters should be addressed to him either at Greenhithe or at the offices of the board, Queen Anne's Chambers, Westminster.

Mr. John McFarland, the well-known Irish contractor who carried out the Thirlmere waterworks scheme, figures in the New Year's Honours List, being among those upon whom a baronetcy has been conferred.

Mr. Edward Davenport, manager of the Swineshaw Valley waterworks, under the Ashton-under-Lyne, Stalybridge and Dukinfield Waterworks Joint Committee, has resigned his position after thirty-three years' service.

Mr. J. Luke, hitherto one of the assistants in the Manchester city surveyor's department, has been appointed deputy surveyor at a salary of £325, subject to a probation of twelve months. Mr. J. Dutton-Walker has been appointed an assistant in the department.

Mr. G. L. Murray, surveyor to the Hexham Urban District Council, who has left England to take up an important appointment in Cape Colony, was, before his departure, presented with a purse of gold by the members of the council, ex-members, officials and other friends.

Mr. M. Tutin, for fourteen years a building inspector on the staff of the Sheffield Corporation, has resigned owing to ill health, and recently he was presented by his colleagues with a case of cutlery. Mr. Tutin went to Sheffield from Southend-on-Sea, and previously he held the position of building inspector at Stockton-on-Tees upon the office being first established.

Mr. A. W. Ward, deputy borough surveyor of Stockport, whose appointment as borough surveyor of Shrewsbury, at a salary of £400 per annum, was reported in our last issue, has held his present office for the past six years. He served his articles with the borough surveyor of Harrogate, and afterwards held a position on the staff for two years. Subsequently he secured the appointment of assistant borough surveyor of Batley, and after five years' service in this capacity he removed to Northampton to take up the position of assistant borough engineer and surveyor. He held this office for four years before going to Stockport. Mr. Ward is an associate member of the Institution of Civil Engineers and a member of the Institution of Municipal and County Engineers.

STREET PAVING CHARGES.

MAGISTRATE'S CRITICISM IN NORTH LONDON CASE.

On Wednesday last, at North London Police Court, Mr. Thomas Bremner, of West End-lane, N.W., appeared before Mr. Chester Jones to show cause why he should not pay £298, due on an apportionment made by the Hackney Borough Council in respect to the paving of a new street. Mr. C. V. Young conducted the case for the council.

At the hearing of the case last week it was explained that Mr. Bremner was the owner of a strip of land 10 ft. wide, running along one side of the road, and it was in respect of this side that the apportionment was made. On the case being called on Wednesday, Mr. Bremner, in answer to the magistrate, said it was very difficult to make any proposal as to the payment of the money, as such property was now at a discount.

Mr. Chester Jones: Do the council know of this case, or has it been initiated and carried on by the officials?

Mr. Young: Oh, yes; the council know all about the case.

Mr. Chester Jones: I cannot imagine an elected body doing anything of this kind, but it is the sort of thing that officials sometimes do.

Mr. Young: It simply arises out of the fact that this gentleman bought the land as a speculation.

Mr. Chester Jones said that he felt there must be something behind this case, and, questioning the defendant, he elicited the statement that he had given £50 for the land. He made an order for the payment of the £298 8s. 10d. at the rate of £2 per month, remarking: "It will take you twelve or fourteen years to pay it off."

Mr. Young: I do not ask for costs.

Mr. Chester Jones: You would not get any if you did. I am sorry to see you in such a case. I have too much regard for you to think that you are in it willingly.

QUERIES AND REPLIES.

We cannot undertake to reply to any queries which are not accompanied by the writer's name and address. These are required as a guarantee of good faith, and not for publication. Sketches accompanying queries should be made separate, on white paper, in plain black ink lines. Lettering or figures should be bold and plain.

902. Treatment of Sewage from Adjoining District.—"Cymro" writes: "I have been asked by my council to prepare an estimate to allow an adjoining authority to connect to our sewers. It has been suggested that this should be arranged on the basis of per 1,000 gallons passing through a meter. I am not aware of this basis being adopted for sewerage purposes, being under the impression that either the population or rateable value is generally considered. I should be glad to know of any district where the 1,000-gallon basis has been adopted."

Good Roads for Manitoba.—The announcement by the Provincial Government of Manitoba (says the *Standard* correspondent) of its intention to further the "good roads" movement, and to encourage intensive farming, has been greeted with popular approval, these matters being regarded as the chief necessities at present in the direction of the development of Manitoba.

FOR OTHER ADVERTISEMENTS

See End of Paper.

HERTFORDSHIRE COUNTY COUNCIL. TENDERS FOR GRANITE SLAG AND TAR-MACADAM.

Tenders are invited for the Supply of Broken Granite, Slag and Tar-macadam required for the Main Roads during the year ending March 31, 1915.

Forms of Tender and Conditions of Contract may be obtained on application at my office, or will be sent through the post upon receipt of a stamped addressed foolscap envelope.

Tenders, which must be on the forms provided, are to be delivered not later than February 5th, 1914.

The lowest or any Tender will not necessarily be accepted.

URBAN A. SMITH, M.INST.C.E.,
County Surveyor.

County Surveyor's Office,
Hatfield, Herts.
December 31, 1913.

URBAN DISTRICT COUNCIL OF ENFIELD. TO CONTRACTORS.

The Council invite Tenders for Making Up the following Private Streets in their District—viz.:—

Drapers-road, Enfield.
Warwick-road, Enfield Lock.

Plans and Specifications can be seen, Forms of Tender and all information obtained, on application to Mr. Richard Collins, the Council's Surveyor, at these offices, any day (except Saturday) between the hours of 9 a.m. and 5 p.m.

The Contractor will be required to observe Trade Union hours of labour and to pay wages according to the published scale of the London County Council for the time being in force.

Separate Tenders for each Road (on the Form supplied only) to be sent in to me not later than noon on Wednesday, the 14th day of January, 1914, endorsed "Tender for —."

The Tenders must be accompanied by a schedule of hours of labour and of prices and wages to be paid for different classes of work, which schedule will be embodied in the Contract.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

T. W. SCOTT,
Clerk.

Public Offices,
Enfield, Middlesex.
December 31, 1913.

(1,092)

RURAL DISTRICT COUNCIL OF CLUTTON. TAR.

The above-named Council invite Tenders for 15,000 gallons of Dehydrated Refined Coal Tar, for surface tarring, complying in every respect with the Road Board Specifications for Tar No. II.

Delivery to be made as requested between the 31st day of March and 1st day of July, 1914, at Hallatrow Station, carriage paid, in Contractors' barrels.

Tenders to be sent to the undersigned on or before the 20th day of January.

Further particulars to be obtained from Mr. T. Orchard, The Grange, Hallatrow, Bristol.

J. SUMNER DURY,
Clerk to the Council.

Temple Cloud,
Bristol.

December 31, 1913.

(1,094)

DOWNHAM MARKET URBAN DISTRICT COUNCIL. DOWNHAM MARKET SEWERAGE AND SEWAGE DISPOSAL.

The above-named Council invite Tenders from responsible Contractors for Sewerage and Sewage Disposal Works. The Works comprise about 2,100 yds. of Stoneware Pipe Sewers, together with Manholes and Appurtenant Works, the Construction of Storage Chamber and Pumping Station, and 712 yds. of 5-in. Rising Main; also Purification Works, consisting of Tanks, Bacterial Filters, &c.

Plans and Specifications can be seen at the offices of the Engineers, Messrs. Elliott & Brown, A.M.M. INST.C.E., Burton Buildings, Parliament-street, Nottingham, and copies of the Bills of Quantities and Form of Tender may be obtained on deposit of Two Guineas (by cheque), which will be returned on receipt of a *bona-fide* Tender, not afterwards withdrawn, and the return of all documents lent to the Contractor for purposes of making up his Tender, within 14 days of the Notice informing him a Tender has been accepted. A copy of the Plans can be inspected at the Offices of the Surveyor to the Council, Mr. J. M. Jackson, The Chambers, Downham Market.

Sealed Tenders, endorsed "Tender for Downham Sewerage and Sewage Disposal Works," to be delivered to the undersigned not later than the first post on the 26th day of January, 1914.

The lowest or any Tender not necessarily accepted.

(By order)

H. R. B. WAYMAN,
Solicitor and Clerk to the Council.

Council Offices,
Downham Market,
Norfolk.

December 31, 1913.

(1,093)

BOROUGH OF HAMMERSMITH. TO PAVING CONTRACTORS.

The Borough Council invites Tenders for paving the Carriageways and Footways of Foliot-street, Fitzneal-street, and Erconwald-street, on the London County Council Old Oak Estate. (Total length, approximately 2,200 ft.)

Plans may be seen, and Specifications and Forms of Tender obtained, on application to Mr. H. Mair, Borough Surveyor, after Monday, 5th January.

Sealed Tenders, endorsed "Tender for Paving Works," must be delivered to me not later than 4 p.m. on Wednesday, the 14th January, 1914.

The Council does not bind itself to accept the lowest or any Tender.

LESLIE GORDON,
Town Clerk.

Town Hall, Hammersmith.
January 1, 1914.

(1,098)

BIRMINGHAM TAME AND REA DISTRICT DRAINAGE BOARD.

RAILWAY SIDING AT THE SALTLEY WORKS.

TO CONTRACTORS.

The Board invite Tenders for Works comprised in the Supply of Railway Material and the Laying and Ballasting of about 950 lin. yds. of Permanent Way, the Construction of a Brick and Concrete Bridge over the River Rea, 213 ft. long and 50 ft. wide, in 3 spans, together with other Works in connection therewith.

The works are situated on the lands of the Board at Saltley, in the City of Birmingham.

Persons desiring to submit Tenders are requested to make application to the Office of the undersigned on and after Wednesday, 7th inst., where the Contract Drawings may be seen and a copy of the Specification and Bill of Quantities obtained.

Tenders, duly signed, sealed and endorsed "Tender for Railway Siding," must be delivered at the Office of Mr. Arnold E. Harris, Clerk to the Board, 117 Colmore-row, Birmingham, not later than 10 a.m. on Wednesday, 14th January, 1914.

The Board do not bind themselves to accept the lowest or any Tender, and Contractors tendering do so at their own cost.

JOHN D. WATSON, M. INST. C.E.,
Engineer to the Board.

Engineer's Office, Tyburn, Birmingham.
(Castle Bromwich Station, M.R.)

January 1, 1914.

(1,095)

CITY OF BATH. SEWAGE DISPOSAL WORKS.

Applications are invited for the appointment of Manager of the Bath Sewage Disposal Works situated at Saltford, near Bath. The Works are sufficient for the disposal of the sewage from a population of about 80,000.

Preference will be given to applicants who have had experience in the management of similar works, and are able to undertake the charge of and carry out repairs to small machinery for mixing lime, pumping sludge, &c.

The salary will be 50s. per week, together with a residence.

Applications, stating the candidate's previous experience and the earliest date upon which he will be able to take up his duties, and accompanied by copies of three recent testimonials, must be sent to me not later than 10 a.m. on Saturday, the 10th instant.

FREDK. D. WARDLE,
Town Clerk.

Bath.
January 1, 1914.

(1,096)

APPLICATIONS are invited for the position of Assistant in a Municipal Surveyor's Office. Salary, 50s. weekly. It is desirable that candidates have a general knowledge of the routine work of such an office, but none without a good architectural experience need apply. Applications, giving full particulars of candidate's qualifications and experience, are to be sent not later than Monday, 5th January, 1914, to Box 1,357, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,099)

SOME RECENT PUBLICATIONS.*

MODERN METHODS OF WATER PURIFICATION. By John Don, F.I.C., &c., and John Chisholm, A.M.I.MECH.E. Price 16s. nett. London: Edward Arnold.

The first edition of this work, which was originally published some two years ago, having become exhausted, the authors have taken the opportunity of thoroughly revising the book, and of adding a chapter devoted to the description of processes which have recently come into prominence. The scope of the work is comprehensive, various chapters dealing with the sources of supply, storage, reservoir construction, filters of several kinds, purification, household appliances, water testing, problems of distribution, and recent advances in sterilisation. Thus the authors have brought together within the scope of a single volume a discussion of all matters with regard to which those interested in the treatment of water should have reliable and up-to-date information. Advances in the method of treating water have followed one or other of three different lines. Arising from a knowledge of the influence of coagulants on turbid waters, there has come into use a large variety of mechanical filters, which in many cases deal rapidly and effectively with waters that are hardly amenable to treatment in the older fashion. Again, the urgency of excluding pathogenic germs from service water has favoured the adoption of some form of sterilisation, either by fluid bactericides or by ozone. Lastly, well marked progress has been made in preparing crude waters for a final sand filtration by means of successive prefiltration, by which the effluent comes to attain great uniformity of quality, with freedom from undesirable bacteria. All these matters are discussed in full detail, and a thorough revision of the whole work secures that the new edition presents to the reader the actual condition of the methods of water treatment as they now exist.

THE CIVIC ENGINEER'S WHO'S WHO. Second (1913) Annual Issue. Price 2s. 6d. nett. London: St. Bride's Press, Limited.

The reception accorded to the first edition of this work was sufficiently encouraging to induce the publishers to issue this second edition, which not only retains the best features of the first, but also marks a considerable advance in more than one direction. The present edition is fifty pages larger than its predecessor, the increase in size being partly due to the addition of several new biographies of engineers belonging to the classes previously represented—chiefly municipal and county engineers or surveyors—and, in particular, to the enlargement of the scope of the work so as to include a number of biographies of the urban district council surveyors of England and Wales. As the work only deals with living engineers, death has necessitated the omission of some articles that appeared in the first edition. Some deaths and other changes have occurred while the work was in the press, but, substantially, the information given will be found to be up to date in these as in other respects.

HAZELL'S ANNUAL, 1914. Edited by T. A. Ingram, M.A. Price 3s. 6d. nett. London: Hazell, Watson & Viney, Limited.

Once more our infallible friend "Hazell's Annual" is at hand with its record of the movements of the world in the year that has just closed and its intelligent anticipation of the questions likely to occupy our attention in the year that is opening. Whether the reader seeks for the 1914 Budget of a foreign country, the latest balance-sheet of an insurance company, the complete list of winning jockeys, or the newly-appointed Suffragan Bishop of Buckingham, he will not be disappointed. Some idea of the extraordinary extent and variety of the information compressed into this wonderful work may be conveyed by the statement that its index contains some 10,000 references. For those who require a reliable digest of hard facts, we can only say that "the blue books of the year boiled down into one red one" is a fitting description of what they will find in "Hazell's Annual."

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

HANDBOOK ON SANITATION. By George M. Price, M.D. Price 6s. 6d. nett. London: Chapman & Hall, Limited.

The author of this book has had considerable experience of public health work in America, and is consequently well qualified to write on sanitation. Although intended primarily as a manual of theoretical and practical sanitation for the use of sanitary inspectors, Mr. Price's work will be found of much value to all students of sanitary science. The book is divided into three parts, the first of which deals with sanitary science as applied to air, water, sewerage and drainage. The second part is devoted to sanitary practice, including factory inspection, offensive trades, food inspection, and disinfection; while the third part deals with sanitary inspection as a profession. The book is written in regard to American practice, but it will be found very useful to sanitary inspectors and students in this country, both as a means of comparison and because of its intrinsic practical value.

FARM GAS ENGINES. By C. F. Hirschfeld and T. C. Ulbricht. Price 6s. 6d. nett. London: Chapman & Hall, Limited.

This book is intended as a practical guide to enable a prospective purchaser of a Farm gas engine to select that type which will be most efficient and economical for his purpose. Undue prominence is therefore not given to the actual operation and care of these engines, but these matters are discussed sufficiently fully to enable the reader to appreciate the necessary conditions of successful working. The greater part of the book is devoted to a discussion of the weak and strong points in the various designs, to the features which give long and useful life and those which tend to cause early failure, and to the characteristics which best adapt different types to different uses. A very useful chapter on "power, price, and speed" is included. The book is copiously illustrated, and the aim of the authors has been admirably carried out.

THE GOOLE COUNCIL INCIDENT.

A PRESENTATION FOR THE SURVEYOR.

A presentation is shortly to be made to Mr. C. G. Bradley, the surveyor to the Goole Urban District Council, who at Leeds Assizes was fined £10 for assaulting Councillor William Jackson, the vice-chairman of the council. Ten of the councillors have decided to pay the fine, while the following address is to be presented to the surveyor: "We, the undersigned property owners, ratepayers, and voters in the Goole urban district area, desire to express our sympathy with you in the trying position in which you have recently been placed as a result of an unfortunate incident which occurred in the Goole council chamber on October 29th. We consider that this regrettable affair was principally the outcome of your strict fidelity to duty, and your upright adherence to the interests of the ratepayers. We wish to take this opportunity of placing on record our appreciation of your professional work in Goole, and the honourable manner in which you have carried out your duties."

Glasgow Street Paving.—Mr. T. Nisbet, the Glasgow master of works, reports that, during the year which ended on May 31st, the amount of capital expenditure on the paving with granite or whin setts of streets within the city was £8,057, being £4,372 less than the amount authorised. The ordinary expenditure for the maintenance and repair of streets was £88,817, as compared with an estimated charge of £79,851. The cost of sanding streets was £3,663, of which £1,101 was allocated against the tramways department.

Society of Engineers: Status Prize.—The council of the Society of Engineers may award this year a premium of books or instruments to the value of £10 10s. for an approved essay on "The Status of the Engineering Profession." The council reserve the right to withhold the premium if the essays received are not of a sufficient standard of merit. The competition is open to all, but, before entering, application for detailed particulars should be made to the secretary, 17 Victoria-street, Westminster. The last date for receiving essays is May 30th next.

SURFACE TREATMENT OF ROADS.

Early last year arrangements were made by which the two classes of business, tar-spraying and road construction, which had been carried on by the Taroads Syndicate, Limited, and the Praed Road Construction Syndicate, Limited, were separated and extended. The fact of this separation has enabled the Taroads Syndicate, Limited, to devote the whole of their attention to the surface treatment of roads. It may not unnaturally be expected to make for an even greater efficiency in the organisation and execution of the work, which has been, and will be, continued by them at their old offices, 9 Victoria-street, Westminster, S.W., under the personal supervision of the chairman, Sir Herbert Mackworth Praed, who has associated with him the same experienced superintendents and staff as in the past.

A record amount of work was done by the company last year, and of the very large number of authorities for whom they have done work, there are none, it appears, that have not given large repeat orders during the seven years the firm have been carrying out these contracts.

A number of advantages are claimed for the machine used by the company in the execution of work undertaken by them. The large type of machine is capable of treating as much as 20,000 yds. super. of road per day, thus rendering it possible to take the fullest advantage of spells of fine weather—a material consideration. Penetration is absolutely assured with the machines, and in practice it has been found that roads treated for two or three years show a tar penetration of from 2 in. to 3 in.; further, complete, even distribution is assured. An immense saving in scavenging and watering is also claimed for roads that have been treated by the process.

It should be added that the machines are thoroughly overhauled after each season's work, and certain improvements and additions increasing their efficiency have recently been embodied with a view of carrying out work under the best conditions during the present year; and, finally, it is eloquent testimony to the simplicity of the system that the firm are able to make use of local labour in any district where they happen to be engaged in the carrying out of a contract.

HIGHWAY MAINTENANCE AND REPAIR IN ENGLAND AND WALES.

Part III. of the forty-second report of the Local Government Board—just issued—contains the following particulars with regard to the mileage of roads in

Description of Roads.	Year 1910-11.		
	Gross expenditure.	Mileage.	Average expenditure per mile.
	£	Miles.	£
<i>Main roads repaired by County Councils other than the London County Council</i>	1,712,653	18,351	93
<i>Main roads repaired, on behalf of County Councils, by Councils of—</i>			
<i>Boroughs other than county boroughs and metropolitan boroughs</i>	281,691	1,243	227
<i>Urban districts other than boroughs</i>	488,793	2,315	211
<i>Rural districts</i>	472,989	5,842	81
<i>Roads (not being main roads) repaired by Councils of—</i>			
<i>Boroughs other than county boroughs and metropolitan boroughs</i>	549,342	4,871	111
<i>Urban districts other than boroughs</i>	969,604	11,411	85
<i>Rural districts</i>	2,312,581	98,077	24
<i>Public roads and streets repaired by Councils of—</i>			
<i>County boroughs</i>	1,287,476	9,366	137
<i>Metropolitan boroughs</i>	686,931	2,144	325
<i>Public streets repaired by the Corporation of London</i>	37,862	48	747

England and Wales, and the money expended on their maintenance and repair from 1910-11 by the several classes of councils.

CHANGE OF TELEPHONE NUMBER.—Readers are requested to note that "The Surveyor" telephone number is now City 1046.

PORTABLE REINFORCED CEMENT BUILDINGS.

Messrs. F. H. Heath, Limited, 22 Bridge-street, Manchester, have recently applied for a patent in connection with a portable sectional reinforced-cement building. The firm have designed this building in response to numerous demands for a building of a semi-permanent type that can be removed to another site when desired and they have already erected several schools, village halls, sanatoria, dispensaries, and so forth, on the new system.

The buildings are timber-framed structures, and the sections are made in a special manner overlapping each other, being attached by means of slots and plates, while on the inside and outside moulded fillets are attached by means of slots and plates. On the inside and outside moulded fillets are attached by screws, so that they are easily moved when required. The walls are made in panelled sections of a convenient width, so that they can be taken down without damage to the cement and plaster work.

The outside of the buildings are finished imitation stonework or rough cast, and the insides are plastered in the usual way, or, in the case of isolation wards, finished in Keen's cement. The roofs are either covered with red asbestos-slates, Goussac, or other superior waterproof coverings.

It may be mentioned that the Local Government Board have approved of this construction, and are granting a twenty years' redemption loan to local authorities for buildings so constructed.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A., Borough Surveyor, Great Yarmouth.

EXAMINATIONS.

Notice is hereby given that the syllabus of the examinations held by the Institution of Municipal and County Engineers has been altered by the addition to Subject IV. (Sanitary Science) of the following section:

(c) The Improvement of Insanitary Areas.

NEW SUBJECT: TOWN PLANNING.

A new subject (VI.), dealing with the town planning portion of the Housing and Town Planning Act of 1909, has been added to the syllabus as an optional subject. The questions set will be based on—

(1) A general knowledge of the town planning portion of the Housing and Town Planning, &c. Act, 1909, and the Local Government Board Regulations thereunder with regard to the preparation of a town planning scheme.

(2) Suitability of area for town planning.

(3) Natural features, consideration of drainage, preservation of forest trees, &c.

(4) Buildings; allocation of areas for dwelling-houses (sites and number per acre), shops, factories, protection from noxious trades, from obstructive buildings, &c.; protection of ancient buildings and monuments.

(5) Building lines.

(6) Streets; arterial and subsidiary or estate streets; their direction and design in relation to traffic and configuration of the ground, and their embellishment.

(7) Provision of parks, open space, playing fields and allotments, disposition and size in regard to the area of the scheme and the nature of the locality.

Candidates who have received the testamur of the institution will be allowed to sit for examination in this subject only should they desire to do so. A certificate will be given to candidates satisfying the examiners.

WEST MIDLAND DISTRICT.

A meeting of the West Midland District of the institution will be held at Birmingham on January 15th.

SOUTH-EASTERN DISTRICT.

A meeting of the South-Eastern District of the institution will be held at 92 Victoria-street on January 17th.

NORTH-WESTERN DISTRICT.

A meeting of the institution is to be held in the North-Western District at Manchester on February 20th and 21st.

THOMAS COLE,
Secretary.

92 Victoria-street, S.W.

INSTITUTE OF SANITARY ENGINEERS.

The president-elect, Mr. John D. Watson, M.Inst.C.E., chief engineer to the Birmingham, Tame and Rea District Drainage Board, will deliver his inaugural address to the members on Wednesday, January 7th.

SEA-COAST EROSION.—For a very complete and expensive library on the cause, prevention and repair of coast erosion the following three works are recommended: "Coast Erosion and Foreshore Protection," by John S. Owens, M.D., Assoc.M.Inst.C.E., F.R.C.S., and Gerald C. Case (price 7s. 6d., post free 7s. 10d.), with numerous illustrations and diagrams; "Sea-Coast Erosion and Remedial Works," by R. G. Allanson-Winn, M.Inst.C.E.I. (price 1s., post free 1s. 1d.); and "Erosion of the Coast and its Prevention," by F. W. S. Stanton, Assoc.M.Inst.C.E., F.S.I. (price 3s., post free 3s. 2d.), with numerous maps and other illustrations. The publishers are the St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, London, E.C.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

CLERK OF WORKS.—January 3rd.—Devonport Town Council. £2 10s. per week.—Mr. J. F. Burns, borough surveyor.

SURVEYOR'S CLERK.—January 3rd. Gellygaer Urban District Council. £80—£100 per annum.—Mr. Frank T. James, clerk, Council offices, Hergeot, Glam.

MANAGER OF SEWAGE DISPOSAL WORKS.—January 5th.—Sutton-in-Ashfield Urban District Council. £2 per week.—Mr. John D. Fidler, clerk.

ASSISTANT BUILDING INSPECTOR.—January 6th.—Corporation of Coventry. £2 5s. per week.—Mr. J. E. Swindlehurst, city engineer and surveyor.

JUNIOR ASSISTANT.—January 7th. Borough surveyor's office, Corporation of Smethwick. £65 per annum.—Mr. A. Hosken, borough surveyor.

BURGH SURVEYOR'S ASSISTANT. January 7th. Alton Town Council. £75 per annum.—Mr. C. Thomson, town clerk.

STREETS AND SANITARY SUPERINTENDENT.—January 7th.—Corporation of Scarborough. £150—£200 per annum.—Mr. Harry W. Smith, borough engineer.

SURVEYOR OF HIGHWAYS.—January 7th.—Louth Rural District Council. £100 per annum.—Mr. F. C. Chard, clerk.

ASSISTANT.—January 10th.—Water engineer and surveyor's department, Bilston Urban District Council. £100—£120.—Mr. Joseph L. Arlidge, clerk.

WATERWORKS ENGINEER.—January 12th.—Bridlington Town Council. £190—£120.—Mr. A. E. Matthewman, town clerk.

CITY ENGINEER.—January 17th. City of Cape Town. £1,500 per annum.—Messrs. Davis & Soper, agents for the corporation, 54 St. Mary-axe, London, E.C.

ENGINEER AND SURVEYOR.—January 31st.—Rhondda Urban District Council. £500—£750.—Mr. W. P. Nicholas, clerk, Pentre, Rhondda.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

ASSISTANT ENGINEER.—Government Electric Light Department, Southern Nigeria. £300—£350 per annum, with allowances.—Messrs. Preece, Cardew & Suell, 8 Queen Anne's-gate, Westminster, S.W. Quote M6541 on letter of application.

ASSISTANT ENGINEERS AND DRAUGHTSMEN.—Sierra Leone Public Works Department. Engineers, £300—£400; draughtsmen, £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

TEACHER OF LAND SURVEYING.—Early in January.—Guildford Technical Institute.—Mr. F. A. Tosswill, Director of Technical Education, Technical Institute, Guildford.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

COVENTRY.—February 1st.—Sketch plans for a technical institute, for the corporation.—Education Offices, 44 Bayley-lane.

BELFAST.—March 20th.—Designs for an art gallery and museum, for the corporation.—Mr. R. Meyer, town clerk.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

NEWPORT PAGNELL. (No date).—Plans and specifications for working-class cottages, for the rural district council. Award of ten guineas.—Mr. C. W. Powell, clerk.

DURHAM.—(No date).—Plans for a residential school for defective children, for the county council.—Education Committee, Shire Hall, Durham.

BATH.—(No date).—Designs for a secondary school, for the corporation.—Mr. F. D. Wardle, town clerk.

BRIGHTON.—(No date).—Designs for a clock tower in Queen's Park, at a cost, including the clock, not exceeding £1,000, for the corporation.—Mr. H. Talbot, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

TEDDINGTON.—January 3rd.—For erecting buildings, chimney shaft, sewers, manholes, connections, and roadways in connection with sewage disposal and refuse destructor works, for the urban district council.—Mr. Marshall Hainsworth, surveyor.

SAWBRIDGEWORTH.—January 5th.—For the erection of council chambers and offices, for the urban district council.—Mr. W. Morris, clerk.

SOUTHPORT.—January 5th.—For the construction of a sea-bathing lake, for the corporation.—Borough Surveyor.

DROYLSDEN.—January 5th.—For the erection of a shelter, for the urban district council.—The Engineer.

SOMERSET.—January 6th.—For the rebuilding of Marston Magna bridge and the widening of the main road approaches, for the county council.—Mr. H. T. Chapman, county surveyor, Wells.

SHEFFIELD.—January 6th.—For laying foundations for three boilers, base of chimney stack, and two motor houses, for the corporation.—Mr. S. E. Feddan, electricity manager, Commercial-street.

EAST RIDING.—January 6th.—For alterations and additions to a school, for the county council.—Building Surveyor, County Hall, Beverley.

CLEETHORPES.—January 7th.—For constructional work in connection with Kingsway enclosure, for the urban district council.—Mr. H. Wainman, surveyor.

GLAMORGAN.—January 7th.—For the erection of a temporary school and works at existing schools, for the county council.—The Clerk, County Hall, Cardiff.

WEST RIDING.—January 7th.—For the erection of a sanatorium, for the Public Health and Housing Committee.—Mr. Francis Alvey Darwin, clerk, County Hall, Wakefield.

STAFFS.—January 7th.—For the erection of two schools, for the Education Committee.—Mr. G. Balfour, director of Education, County Education Offices, Stafford.

WINDSOR.—January 8th.—For the extension of the open-air baths, for the corporation.—Mr. E. A. Stickland, borough surveyor.

LEXDEAN AND WINSTREE.—January 9th.—For the construction of a water supply scheme, for the rural district council.—Messrs. Sands & Walker, engineers, Milton Chambers, Nottingham.

DUNMOW.—January 10th.—For repairs to a bridge, for the rural district council.—Mr. A. E. Floyd, clerk.

LEWES.—January 10th.—For the erection of a school, for the Education Committee.—Mr. E. H. Fuller, architect, 19 High-street.

SLEAFORD.—January 10th.—For a deep boring in Kirkby-la-Thorpe, for the rural district council.—Mr. Edmund Clements, clerk.

CROMPTON.—January 10th.—Schemes and tenders for refuse destructor and steam disinfecter, for the urban district council.—Mr. F. F. Gartside, clerk and surveyor, Town Hall, Shaw, near Oldham.

DURHAM.—January 13th.—For the erection of a new school, for the county council.—Mr. W. Rushworth, Shire Hall, Durham.

DURHAM.—January 13th.—For extensions of a school, for the county council.—Mr. W. Rushworth, Shire Hall, Durham.

GLASGOW.—January 14th.—For alterations and additions to police buildings, for the corporation.—Mr. J. Lindsay, town clerk.

RICHMOND (Surrey).—January 14th.—For the erection of a cookery centre, for the Education Committee.—Mr. J. H. Brierley, borough surveyor.

BOURNEMOUTH.—January 14th.—For the erection of conveniences and shelters, for the corporation.—Mr. F. W. Lacey, borough engineer and surveyor.

KENT.—January 15th.—For the erection of two blocks of asylum buildings, for the Asylums Committee.—Mr. F. R. Howlett, clerk, 9A King-street, Maidstone.

WARRINGTON.—January 16th.—For the erection of a school, for the corporation.—Mr. I. Moore Murray, Education Office.

RADCLIFFE.—January 17th.—For the erection of sixteen dwellings, for the urban district council.—Mr. W. L. Rothwell, engineer and surveyor.

NEWPORT PAGNELL.—January 17th.—For the erection of eight houses, for the rural district council.—Mr. W. J. Budds, surveyor.

RAMSGATE.—January 19th.—For the erection of a shelter, for the corporation.—Mr. T. G. Taylor, borough engineer.

SWANSEA.—January 26th.—For the construction of masonry and concrete approaches, piers, for a bow-string truss steel girder footbridge, and also for the supply and erection of the bridge, for the corporation.—Mr. H. Howard Humphreys, 28 Victoria-street, Westminster, S.W.

DORSET.—January 30th.—For the erection of a school, for the Education Committee.—Messrs. Fletcher & Bratt, Wimborne.

EGREMONT.—January 30th.—For the erection of seventy-six houses, for the urban district council.—Mr. J. S. Stout, architect, 36 Lowther-street, Whitehaven.

Iron and Steel.

IRLAM.—January 5th.—For the supply and fixing of iron railing, for the urban district council.—Mr. R. H. Winterbottom, surveyor.

LEICESTER.—January 7th.—For the purchase of second-hand cast-iron spigot and socket pipes, in good condition, for the corporation.—Mr. G. T. Edwards, engineer and manager, Waterworks.

WARRINGTON.—January 7th.—For the supply of weldless steel pipes for feeding boilers, for the corporation.—Mr. F. V. L. Mathias, borough electrical and tramways manager.

DARLINGTON.—January 7th.—For the erection of a steel coal-store roof, railway gantries, and inspection chambers at the gasworks, for the corporation.—Mr. F. P. Tarratt, engineer, Gasworks.

SPRINGHEAD.—January 10th.—For the supply of 260 manhole and lamphole covers, for the urban district council.—Mr. R. Kilner, 25 Queen's-street, Oldham.

BOOTLE.—January 14th.—For the supply and erection of wrought-iron railings, for the corporation.—Borough Engineer.

HARTSHORNE AND SEALS.—January 16th.—For laying 5,000 yds. lineal of 4-in. and 3-in. cast iron spigot and socket pipes, fixing valves and hydrants, constructing service reservoir and pump well, and erecting windmill and pumps, for the rural district council.—Mr. Norman F. Spence, engineer and surveyor.

SLEAFORD.—January 24th.—For the supply, laying and jointing of about 8½ miles of cast-iron mains and

specials, 4-in. and 3-in. diameter respectively, the provision and fixing of sluice and air valves, stand posts, and other works of water supply, for the rural district council.—Mr. W. B. Marsden, engineer and surveyor.

LONDON.—January 27th.—For the supply of 584 tons of special section-rolled steel bar for magnetic brake shoes, for the county council.—Chief Officer, London County Council Tramways, 62 Finsbury-pavement, E.C.

WARSAW.—February 16th.—For the supply of two vertical compound engines, with plunger, piston, or differential pumps, or of two turbines, with centrifugal or turbo-pumps, for the Municipality.—Sir William H. Lindley, 29 Blittersdorferplatz, Frankfort-on-Maine.

Roads.

HAILSHAM.—January 3rd.—For the supply of granite, stone, flints, beach, and cartage, for the rural district council.—Mr. E. Catt, clerk.

SOUTH STONEHAM.—January 3rd.—For the supply of British macadam, for the rural district council.—Mr. F. Heather, surveyor, Cheevin Side, Old Portsmouth, Southampton.

ULVERSTON.—January 3rd.—For highway improvement work, for the rural district council.—The Engineer, Virginia House, 24 Queen-street, Ulverston.

NORTH RIDING.—January 3rd.—For the supply of broken and unbroken stone, and steam rolling and scarifying, for the county council.—Mr. W. G. Bryning, county surveyor, Northallerton.

PONTYPRIDD.—January 5th.—For work of road improvement, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor.

HIPPERHOLME.—January 5th.—For the supply of macadam from April 1st to December 31, 1914, for the urban district council.—Mr. G. Wharton Thompson, engineer and surveyor.

BRENTWOOD.—January 5th.—For work of making up and drainage, for the urban district council.—Mr. A. T. G. Woods, New-road, Brentwood.

IRLAM.—January 5th.—For the supply of road materials, for the urban district council.—Mr. R. H. Winterbottom, surveyor.

BOSTON.—January 6th.—For the supply of 15,142 tons of granite and 2,104 tons of slag, for the rural district council.—Mr. H. Snaith, clerk.

SOUTHWICK.—January 5th.—For making up a private street, for the urban district council.—Mr. Geo. W. Warr, surveyor.

BICESTER.—January 5th.—For the supply of hand-picked Hartshill and chippings, for the rural district council.—Mr. H. Bannister Eames, surveyor.

BRENTFORD.—January 6th.—For the supply of Kentish pit flints, for the urban district council.—Mr. J. W. Croxford, surveyor.

CHINGFORD.—January 6th.—For works of making up, for the urban district council.—Mr. J. T. Griffin, surveyor.

EASTHAMSTEAD.—January 6th.—For the supply of broken and unbroken granite, slag, limestone, and flints, for the rural district council.—Mr. J. R. Treadwell, surveyor of highways.

ESSEX.—January 6th.—For supplying and laying about 700 lin. yds. of 12-in. and 8-in. granite kerb, and 12-in. and 6-in. channel, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

TWICKENHAM.—January 7th.—For forming, levelling, paving, metalling, kerbing, channelling, and making good portions of a street, for the urban district council.—Mr. Fred W. Pearce, surveyor.

LEITH.—January 7th.—For the supply of granite and whinstone paving materials, for the corporation.—The Burgh Surveyor.

WAKEFIELD.—January 7th.—For the supply of 500 tons of 6-in. to 6½-in. by 4-in. to 4½-in. granite setts, for the corporation.—City Surveyor.

LLANTRISANT AND LLANTWIT FARDRE.—January 8th.—For the execution of road improvements, for the rural district council.—Mr. T. Saunders, surveyor, School-street, Pontyclun.

TUNBRIDGE WELLS.—January 8th.—For the supply of 3,000 tons of broken granite, 300 tons of granite siftings, and 1,200 tons of granite chippings for road tarring, for the corporation.—Mr. W. H. Maxwell, borough engineer.

HARDINGSTONE.—January 9th.—For the supply of granite, slag, and footpath chippings, for the rural

district council.—Mr. J. R. Phillips, clerk, 2 St. Giles'-square, Northampton.

DORSET.—January 9th.—For the supply of broken granite, basalt, quartzite, slag, and tarred macadam, for the county council.—Mr. W. T. Fletcher, county surveyor, Dorchester.

DORSET.—January 9th.—For surface tarring on main roads, for the county council.—Mr. W. T. Fletcher, county surveyor, Dorchester.

HASTINGS.—January 10th.—For the supply of best unbroken blue stone, for the rural district council.—Mr. David Paine, surveyor, Stonclynk Farm, Fairlight.

ABERSYCHAN.—January 10th.—For the execution of private street works, for the urban district council.—Mr. W. H. V. Bythway, clerk.

BOURNE.—January 10th.—For the supply of roadmen's barrows and tools, for the rural district council.—Mr. T. Lake, district surveyor.

BRIDLINGTON.—January 10th.—For making up certain roads, for the corporation.—Borough Surveyor.

ROYTON.—January 12th.—For the supply of non-slippery granite setts, pitch, oil and cement, for the urban district council.—The Surveyor.

WOODSTOCK.—January 12th.—For the supply of hand-picked unbroken stone, best broken stone (2-in. gauge, clean and free from chippings), best double-screened nuts for patching purposes (1½-in. gauge), best double-screened coarse chippings and binding chippings, and best rubble, for the rural district council.—Mr. A. G. Higgs, clerk.

TRING.—January 12th.—For the supply of 12,000 gallons of refined coal tar, for the urban district council.—Mr. S. S. Gettings, surveyor.

FLINTSHIRE.—January 12th.—For the supply of broken granite, chippings, and local stone, for the county council.—Mr. S. Evans, county surveyor, County Buildings, Mold.

PERRY BAR.—January 13th.—For the supply of Rowley rag and blast furnace cinder, for the urban district council.—Mr. E. Bailey, surveyor, Green-lane, Hamstead, near Birmingham.

BRIXHAM.—January 13th.—For relaying footpaths, for the urban district council.—The Surveyor.

STOKE-ON-TRENT.—January 14th.—For making up certain streets, for the corporation.—Borough Surveyor.

EASINGWOLD.—January 14th.—For the supply of whinstone slag, for the rural district council.—Mr. F. J. H. Robinson, clerk.

MIDHURST.—January 17th.—For the supply of granite, tar-macadam and tar, for the rural district council.—Mr. A. G. Gibbs, surveyor.

HALE.—January 17th.—For making up a street, for the urban district council.—Mr. T. Blagburn, surveyor.

WANDSWORTH.—January 19th.—For road repairs in certain roads, for the borough council.—Mr. P. Dodd, borough engineer.

SURREY.—January 20th.—For the supply of high-class granites, basalts, limestone, slag, tar-macadam, bitumen, pitch, tar, and tar oils, for the county council.—Mr. A. Dryland, county surveyor, Kingston-on-Thames.

LONDON.—January 20th.—For work of road construction at Tottenham, for the county council.—Architects' Department (Housing Section), 19 Charing Cross-road, W.C.

SKIPTON.—January 20th.—For the supply of road materials, for the rural district council.—Mr. A. Rodwell, surveyor.

BROMLEY (Kent).—February 2nd.—For the execution of sewerage, levelling, paving, metalling, channelling and making good portion of a road, for the rural district council.—The Surveyor, Maulden House, Sidcup-hill, Sidcup.

GLOUCESTERSHIRE.—(No date.)—For surface tarring about 65 miles of main roads, for the county council.—Mr. E. S. Sinnott, county surveyor, Shire Hall, Gloucester.

Sanitary.

MIRFIELD.—January 1st—19th.—For the extension of works for the disposal of sewage at the sewage farm, Northorpe, in two contracts, for the urban district council.—Mr. Edwin Gill, engineer and surveyor.

FARNBOROUGH.—January 3rd.—For the construction of two concrete sedimentation tanks, underground ejector chamber, ironwork, valves, plant, and other works, for the urban district council.—Mr. J. E. Hargreaves, surveyor.

THIRSK.—January 3rd.—For the removal of house refuse, for the rural district council.—Mr. A. Green, Holme-field-terrace, Sowerby.

MATLOCK.—January 3rd.—For the supply and erection of revolving sprinklers on the percolating filters at sewage disposal works, for the urban district council.—Messrs. James Diggle & Son, 14 Victoria-street, Westminster.

TEDDINGTON.—January 3rd.—For the construction of sewers, manholes, chimney shaft and other works, for the urban district council.—Mr. M. Hainsworth, surveyor.

STRETFORD.—January 3rd.—For the construction of a storm sewer and channel nearly a mile long, for the urban district council.—Mr. Ernest Worrall, surveyor.

PONTYPRIDD.—January 5th.—For the construction of stoneware and steel tube sewer and manholes, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor.

RUNCORN.—January 5th.—For the removal of nightsoil, for the rural district council.—Mr. G. F. Ashton, clerk.

WEST BROMWICH.—January 5th.—For the removal of nightsoil and emptying cesspools, for the corporation.—Inspector of Nuisances, Sanitary Offices.

LEPTON.—January 5th.—For the construction of a sewer, for the urban district council.—Messrs. J. B. Abbey & Son, District Bank Chambers, Market-street, Huddersfield.

SOUTHPORT.—January 6th.—For the construction of stoneware pipe intercepting sewers, surface-water drains, destructor buildings, and other works appertaining thereto, for the corporation.—Mr. G. Midgley Taylor, engineer, Caxton House, Westminster, S.W.

WALSINGHAM.—January 6th.—For the construction of sewerage drainage connections, for the rural district council.—Mr. Arthur W. Smith, sanitary surveyor.

COCKERMOUTH.—January 6th.—For the removal of house refuse, for the rural district council.—Mr. J. H. Musgrave, clerk.

ROCHESTER.—January 6th.—For laying stoneware pipe drains, for the corporation.—Mr. W. Banks, city surveyor.

KIRKBURTON.—January 7th.—For the construction of sewers and manholes, for the urban district council.—Messrs. J. B. Abbey & Son, District Bank Chambers, Market-street, Huddersfield.

WREXHAM.—January 7th.—For the construction of 9-in. sewer, with manholes, for the rural district council.—Mr. J. Price Evans, engineer, Argyle Chambers, Wrexham.

DOWNPATRICK.—January 10th.—For the construction of a sewer, for the rural district council.—The Clerk.

EBBW VALE.—January 13th.—For work of scavenging, for the urban district council.—Mr. T. Hughes, clerk.

BOOTLE.—January 14th.—For the execution of drainage work, for the corporation.—Borough Engineer.

HACKNEY.—January 15th.—For the collection and removal of house and other refuse, for the borough council.—Mr. N. Scorgie, deputy town clerk and borough engineer.

WALTHAMSTOW.—January 22nd.—For drainage and other works, for the parochial charities.—Mr. W. Houghton, surveyor, 58 Old Broad-street, E.C.

SHARDLOW.—January 23rd.—For the construction of 3 miles of stoneware pipes (12-in. to 6-in.), with manholes and other appurtenant works, three ejector chambers, with 1½ miles of 8-in. and 2½-in. compressed air main, 1,815 yds. of 7-in. and 5-in. rising main, with air compressor stations, and purification works, for the rural district council.—Messrs. Elliott & Brown, Burton Buildings, Parliament-street, Nottingham.

NEWCASTLE (Co. Down).—January 31st.—For the construction of a complete sewerage scheme, for the urban district council.—Messrs. Swiney & Croasdale, Avenue Chambers, Belfast.

LONDON.—February 2nd.—For the execution of works for three years in the reparation, maintenance, and reconstruction of sewers and drains, for the corporation of the city.—Bell, Guildhall, E.C.

Stores.

SLOUGH.—January 3rd.—For the supply of tools, ironmongery, stoneware pipes, Portland cement, tar oil, distilled tar, screened shingle, and prepared tared granite, for the urban district council.—The Surveyor.

BEXLEY.—January 6th.—For the supply of road materials, glazed stoneware socketed pipes, and best Portland cement, for the urban district council.—Mr. W. T. Howse, surveyor.

PLYMOUTH.—January 8th.—For the supply of fire hydrants, lead pipe, pig lead, stopcocks, februles, cast-iron work, sluice valves, and cartage, for the corporation.—Mr. Frank Howarth, water engineer.

ST. PANCRAS.—January 12th.—For the removal of road-sweepings and gully soil, horsing water vans, horsing road-sweeping and other machines, cartage, and the supply of timber, creosoted deal blocks, jarrah wood blocks, barrows, trucks, handles, paints, oils, ironmongery, smiths' and founders' works, tools, Yorkshire stone and artificial paving slabs, granite kerbs, paving setts, broken granite and Kentish rag, gravel and other roadway materials, bass brooms and horse brush stocks, tarpaulins, hemp, rubber goods, pitch, tar, creosote oil, and carbolic powder, and coke, for the borough council.—Mr. W. Nisbet Blair, borough engineer and surveyor.

PLYMOUTH.—January 17th.—For the supply of paints, varnishes, ironwork, petroleum oil, broom-heads, household brushes, iron and steel, pitchpine, deals, flooring, carbolic powder, Portland cement, lubricating oils, tar, pitch, painters' brushes, explosives, soap, softwood blocks, creosote, disinfectant fluid, granite kerbs, setts, white and red lead, re-filling machine-revolving brooms, benzoline, motor spirit, tools, indiarubber goods, hose, and ship chandler's goods, for the corporation.—Mr. James Paton, borough engineer and surveyor.

MIDDLESBROUGH.—January 19th.—For the supply of annealed scoriæ blocks, bricks, castings, concrete flags and kerbs, Portland cement, pitch and tar, sanitary pipes, gullies, junctions, broken slag, domestic coal, timber, whinstone and granite (broken), whinstone and granite setts and kerbs, brushes, bolts, nuts, disinfectants, general stores, glass, hardware, indiarubber goods, iron, steel, leather belting, oils, paints, varnishes, packings, picks, shovels, shafts, polishes, cleaning materials, and ropes, for the corporation.—Mr. S. E. Burgess, borough engineer.

STEPNEY.—February 10th.—For the supply of bricks, lime, fireclay, brooms, cast-iron work, colours, varnishes, painters' brushes, drainage materials, oilman's goods, Portland cement, pitch, tar, green oil, bitumen, timber, tools, implements, ironmongery, wheelwrights' materials, ballast, shingle, sand, hoggin, flints, uniform clothing, boots, disinfectants, paving materials, horse hire, and squaring and re-dressing old paving materials, for the borough council.—Mr. M. W. Jameson, borough engineer.

HASTINGS.—December 29th.—For the supply of manhole covers, gullies, brooms, and brushes, for the corporation.—Mr. P. H. Palmer, borough engineer.

Miscellaneous.

BEDWELTY.—January 5th.—For hauling and laying steel gas mains, for the urban district council.—Mr. Dan. U. Price, engineer and surveyor.

LEXDEN AND WINSTREE.—January 9th.—For laying water mains, valves, hydrants, and constructing water tower, for the rural district council.—Messrs. Sands & Walker, Milton-chambers, Nottingham.

MATLOCK.—January 10th.—For the purchase by the urban district council of a second-hand fire engine.—Mr. Joseph Turner, engineer and surveyor.

NORTHAMPTON.—January 12th.—For the construction of a double line of tramways to Far Cotton, and the doubling of a section of the Kingsthorpe route, together with the necessary overhead equipment, underground feeders, and telephones, for the corporation.—Mr. Alfred Fidler, borough engineer.

CHESTERFIELD.—January 19th.—For sinking a trial borehole, for the Gas and Water Board.—Mr. J. Middleton, clerk.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.

‡ Provisionally accepted.

AUDENSHAW.—Accepted for the removal of nightsoil and refuse, for the urban district council.—Chairman of Sanitary Committee:—

W. Phillips, Audenshaw.

BELFAST.—For the supply of 250 tons of setts, for the Belfast Harbour Commissioners.—Mr. W. R. Kelly, harbour engineer:—

Penmaenmawr and Welsh Granite Company, Limited, Penmaenmawr.

BRIDLINGTON.—For laying a 12-in. sewer, for the corporation.—Mr. E. R. Matthews, borough surveyor:—

Brumby, Robinson & Son, Hull, £180.

CHERTSEY.—For the erection of sixteen artisans' dwellings, for the rural district council.—Mr. H. Beoney, surveyor:—

Norris & Co., Sunningdale	£4,112
Gaze & Son, Byfleet	4,071
E. B. Tarring, Weybridge	4,005
W. G. Tarrant, Byfleet	3,999
Allwork Brothers, Woking	3,997
F. Pizzev, Sunninghill	3,904
F. & H. F. Higgs, Cobham	3,853
Sherfield Brothers, Farnham	3,812
S. Silk, Horsell	3,794
Collinson & Co., Teddington	3,715
Drowley & Bridger, Woking	3,680
R. Love & Co., Sunninghill	3,518
T. Crossley & Sons, Bromley †	3,373
J. Chitty & Co., Camberley	3,192

Surveyor's estimate, £3,140.

CHESTER-LE-STREET.—For the erection of 113 houses at Pelton, for the rural district council.—Mr. J. H. Mole, surveyor:—

J. Cook, Stoke-on-Trent	£31,500
J. Wears, Pelton Fell	31,500
Middlemiss Brothers, Newcastle-on-Tyne	31,000
I. Berriman, Fence Houses	30,254
G. Douglas, Newcastle-on-Tyne	29,383
P. Heel, Stanley, co. Durham	28,552
S. Miller, Newcastle-on-Tyne	28,485
C. Groves, Chester-le-Street	28,351
Clark & Son, New Seaham	28,263
S. Sherriff & Son, South Shields	28,250
H. Wilson, Fatfield	27,466
J. Douglas, Newcastle-on-Tyne	26,500
L. F. Teffel, Newcastle-on-Tyne	26,490
E. Dyson, Pelton	26,400
P. Duffy, Stanley, co. Durham	26,000

Surveyor's estimate, £25,739.

CHESTER-LE-STREET.—For the construction of a recreation hall at the consumption sanatorium, Birtley Fell, for the rural district council:—

Thompson & Sons, Chester-le-Street	£524
C. Groves, Chester-le-Street	518
C. B. Smith, Gateshead	495
W. Arnell, Gateshead	486
B. Bruce, New Washington, co. Durham	471
Norman, Chester-le-Street	470
J. Burnett & Son, Birtley, co. Durham	462
H. Wilson, Washington, co. Durham	426

Surveyor's estimate, £465.

GRANGEMOUTH.—For strengthening and resurfacing a main road, for the corporation.—Mr. D. A. Donald, burgh engineer:—

J. & J. Lang & Co., Limited, Greenock	£9,451
Stark & Dobbie, Glasgow	3,264
A. H. Robertson, Inverkeithing	3,215
F. Flaherty, Falkirk	3,088
W. Dobson, Edinburgh	2,922
R. C. Brebner & Co., Edinburgh	2,849
A. Stark & Sons, Glasgow	2,820

HARTLEY WINTNEY (Hants).—For new sewage disposal, sewerage and drainage works, including tanks, filter beds, and machinery, for the district council.—Mr. T. J. Moss-Flower, engineer, Westminster, S.W., and Carlton Chambers, Bristol:—

J. & T. Binns, Croydon	£5,787
T. C. Glyas, Bristol	5,700
Crosby & Co., Farnham	5,289
Osman & Co., Southampton	5,274
McCarthy E. Pitt, Reading	5,259

KANTCRK.—For erecting pump on well, building a wall, and repairing cottage, for the rural district council:—

Erecting Pump and Building Wall C. O'Callaghan, Newtown, Charleville, £20.
Repairing Cottages.—C. O'Callaghan, Newtown, Charleville, £18.

MARSTON SICCA.—For the construction of the Long Marston water supply, for the rural district council.—Messrs. Wilcox & Raikes, engineers, Birmingham:—

Johnson Brothers, Gloucester	£1,678
A. Holloway, Wolverhampton	1,121
T. Broad, Limited, Great Malvern	1,039
Currell, Lewis & Martin, Birmingham	999
Childs & Withers, Worcester	954
Firth & Co., Derby	920
W. Thorpe, Birmingham	899
J. Riley, Cheltenham	895
W. Ellis, Birmingham	884
E. Barke & Son, Stoke-on-Trent	860
G. Law, Kidderminster	840
Staveley Coal and Iron Company, Chesterfield	834
Rowell & Sons, Chipping Norton	818

NORFOLK.—For the erection of a school at Wiggénhall, St. Mary Magdalen, for the Education Committee.—Mr. J. E. Burton, architect, Norwich:—
 R. Shanks, Chatteris, Cambs £895
 H. C. Greengrass, Norwich 887
 F. W. Ashby, Limited, Downham Market 834
 Medwell & Son, King's Lynn 829
 J. J. Bone, King's Lynn 822
 T. Nes & Son, King's Lynn 796
 J. W. Collins, Downham Market 783
 Tash & Langley, King's Lynn § 778
 § Accepted subject to reductions.

NORTHUMBERLAND.—For the erection of a school at Newbiggin Colliery, for the Education Committee:—
 R. & A. P. Tait, Seaton Delaval, Northumberland, £9,854.

SHREWSBURY.—Accepted for the construction of a street, for the corporation.—Mr. W. Chapple Eddowes, borough surveyor:—
 H. Price, Shrewsbury.

TENBY (Pembrokeshire).—For new sewerage and sea outfall works, including the laying and jointing of cast-iron and stoneware pipe sewers, together with manholes, hatch-boxes, and flushing chambers; also the construction of screening chamber, 8-ft. diameter tank sewer, penstock chambers, penstock house, 4-ft. diameter cast-iron sea outfall, and other incidental works, for the council.—Mr. T. J. Moss-Flower, engineer, Westminster, S.W., and Carlton Chambers, Bristol:—

W. Jones & Co., Neath	£23,690
T. C. Gluyas, Bristol	21,987
J. Dickson, St. Albans	21,574
G. Stow & Co., Newport	21,256
J. D. Binns, Croydon	21,009
T. Wilkinson & Co., Bournemouth	19,423
J. Riley, Cheltenham	18,342

TOTNES.—For laying stoneware sewers, building manholes, and laying water mains, for the corporation.—Mr. A. Warren, borough surveyor:—

T. E. Brook, Totnes	£214
C. Kinsman, Totnes	190
F. Cornelius, Stoke Fleming	189
W. Shaddock, Plymouth	184
W. Reeves & Son, Totnes	174

WAREHAM.—For the erection of twelve cottages in the parish of Studland, for the rural district council.—Mr. W. Watts Pookes, architect and surveyor:—

A. B. Burdess, Parkstone	£2,631
F. Parsons, Swanage	2,569
E. Burt, Swanage	2,480
Parsons & Hayter, Wareham	2,381
F. W. Pond, Swanage	2,328
E. F. Bascombe, Broadstone	2,275
J. Francis, Bournemouth	2,156
J. Lawford, Parkstone	2,148
J. Flower, Winton	1,980

Surveyor's estimate, £2,230.

WARWICKSHIRE.—Accepted for the supply of road material (broken and unbroken), for the county council.—Mr. John Willmot, county surveyor, Birmingham:—

C. Abell, Limited, Atherstone.
 Abdoo Cleo Stone Quarry Company, Bridgnorth.
 W. Boon & Sons, Nuneaton.
 Cleo Hill Dhu Stone Company, Ludlow.
 Cleo Hill Granite Company, Ludlow.
 Currall, Lewis & Martin, Birmingham.
 Enderby and Stoney Stanton Granite Company, Leicester.
 Field & Mackay, Ludlow.
 B. J. Forder & Son, Limited, London.
 W. Griffiths & Co., Limited, London.
 W. L. Ireland, Nuneaton.
 Jee's Hartshill Granite Company, Atherstone.
 Judkins, Limited, Nuneaton.
 Mountsorrel Granite Company, Loughborough.
 Rowley Regis Granite Company, Rowley Regis.

WEDNESBURY.—For the diversion and sewerage of a road, for the corporation:—

Martin & Element, Smethwick	£814
Guest & Son, Stourbridge	808
T. Farley, Sawbridgeworth, Herts	808
Currall, Lewis & Martin, Birmingham	299
G. P. Trentham, Birmingham	261
Emery & Co., Aston	246
Jukes & Co., Tipton	236
A. Heatherley, Handsworth	230

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JANUARY.

- 7.—Institute of Sanitary Engineers: Presidential Address by Mr. John D. Watson, M.INST.C.E. 8 p.m.
- 9.—Junior Institution of Engineers: Mr. C. H. Woodfield on "The Future of the Institution." 8 p.m.
- 12.—Surveyors' Institution: Mr. Graham Mould, Barrister-at-Law, on "The Law of Dilapidations."
- 15.—Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham.
- 17.—Institution of Municipal and County Engineers: South-Eastern District Meeting at Institution Offices.
- 19.—Surveyors' Institution (Junior Meeting): Mr. H. J. Smith on "The Housing and Town Planning Act in Working." 7 p.m.
- 26.—Surveyors' Institution: Mr. George Corderoy on "Measuring and Quantity Surveying."
- 29.—Concrete Institute: Discussion on Joint Report of the Reinforced Concrete Practice Committee and the Quantity Surveyors' Association, on "Standard Methods of Measurement for Reinforced Concrete Work." 7.30 p.m.

FEBRUARY.

- 4.—Institute of Sanitary Engineers: Annual Dinner, Holborn Restaurant.
- 16.—Institute of Sanitary Engineers: Mr. F. R. O'Shaughnessy, F.I.C., on "The Significance of Colloidal Matter in the Problem of Sewage Disposal." Caxton Hall, Westminster. 8 p.m.
- 20-21.—Institution of Municipal and County Engineers: Meeting at Manchester.
- 23.—Surveyors' Institution: Annual Dinner, Whitehall Rooms. 7 p.m.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

BILSTON URBAN DISTRICT COUNCIL.
WATER ENGINEER AND SURVEYOR'S DEPARTMENT.

The Council invite applications for the Appointment of an Assistant in the above Department at a salary of £100, rising by annual increments of £10 to £120 per annum.

Experience in a Surveyor's Office essential, and preference will be given to candidates who have passed the Qualifying Examination for Assoc. Membership of the Institute of Civil Engineers, or hold the Testamur of the Institute of Municipal and County Engineers.

Applications, stating age and experience, accompanied by not more than three recent testimonials, and endorsed "Surveyor's Assistant," must be sent to me not later than Saturday, the 10th of January, 1914.

Canvassing, directly or indirectly, will be a disqualification.

JOSEPH L. ARLIDGE,

Clerk to the Council.

Town Hall,
 Bilston, Staffs. (1,066)

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

APPOINTMENT OF MANAGER OF SEWAGE DISPOSAL WORKS.

The Sutton-in-Ashfield Urban District Council invite applications for the appointment of a Manager of their Sewage Disposal Works at a salary of £2 per week.

Candidates must have had experience in a similar capacity.

Applications, in candidate's own handwriting, stating age, present position and previous experience, and accompanied by copies of three recent testimonials, to be sent in not later than 5 o'clock on Monday, the 5th day of January, 1914, endorsed "Manager," to the undersigned.

JOHN D. FIDLER,

Clerk.

Clerk's Office,
 Forest-street,
 Sutton-in-Ashfield, Notts. (1,075)

A FIRM of standing requires the services in London and District of a representative for Sewage Ironwork Fittings. Experience in this class of business and connection with engineers and contractors are essential points. Salary and commission would be the basis of remuneration.—Apply, with full particulars, to Box 1,350, office of THE SURVEYOR, 21 Bride-lane, Fleet-street, E.C.

GUILDFORD EDUCATION COMMITTEE.

Wanted, early in January, Teacher of Land Surveying for the Guildford Technical Institute. Tuesday evenings (two hours). Travelling expenses paid. Applications, stating age, qualifications, teaching experience and salary required, accompanied by testimonials, to be sent to F. S. Tosswill, Director of Technical Education, Technical Institute, Guildford. (1,075)

BOROUGH OF SCARBOROUGH. STREETS AND SANITARY SUPERIN- TENDENT.

The Town Council of Scarborough invite applications from persons, not over 45 years of age, for the position of Superintendent of the Streets and Sanitary Department of the Corporation.

Terms of appointment and list of duties may be obtained on application to me.

Candidates should have had actual working knowledge in some town other than Scarborough in the performance of the duties to be carried out.

Salary £150 per annum, rising, by such amounts and at such times as the Council may think proper, to £200 per annum.

Applications must be on printed form only, which form can be obtained from me, and should be sent to me in a sealed envelope, endorsed "Superintendent," so as to reach me not later than 12 noon on Wednesday, January 7, 1914.

Canvassing, directly or indirectly, in any way whatsoever, is distinctly forbidden, and will be deemed a disqualification. This condition will be strictly observed.

No more than two copy (not original) testimonials may accompany each application, and such testimonials must be from persons having actual knowledge of the candidate's experience.

Dated this 20th day of December, 1913

HARRY W. SMITH,
Borough Engineer.

Town Hall,
Scarborough. (1,065)

CITY OF COVENTRY. ASSISTANT BUILDING INSPECTOR.

The General Works Committee of the Corporation of the City of Coventry is prepared to receive applications for the appointment of a Temporary Assistant Building Inspector in the City Engineer's Department.

The appointment will be temporary, but will be of at least 12 months' duration.

Candidates must be thoroughly qualified persons between the ages of 27 and 40, and will be required to undertake the inspection and testing of drainage, and to make accurate surveys and records of all new buildings, drainage, &c., and generally to assist the Building Inspector.

Candidates must have had experience in the above work, and should possess the certificate of the Sanitary Institute.

Wages will be at the rate of £2 5s. per week, and the appointment will be terminable by one week's notice on either side.

Applications, in candidate's own handwriting, stating age, experience, past and present employment, accompanied by copies of not more than three recent testimonials, and endorsed "Assistant Building Inspector," to be sent to the undersigned not later than Tuesday, the 6th proximo.

Canvassing, directly or indirectly, will be considered a disqualification.

J. E. SWINDLEHURST, M.INST.C.E.,
City Engineer and Surveyor.

St. Mary's Hall,
Coventry.
December, 1913. (1,085)

GELLYGAER URBAN DISTRICT COUNCIL. SURVEYOR'S CLERK.

The above Council require the services of a Clerk in their Surveyor's Department. Applicants must have had previous experience in a similar position, and must be capable of checking and allocating all bills, keeping and balancing wages books, cash and other accounts, and have a knowledge of the general routine of the office. Preference will be given to candidates who have also a knowledge of shorthand and type-writing. Salary £80 per annum, rising by yearly increments of £5 to £100.

Applications, giving age and full particulars of experience, and accompanied by copies of not more than three recent testimonials, to be sent to me not later than the 3rd day of January, 1914.

FRANK T. JAMES,
Clerk to the Council.

Council Offices,
Hengoed, Glam. (1,079)

JUNIOR ASSISTANT required. Temporary. Westminster. Must be good draughtsman, with some experience in levelling. 3 or 3½ guineas, according to qualifications.—Apply Box 1,354, office of THE SURVEYOR, 24 Bride-lane Fleet-street, E.C. (1,051)

RHONDDA URBAN DISTRICT COUNCIL. APPOINTMENT OF ENGINEER AND SURVEYOR.

The Rhondda Urban District Council invite applications for the position of Engineer and Surveyor to the Council.

Candidates must have gained experience in the duties relating to the office in a large and developing Urban Sanitary District, and must be Members of the Institute of Civil Engineers.

The gentleman appointed to the position will be required to devote the whole of his time to the duties of the office, and must reside within the Rhondda Urban area.

Candidates must not be under 30 nor more than 45 years of age.

Commencing salary £500 per annum, rising by annual increments of £50 to a maximum of £750 per annum.

Offices will be provided by the Council, who will also find all the necessary clerical and other assistance.

Applications must be made on the Form provided for the purpose, which may be obtained from the undersigned, and which Form, accompanied by copies of three recent testimonials, enclosed in an envelope, and endorsed "Engineer and Surveyor," must be delivered to me, the undersigned, on or before the 31st day of January, 1914.

Canvassing Members of the Council, or asking from them letters of introduction or recommendation, is absolutely prohibited, and any applicant canvassing a Member by circular or otherwise, or obtaining from him a letter of recommendation to any other Member or Officer of the Council, will be disqualified.

Candidates, if they so desire, may print the prescribed Form of Application as filled in by them and the testimonials submitted in support thereof, and may send 40 copies thereof to the undersigned, who will distribute the same to the Members of the Council.

W. P. NICHOLAS,
Clerk of the Council.

The Council Offices,
Pentre, Rhondda.
December 22, 1913. (1,077)

COMPETITIONS OPEN.

COMPETITION FOR PROPOSED CONCRETE COTTAGES.

THE Proprietors of *Concrete and Constructional Engineering* invite Architects, Surveyors and their Assistants, residing in the British Empire, to compete in the preparation of the Design of a suitable Detached or Semi-detached Labourer's Cottage, largely or mainly of concrete, to be erected in sets of six in the Home Counties of England (at least 30 miles from Charing Cross), at a prime cost to the owners of £125 per cottage.

The Proprietors offer the following Premiums:—

First Prize—One Hundred Guineas.

Second Prize—Fifty Guineas.

Third Prize—Twenty-five Guineas.

Fourth and Fifth Prizes—Ten Guineas each.

The Assessors (whose decision as to the competition is final) will be:

Max Clarke, F.R.I.B.A.

Prof. A. Beresford Pite, F.R.I.B.A.

Edwin O. Sachs, F.R.S.E.D.

The Competitive Designs must be delivered not later than May 15th, 1914, Noon, at the Offices of *Concrete and Constructional Engineering* (but not earlier than May 1st).

The Conditions of the Competition will be found in the January issue of *Concrete and Constructional Engineering*, obtainable after January 3rd, 1914, on application in writing with remittance of 1s. 3d. to the Publisher, *Concrete and Constructional Engineering*, North British and Mercantile Building, Waterloo-place, Pall Mall, London, S.W. (1,029)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

RURAL DISTRICT OF WOODSTOCK.
HARTSHILL, LEICESTERSHIRE GRANITE,
ROWLEY REGIS, AND BEST RUBBLE,
OR OTHER HARD STONE.

The Rural District Council of Woodstock invite Tenders for the Supply of Stone of each or either of the qualities above named at per ton—viz.:—

Best Hand-picked Unbroken Stone, Best Broken Stone (2-in. gauge, clean and free from chippings), Best Double-screened Nuts for patching purposes (1½-in. gauge), Best Double-Screened Coarse Chippings and Binding Chippings, and Best Rubble.

The Stone is to be delivered to the Council at the undermentioned Wharves on the Oxford and Birmingham Canal—viz.: Aynho, Semerton, Heyford, Euslow, Thrupp Landing, Langford-lane, Kidlington, Bridge, King's Bridge, and Wolvercote; and at the undermentioned Railway Stations—viz.: Handborough and Woodstock.

The Stone is to be delivered at the dates and places and in the quantities to be specified in the Surveyor's written orders, to be sent by post to the Stone Contractors from time to time, and the whole of the Stone is to be supplied before the 1st of October next.

A person tendering, if his Tender is accepted, will be required to sign a written Agreement to supply the Stone in accordance with the terms of this advertisement and the Surveyor's orders.

Tenders and Samples must be delivered at my Office in Woodstock on or before Monday, the 12th day of January, 1914.

Wharfage and Railway Charges are payable by the Stone Contractors.

Forms of Tender can be obtained on application at my Office.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
A. G. HIGGS,
 Clerk to the District Council.

Woodstock.
 December 29, 1913. (1,086)

MIRFIELD URBAN DISTRICT COUNCIL.
SEWAGE DISPOSAL WORKS.

The Mirfield Urban District Council invite Tenders for the Extension of Works for the Disposal of Sewage at the Sewage Farm, Northorpe, within the District of Mirfield.

Contract No. 1 comprises the Construction of Screening Channel, Detritus Tanks, Gauge Channel, Settling Tanks, Stormwater Tanks, Sludge Drainers, Conduits, Drains, Manholes and other incidental works.

Contract No. 2 comprises the supply and delivery of Sluice Valves, Sludge Valves, Gauge Plates, Cast-iron Pipes and Specials, Wrought-iron Ladders, Manhole and Lamphole Covers, &c.

Copies of General Conditions of Contract and Specification and Bill of Quantities with Forms of Tender may be obtained and Drawings inspected on application to Mr. Edwin Gill, Engineer and Surveyor, Council Offices, Mirfield, on or after 1st of January, 1914, for Contract No. 1, and after the 5th of January for Contract No. 2 on payment of £2 2s., which must be forwarded with the application for Quantities, which amount will be returned on receipt of a *bona-fide* Tender and return of all documents entrusted to the Contractor for the purpose of Tendering.

The Council do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, with the Bill of Quantities, in envelopes supplied, and endorsed "Sewage Disposal Works," must be delivered not later than 12 o'clock noon on January 19, 1914.

EDWARD B. WILSON,
 Clerk to the Council.

Council Offices,
 Mirfield.
 December 28, 1913. (1068)

SURREY COUNTY COUNCIL.

MAIN ROADS UNDER DIRECT COUNTY MANAGEMENT.

URBAN DISTRICTS OF WALTON-ON-THAMES AND WINDLESHAM, AND RURAL DISTRICTS OF GUILDFORD AND HAMBLEDON;
 (Portsmouth Road North of Godalming only).

MATERIALS.

Tenders are invited for the supply of high-class Granites, Basalts, Limestone, Slag, Tar-Macadam, Bitumen, Pitch, Tar, and Tar Oils delivered at Railway Stations; also for Flints, and Fine Gravel for footpaths, delivered either at Stations or at the road-side.

Specifications, Schedules, and Forms of Tender may be obtained on application to the County Surveyor, County Hall, Kingston-on-Thames, to whom Tenders must be sent in sealed and endorsed envelopes so as to reach his Office on or before the 20th day of January, 1914.

By order,
A. DRYLAND,
 County Surveyor.

County Hall,
 Kingston-on-Thames.
 22nd December, 1913. (1067)

AMMANFORD URBAN DISTRICT COUNCIL.
PROPOSED SEWERAGE SCHEME.

The above Council invite Engineers to quote their terms (inclusive) for—

- (1) Preparing a Scheme for the Sewerage of their Urban District with Plans, Details, &c.
- (2) For preparing all necessary Plans and rendering all necessary assistance in the promotion of a private Bill in Parliament.
- (3) For superintending and carrying out to its completion the above-mentioned Sewerage Scheme.

All Plans, Sections, &c., to be the property of the Council.

All applications to be in the hands of the undersigned, marked "Sewerage," on or before the 6th day of January, 1914.

T. M. EVANS,
 Clerk to the Council.

Dated this 22nd day of December, 1913. (1,060)

SHARDLOW RURAL DISTRICT COUNCIL.
DRAYCOTT AND BREASTON SEWERAGE AND SEWAGE DISPOSAL WORKS, &c.

The above-named Council invite Tenders from responsible Contractors for the Sewerage and Sewage Disposal Works in the Parishes of Draycott and Breaston, near Derby. The works comprise about 3 miles of Stoneware Pipes (12 in. to 6 in.), with Manholes and other appurtenant Works; three Ejector Chambers with 1½ miles of 3-in. and 2½-in. Compressed Air Main and 1,815 yards of 7-in. and 5-in. Rising Main; with Air Compressor Station. Also the Construction of Purification Works, consisting of Tanks, Bacterial Filters, &c.

Plans and Specification can be seen at the Offices of the Engineers, Messrs. Elliott & Brown, A.M.M. INST.C.E., Burton Buildings, Parliament-street, Nottingham, and copies of the Specification, Bills of Quantities, and Form of Tender may be obtained (after the 9th day of January) on deposit of Three Guineas (by cheque), which will be returned on receipt of a *bona-fide* Tender, not afterwards withdrawn, and the return of all documents.

Sealed Tenders, endorsed "Tender for Draycott and Breaston Sewerage Works," to be delivered to the undersigned not later than the first post on Friday, the 23rd day of January, 1914.

The lowest or any Tender will not necessarily be accepted.

(By order)
J. W. NEWBOLD,
 Clerk to the Council.

Becket-street,
 Derby. (1,089)

RAILS, F.B., wanted; about 1,000 yds. 20-22 lb. per yard. Must be in good condition. State full particulars and lowest price delivered Manchester.—Box 1,356, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

COUNTY BOROUGH OF SWANSEA. VICTORIA PARK BRIDGE, WITH APPROACHES THERETO.

The Corporation of Swansea invite Tenders for the Construction of Masonry and Concrete Approaches, Piers, &c., for a Bow-string Truss Steel Girder Foot-bridge of 111-ft. span, and also for the Supply and Erection of the said Bridge.

The Contract has been drawn up in two parts—viz.,

- (1) Masonry, &c., for Approaches and Piers.
- (2) Steelwork for the Bridge;

but Contractors may submit Tenders for one or both parts.

Particulars and Forms of Tender may be obtained from the Corporation's Consulting Engineer, Mr. H. Howard Humphreys, of 28 Victoria-street, Westminster, S.W., on Wednesday and Thursday, the 14th and 15th days of January, 1914, between 10 a.m. and 5 p.m.

Intending Contractors will be required to deposit a sum of Three Guineas prior to particulars being furnished, such sum being returned on receipt of a *bona-fide* Tender.

Tenders, endorsed "Victoria Park Bridge," must reach the undersigned not later than 11 a.m. on the 26th day of January, 1914. The Corporation do not bind themselves to accept the lowest or any Tender for either part of the Contract.

H. LANG COATH,
Town Clerk.

Guildhall,
Swansea.

December, 1913. (1,064)

SLEAFORD RURAL DISTRICT COUNCIL. EXTENSION OF WATERWORKS FOR THE PARISH OF HECKINGTON.

CONTRACT No. 2.

The Sleaford Rural District Council are prepared to receive Tenders for the Supply, Laying and Jointing of about 8½ miles of Cast-iron Mains and Specials, 4 in. and 3 in. diameter respectively, the Provision and Fixing of Sluice and Air Valves, Standposts, and other Works of Water Supply for the Parish of Heckington, in accordance with the Specifications and Quantities prepared by Mr. W. B. Marsden, Engineer and Surveyor to the Council, Sleaford.

Copies of the Specification and Bills of Quantities, with Form of Tender, may be obtained from, and the Plans inspected at, the Office of the aforesaid Engineer, 74 Southgate, Sleaford, on and after the 1st day of January, 1914, upon payment of £2 2s. (cheque only), which will be returned upon receipt of a *bona-fide* Tender and the return to the Engineer of all documents, &c.

Tenders, endorsed "Heckington Water Supply, Contract No. 2," are to be delivered to me, on or before Saturday, the 24th day of January, in a sealed packet.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

EDMUND CLEMENTS,
Clerk to the Council.

74 Southgate,
Sleaford.

December 23, 1913. (1,082)

SLEAFORD RURAL DISTRICT COUNCIL. PARISH OF KIRKBY-LA-THORPE. WATER SUPPLY.

CONTRACT No. 1.

Tenders are invited for a Deep Boring in the above Parish, about 2½ miles east from Sleaford.

Specification, Schedules and Form of Tender, with all particulars, may be obtained from the Council's Engineer, Mr. W. B. Marsden, 74 Southgate, Sleaford.

Sealed Tenders, endorsed "Kirkby-la-Thorpe Water Supply," to be sent to me on or before January 10th, 1914. The Council do not bind themselves to accept the lowest or any Tender.

(Signed) EDMUND CLEMENTS,
Clerk to the Rural District Council.

74 Southgate,
Sleaford.

December 30, 1913. (1,088)

BARNET URBAN DISTRICT COUNCIL. TO BUILDERS AND CONTRACTORS.

The Barnet Urban District Council invite Tenders for the Erection of New Council Offices, Underground Convenience and Work in connection therewith, in Wood-street, Barnet.

On payment of a deposit of £2 2s., the Bills of Quantities can be obtained from, and the Plans inspected at the Office of, Mr. W. F. Wilkins, Surveyor to the Council, No. 40 High-street, Barnet, Herts., any time during office hours.

The deposit will be returned upon receipt of a *bona-fide* Tender, together with all documents relating thereto.

The Contractor will be required to pay all trades the standard rate of wages for the district.

The Council do not bind themselves to accept the lowest or any Tender.

Approved Sureties will be required as security for the performance of the Contract.

Tenders, on the Form supplied, and accompanied by the Bills of Quantities properly filled in, must be delivered, sealed and endorsed "Council Offices," to the undersigned at No. 40 High-street, Barnet, not later than Noon on Thursday, January 29th, 1914.

(By order)

HY. W. POOLE,
Clerk of the Council.

Barnet.

December 30, 1913.

(1,091)

BOROUGH OF PLYMOUTH.

Notice is hereby given that after the expiration of 10 days from the date hereof the Corporation intend to enter into Contracts for the Supply of the following Goods and Materials for one year:—

Schedule No. 3.—Section A—Paints.

Section B—Varnishes.

- | | | |
|----|----|---|
| .. | .. | 5.—Ironwork. |
| .. | .. | 7.—Petroleum Oil. |
| .. | .. | 8.—Broomheads. |
| .. | .. | 9.—Household Brushes. |
| .. | .. | 11.—Iron and Steel. |
| .. | .. | 13.—Pitchpine, Deals, Flooring, &c. |
| .. | .. | 14.—Carbolic Powder. |
| .. | .. | 15.—Portland Cement. |
| .. | .. | 16.—Lubricating Oils. |
| .. | .. | 17.—Tar and Pitch; includes refined tar for use in the construction of tarred macadam roads and for tar-spraying. |
| .. | .. | 18.—Painters' Brushes. |
| .. | .. | 19.—Explosives. |
| .. | .. | 22.—Soap. |
| .. | .. | 23.—Wood Blocks, Soft. |
| .. | .. | 24.—Creosote. |
| .. | .. | 28.—Disinfectant Fluid (Bacteriological test). |
| .. | .. | 29.—Granite Kerbs, Setts, &c. |
| .. | .. | 30.—White Lead, Red Lead, Linseed Oil, and Turpentine. |
| .. | .. | 31.—Refilling Machine Revolving Brooms. |
| .. | .. | 33.—Benzoline and Motor Spirit. |
| .. | .. | 34.—Tools. |
| .. | .. | 35.—Indiarubber Goods, Hose, &c. |
| .. | .. | 36.—Ship Chandlers' Goods (Sundry Oils, Waste, Grease). |

Tenders must be based on the whole of a Schedule (with the exception of Schedules Nos. 3, 4, 22, 29 and 36), and not on any particular item contained therein.

(Separate Tenders will be considered for Sections A and B of Schedule No. 3.)

Schedules may be obtained on payment of a deposit of £1 in cash for each Schedule. The deposits on the Schedules will be returned, provided *bona-fide* Tenders are received on or before the 17th January, 1914. Should the Contractor withdraw his Tender, or fail to send in one, the amount of his deposit will be forfeited, and the Contractor who applies for the Schedules must do so on the distinct understanding that he is willing to abide by the terms of this advertisement.

The lowest or any Tender will not necessarily be accepted.

Tenders to be delivered not later than Saturday, January 17, 1914, addressed to the undersigned.

JAMES PATON,
Borough Engineer and Surveyor.

Municipal Offices,
Plymouth.

December 21, 1913.

(1,056)

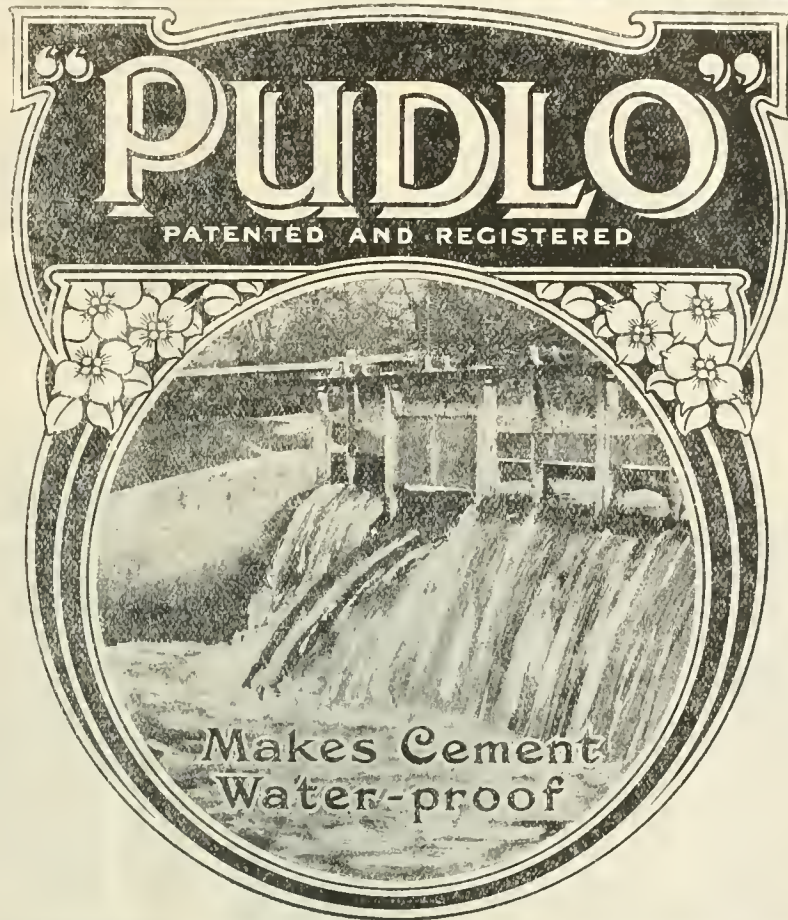
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Failure impossible.

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DOES NOT
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It adds to the
strength.

See Fajja's and
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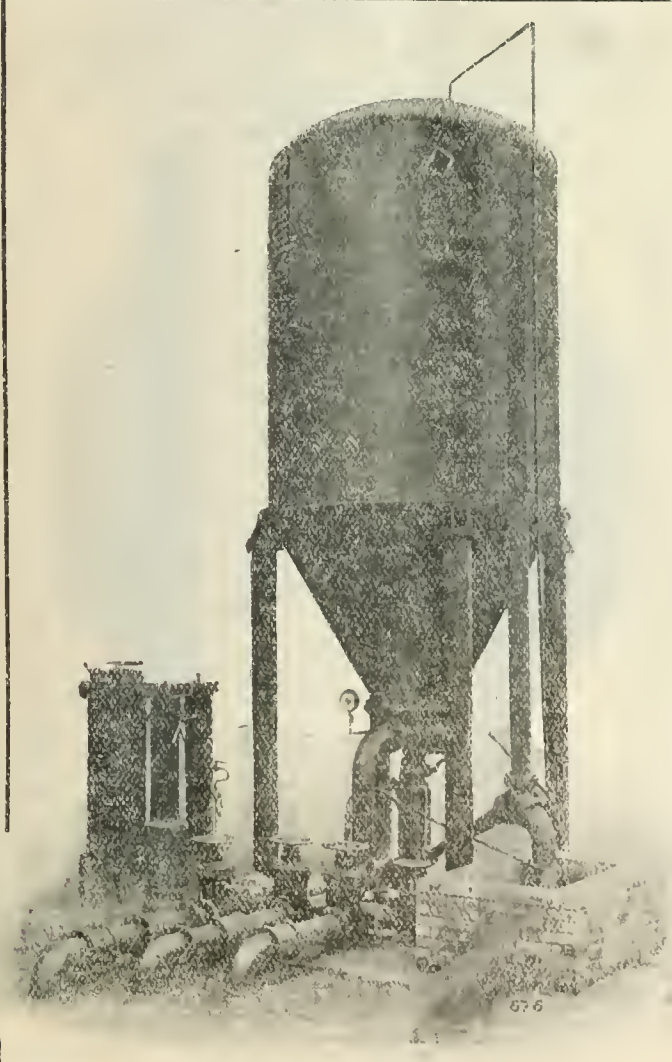
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FOR DAMP WALLS,
FLOODED CELLARS
AND FLAT ROOFS.

See full specifications
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COUNTY BOROUGH OF MIDDLESBROUGH ANNUAL TENDERS.

The Corporation invite Tenders for the Supply of the following Materials, required from the 1st day of April, 1914, to 31st day of March, 1915:—

SECTION No. 1.—Annealed Scoræ (Broken) and Annealed Scoræ Blocks; Bricks; Castings; Concrete Flags and Kerbs; Portland Cement; Pitch and Tar; Sanitary Pipes, Gullies, Junctions, &c.; Slag (Broken); Coal (for domestic use only); Timber; Whinstone and Granite (Broken), and Whinstone and Granite Setts and Kerbs.

SECTION No. 2.—Brushes, &c.; Bolts and Nuts; Disinfectants, &c.; General Stores; Glass; Hardware; Indiarubber Goods; Iron and Steel; Leather Bolting; Oils; Paints and Varnishes; Packings; Picks, Shovels and Shafts; Polishes and Cleaning Materials; Ropes, &c.

Specification and Schedule may be obtained on application at the Borough Engineer's Office, Municipal Buildings.

Sealed Tenders, endorsed "Yearly Contracts," and made out upon the Forms supplied for either one or more of the Contracts numbered one to twenty-six respectively, are to be sent to Preston Kitchen, Esq., Town Clerk, Municipal Buildings, Middlesbrough, not later than first post Monday, 19th January, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender.

(By order)

S. E. BURGESS, M.INST.C.E.,
Borough Engineer.

Borough Engineer's Office,
Municipal Buildings,
Middlesbrough.
January 1, 1914

(1,037)



KINNEAR PATENT STEEL ROLLING SHUTTERS

Are used by more than fifty Corporations, Municipalities, etc., throughout the United Kingdom, on

TRAM CAR DEPOTS
GENERATING STATIONS
BOILER HOUSES
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Improved Methods, High-grade Bitumen and Exclusive Machinery solve the problem of Economical and Efficient Construction of Roads at a Low Cost.

WRITE FOR THIS BOOK.

Voidless Asphalt Macadam construction is explained and illustrated in an interesting book issued by Highways Construction Limited. It will be sent on request addressed to:—

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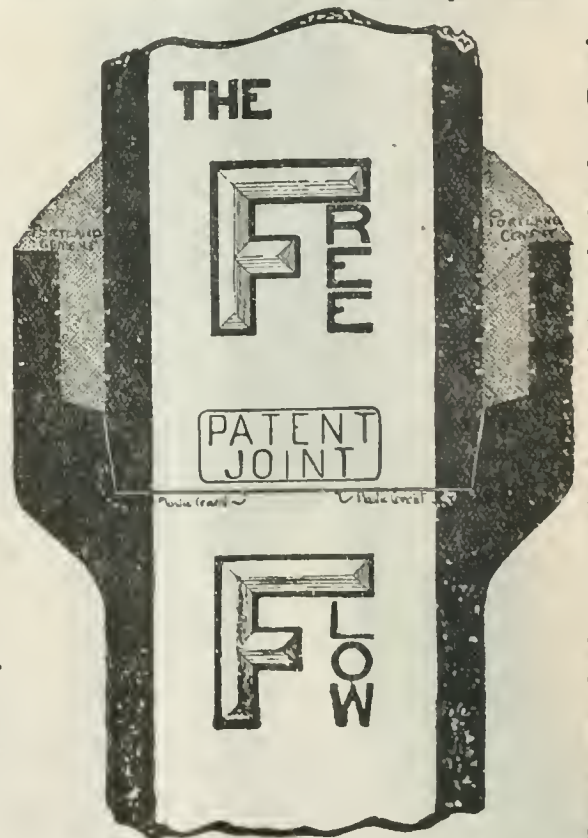
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The Final Form of Stoneware Pipe Joints.

Cheaper than an ordinary Pipe—Why?



Because—Labour costs so much less in laying Drain.

Self-Inverting. No Bitumen Rings.

JOHN KNOWLES & CO. (London), Ltd.
38 KING'S ROAD, ST. PANC AS, LONDON, N.W.

Tel. Address: "John Knowles, London." Telephone: No. 2700 North (2 lines).

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

JANUARY 9, 1914.

No. 1,147.

Minutes of Proceedings.

Cement Injection for Foundations.

The formation of foundations under ground or under water by means of cement injection is no new idea. Portland cement grout when forced through a tube under pressure into a substratum of gravel will, under suitable conditions, form good concrete at and near the point of injection. It is more than twenty years since Mr. W. R. Kinnipple advocated the method, and from time to time works have actually been carried out in which the principle has been employed, but owing to the uncertainty of the results the grouting of gravel in river beds, or elsewhere, in order to form foundations for piles, piers, or similar works, does not appear to have been seriously adopted hitherto. On the other hand, the principle of forcing cement grout under pressure through pipes in order to strengthen inaccessible work, or in order to fill fissures or cavities, has certainly been adopted with considerable success. One has only to instance the common practice of forcing cement grout behind the iron cylinders in ordinary tube railway work or sewer work, the restoration of the walls of Winchester Cathedral by the process of injecting grout to fill up all cracks, cavities and bad joints, or the work done at the Walshaw reservoir, Halifax, where liquid cement was successfully pumped into 5-in. boreholes in order to fill up all crevices in the stratum under the dam. Similar work has also been done recently in America under the Lahouta dam in Nevada, where 2½-in. tubes were used. The injection of grout behind the concrete linings of the Catskill pressure tunnels is a further instance showing the important part which cement injection plays on works of the first magnitude at the present time.

Notwithstanding the undoubted efficiency of the process of cement injection, in similar processes, it does not appear that much certainty exists as to the result of grouting gravel under water, as may be seen from the experiments recently carried out in America, and described by Mr. H. H. Cartwright in a recent number of the *Engineering News*. These experiments, which are of a most interesting and instructive character, are dealt with elsewhere in the present issue. They certainly demonstrate the many difficulties with which the engineer must contend when he attempts to grout gravel in river beds. The facts that the exact quality and condition of underground gravel cannot be known, that unsuspected beds or patches of silt or mud may exist, that cement injected travels along the line of least resistance, that with air-blown charges the cement is apt to be carried towards the surface of the water with the escaping air, are among the difficulties to be encountered. The value of the process therefore depends primarily upon the possibility of forming the required

foundation in any other way with equal economy. Where, however, it is found to be worth while to make the necessary borings to prove the existence and quality of the gravel, to drive sheet piling in order to confine the cement and prevent its lateral escape, and to prove the extent, quality and character of the concrete foundation when formed by borings made after the work has set, a case will exist in which the method can be used with advantage, for it has certainly been shown by the experiments referred to that good, hard concrete can be formed under water of considerable depth by forcing cement into the gravel through pipes by means of air pressure.

* * *

The Association of Consulting Engineers.

Of all the events of the year that has just drawn to a close there is one which, in its significance as regards the status of the engineering profession, stands out from the rest, marking as it does almost the only definite achievement in the attempts which have been made to obtain for the engineer a due recognition of his standing as a professional man. The granting of the official certificate to the Association of Consulting Engineers has raised the status of every genuinely professional and duly qualified engineer and highway surveyor in the country. Recognition of the consulting branch of the profession necessarily implies recognition of other branches. The engineer to a local authority is no longer a person who, if he were not an official, might be regarded as ranking with plumbers, electric-light fitters, and other mechanics. On the contrary, his official position will merely mark him as belonging to one branch of a profession now recognised as such by the authorities. If it be admitted that one bough of a large tree is an oak bough, it necessarily follows that, apart from "graft," the whole tree is an oak. *Verb. sap.* The Association of Consulting Engineers makes no attempt to arrogate to itself professional pride or position. A member of that body who found it expedient to sever his formal connection with it in order to take a post in the employment of a Government, a public body, or a contractor, would merely be regarded as one who had stepped aside, not in any sense as one who had stepped down. It would be assumed, of course, that in his new capacity his view of the relations between consultants, officials, and engineers in private employment would be exactly what they were before. The Satyr who objected to the processes which he deemed "blowing hot and cold with the same mouth" was, of course, a person of undeveloped intelligence, who did not realise the significance of the difference in temperature between cold fingers and hot porridge, and his prototypes of to-

day will continue to blame the engineer for an impartiality which, on account of differences in the objects of criticism or report, seems to them like inconsistency. While the worth of the individual must be judged not only by his actions, but also in the light of his opportunities and temptations, the worth of the profession as a whole is judged on results alone, and the Association of Consulting Engineers has done well in deciding that, as far as they themselves are concerned, the opportunities shall be as good as possible, and the temptations, as far as may be, removed. A narrow, but significant, view held by a materialistic substratum of society is that a gentleman is a person who need not cheat nor be guilty of meanness, because he is fortunately situated. Let us on the one hand inculcate the higher ideal, and on the other hand extend, in our own profession at least, the fortunate or favourable conditions.

* * *

Conditions Affecting the Maintenance of Roads.

Until a very few years ago, ideas as to most of the conditions affecting road maintenance and the serviceableness of roads were exceedingly crude, and often erroneous. Several of the most important factors were, of course, carefully studied. The effects of traffic, the influence of tyre width and wheel diameter, the extent to which bonding took place in different kinds of crust—all these were carefully considered, and much attention was given to the choice of stones and binders, and, recently, to the qualities of different bituminous binding materials. There were, too, some factors to which attention was directed less consistently, but often usefully, such as the nature of the soil of the road bed, and the influence of subsoil springs and seepage water; but successful methods based on a knowledge of these factors were seldom studied in such a manner as to make manifest their underlying principles, and the information gained added but little to the common stock of knowledge. A large number of other conditions, some of them very important, were, moreover, scarcely ever considered, and current ideas as to these matters often were, and still are, erroneous. The effects of the rainfall of the district, and its characteristic wet and dry spells were sometimes practically taken into account in the locality, but the methods adopted were not always traced to their causes and were often considered as though they were based upon general conditions, and could be regarded as standard practice; and they were therefore recommended for localities to which they were not suited. Again, engineers who were concerned with the conversion of muddy and swampy roads into hard highways were so impressed with the difficulties of trampling through mud, and with the measures taken to dry roads which had been swampy for generations, that they recommended such measures as suitable for the maintenance of all roads, including those in dry climates and traversing hard, gravelly uplands.

The situation was profoundly changed by the publication, by the St. Bride's Press, of Mr. Reginald Ryves' book, "The King's Highway." A number of chapters in this book provide the basis for the study of geological, topographical and climatic factors, and roadside conditions, and of the means which may be taken to combat their ill effects or enhance their favourable influences. To take a single example, the study of the measures to be taken to prevent Northern roads from being blocked by snowdrifts is an important contribution to the science of road planning. Since then we have repeatedly pointed out that a large amount of useful data would be provided if roads, selected on account of sudden and sharp changes in one factor at a time, were divided into lengths, and the costs of maintenance of these lengths separately recorded. The effects of width of carriageway,

width between fences, and the different kinds of shade and screening from wind could then be separately studied and compared. Such data would, cost for cost, be worth more than any to be derived now from official laboratories, since the main facts as regards laboratory experiments are widely known, and fresh information is constantly before us from various sources.

* * *

The Scottish Experimental Lengths.

The method which we have advocated is now, we are glad to be able to announce, accepted by a number of Scottish road surveyors, and the Roads Committee of the Scottish District of the Institution of Municipal and County Engineers are organising a series of experiments of this character. In order that the trial lengths may be the more strictly comparable, these will be specially made to close specifications in situations chosen in the manner which we have recommended. It is intended that, as far as possible, the different factors or sets of factors shall be separately compared, and since the climate cannot be eliminated it is to be taken first. This means that the first set of road lengths will be in other respects as similar as possible. The other factors cannot, of course, be isolated, but by a wise choice of the sequence of the comparisons much useful information may be gained. We have devoted a large part of the present issue to a presentment of the scheme as set forth in the draft memorandum of the Roads Committee, and have given nearly all the particulars relating to the meteorological stations which are to be established alongside the experimental lengths. It is perhaps to be regretted that the committee have not specified road crusts more representative of general practice, but the point is not one of dominant importance. No doubt the committee will see the wisdom of drawing the attention of the observers to facts already known, in order that their powers of observation may be whetted and concentrated on what really matters.

In this connection it may be suggested that the idea that the different factors can really be isolated should not be conveyed in the memorandum. It may also be pointed out that the passage beginning—"The description of road fences . . . is unfortunately worded, for, although it contains a reference to walls, it definitely suggests that the free circulation of air is mainly prevented by over-shading trees or other large obstructions; whereas in actual fact the effect of walls in preventing the favourable circulation of air currents is many times greater than that of trees, and, in many cases, greater than that of large obstructions, such as houses. The memorandum is, however, a first draft, intended for the use of those surveyors who are beginning the work at once, and its authors will have the opportunity of revising it before the experiments are in full swing. The initiative and energy of the Scottish surveyors deserve the highest praise, and their experience with these trial lengths of road will be watched with the greatest interest. There is nothing, however, to prevent similar experiments from being made on selected lengths of existing roads.

* * *

The Drainage of Schools.

The paramount importance of modern sanitation for inhabited buildings of all kinds is now so generally recognised that it is no longer necessary, as was at one time the case, perpetually to urge the danger to the health of the inmates which is inherent in defective drainage systems. In no class of buildings perhaps is it more necessary to bear this principle in mind than in the case of schools, and, recognising this, the Local Government Board have just issued an important memorandum setting forth their views in regard to the drainage of public elementary schools for which loans under

the board's sanction are required. The memorandum has special reference to schools in rural districts where sewers and water services are not available, and its importance is such that we reproduce it *in extenso* in another column. The principles which are laid down in regard to the removal and disposal of waste matters are in no sense novel, but it is necessary to remind educational authorities of their duties in regard to the matters dealt with, and the memorandum therefore serves a very useful purpose. In particular, it is emphasised that the best means for disposing of waste matters must vary in different cases, according to the existing facilities of drainage and water supply, and other local conditions, so that it is impossible to lay down any stereotyped code of regulations. It is clearly pointed out, however, that in no case can disposal of sewage by subsoil irrigation, or any system of leakage into the subsoil, or by its discharge untreated into a ditch or watercourse be regarded as satisfactory. A further rule of general application is that land for irrigation should have an adequate area and suitable soil, and should be at a sufficient distance from any inhabited building or source of water supply, so as not to create a nuisance or pollute the water. It is to be hoped that the contents of the memorandum will be strictly observed in the future by educational authorities, both as regards old and new schools.

* * *

A Unique Resignation.

To resign one's position is, in the municipal engineering world, to lay oneself open to a certain amount of suspicion. There are, of course, resignations and resignations. A man may resign owing to having already been appointed to a better post. He may resign to escape from a life which has become a miniature hell. Ill-health, change of occupation, increasing years, an Irishman's rise, an unexpected inheritance—these are among further reasons of a quite *bona-fide* nature for tendering one's resignation. And there remains the enforced resignation, enforced not necessarily owing to any misfeasance or non-feasance on the part of the officer, but simply, only too often, as the result of some dispute or misunderstanding. Resignation as an alternative to dismissal is, happily, of rare occurrence. We now have a new reason for resignation put forward, and the circumstances strike us as unique. Mr. W. Clement, engineer to the Municipality of South Vancouver, has tendered his resignation because his duties were too light. It is not on record that he asked for less pay, but he certainly desired more work. His salary was £600 a year—not perhaps a very alarming one in a country like Canada, but equal, roughly speaking, to some £300 or £400 in England. Had Mr. Clement thought of it he might have "swopped jobs" with a municipal engineer here. He would then have found no lack of work, while he might have had the good fortune to drop into a berth where the halfpence were solemnly counterbalanced by the kicks. The happening is one which might well engage the attention of the new Canadian Institution of Municipal Engineers. "Work for all" would make an excellent motto for the institution device, with, as crest, a municipal engineer rampant—for work.

* * *

At a recent meeting of the **Building By-laws**, British Constitution Association an interesting paper on the subject of building by-laws was read by Sir William Chance. Sir William pointed out that the origin of regulations relating to building must be sought at least as far back as the Great Fire of London. The paper, however, was only concerned with the by-law problem as it exists in rural areas, in regard to which aspect of the question the associa-

tion has drafted a Bill for submission to Parliament. In pointing out that the rural code has been evolved with too little emendation from the Model by-laws which were originally designed for urban districts the reader of the paper was not breaking any new ground. This anomaly has been to a great extent remedied by the new Model by-laws of the Local Government Board, drafted with special reference to the requirements of rural districts. In the memorandum which prefaced this new series the board stated that it had been represented to them that it would be useful if a series of Model by-laws were framed dealing only with those subjects which were most in need of regulation and control in a rural district from a sanitary point of view, and omitting the additional requirements usually found in an urban code. The new series of by-laws are confined to matters affecting health as distinguished from matters affecting the structure of buildings. It is well known that since the issue of the new series of by-laws the Local Government Board have made considerable efforts to secure their adoption in those rural districts in which the old code was in operation. The principle aimed at by the British Constitution Association is such an elasticity as will leave a builder free to do what he likes so long as he does nothing which will endanger public health. They thus desire to give the local authorities a mere general control over buildings, and they suggest that, in case of difference of opinion between a council and a builder, the Local Government Board should act as arbitrator. In our view such an arrangement is open to considerable objection, both as regards the details of administration and the maintenance of a high standard of building. The subject is one of great difficulty, and, having regard to the present condition of rural housing, we welcome any serious contribution to its discussion, even though we may not be able to express full agreement with the views set forth.

* * *

A County Surveyor's Salary.

The advent of the mechanically propelled vehicle has necessarily resulted in a very large increase in the work of those responsible for highway administration during the past few years. Perhaps those to whom most additional work has fallen are the county surveyors, and it is not surprising that with the enormous increase in the funds which they have to administer there should have been a corresponding tendency to raise salaries. In many places this state of affairs has been frankly accepted, but in certain instances the voice of the self-styled economist has been raised. We observe from the *Derbyshire Times* that an attempt is being made to make the salary of the surveyor of that county matter of public controversy. The proposal is that the salary should be raised by £200 a year by increases spread over two years. One enlightened councillor has intimated his intention of moving the rejection of this proposal, and has expressed the view in the public Press that a man "more amiable and quite as competent" could be obtained to fill the office at £500 a year. An attempt was made to raise a discussion on the matter at a meeting of the South Wingfield Parish Council, whose interest is, to say the least, indirect. At this meeting one worthy member asserted that no surveyor is worth £800 out of public money. It will evidently be a long time yet before local authorities will learn that the cheapest officials are not necessarily the most economical. If the members would only apply in their public capacity the same principle as that which they use when selecting a private doctor or lawyer, some progress would be made. What large public bodies require is high professional ability, and this cannot be obtained unless the proper price be paid.

Experimental Road Construction in Scotland.

SPECIFICATIONS AND CONDITIONS.

[Notes and extracts from a memorandum prepared for the Roads Committee of the Institution of Municipal and County Engineers, Scottish District, by J. Walker Smith and David Ronald. This Memorandum in its present form is a first draft, issued for the assistance of those who wish to instal the measuring and recording instruments at an early date, and possibly make a beginning with actual construction.]

In December of last year the Scottish District of the Institution of Municipal and County Engineers appointed a Roads Committee to "collect and tabulate reliable data as to improved methods of road construction, and, particularly, information as to the effect of climatic conditions taken in conjunction with traffic upon experimental road lengths to be laid down in districts in Scotland having distinctive climatic conditions."

After several meetings the committee have decided to lay down experimental road lengths in a number of districts in Scotland. It is desired to obtain useful information from the first, and ultimately to be able to decide which are the best and most economical form of road construction to meet any given condition of traffic and weather. It has been arranged to put down experimental lengths of road crust in localities where traffic is fairly comparable, and where the surveyors will cordially co-operate with the committee.

Provisional arrangements have already been made with the following county surveyors: Messrs. R. S. Anderson (Peebles), T. Callen (Haddington), P. Clarke (Dunbar), G. Donaldson (Kirkcaldy), W. L. Gibson (Dunblane), R. Paterson (Lockerbie), R. Spittal (Hamilton) and A. Stevenson (Ayr), with Mr. David Ronald, burgh engineer, Falkirk.

The keeping of records should afterwards be extended to all main roads, and thereafter gradually extended. "and sufficient and careful records kept by engineers or surveyors in the ordinary and recognised course of their duties."

THE NATURE OF THE RECORDS.

For intelligent appreciation of results there must be carefully recorded the conditions which obtain at the commencement of the experiments:—

(a) Physical and local conditions; (b) specification and record of methods of construction and materials employed. Then a careful record must be kept of the factors tending to destroy the road: (c) traffic; (d) meteorological conditions. These combined factors will operate to produce certain conditions which must be recorded by (e) measurements of wear, (f) observations of condition of surface. The factor of cost must then be considered under two headings: (g) initial cost; (h) maintenance.

Physical and Local Conditions.—These may best be recorded upon a 25-in. plan with horizontal and cross-sections, as an example sheet A (reproduced herewith). These plans and cross-sections should contain such information as may be necessary, including the following:—

The formation of the present roadway and nature of substratum; the width of the roadway available for vehicular traffic; the width of the footpaths and grass wastes at roadside; the description of road fences, hedges, walls, &c., and particularly the extent to which the roadway is overshadowed by large trees or other obstructions tending to prevent the access of the sun's rays or the free circulation of air; the means of surface drainage, and the points of outfall for surface water; the position occupied by each section under experiment (each section should be 100 yds. in length); the points where the cross-sections have been taken (the centre of each experimental section is most suitable); the points where the measuring blocks are to be inserted in the roadway for the purpose of measuring surface wear (these should fall upon the lines of cross-section); the point where the census of traffic is observed; the location of the meteorological station—if conveniently close.

The measuring blocks should be placed in position before the original surface has been disturbed to enable the original section to be plotted upon squared paper.

There are so many unknown factors in this problem that it is necessary to isolate each in turn. For the present it is desired to keep constant all conditions except climate, which is purposely selected for its variation. The width, grade, subsoil, materials and methods of construction, time of construction, traffic,

&c., are hoped to be reasonably similar. The width is desired to be 18 ft.; the grade should be easy; the subsoil should be good, of dry gravel, if possible; the materials and methods of construction are closely specified, and binders will be supplied from the same bulk. The date of construction is expected to be approximately the same for all localities; the traffic in the various localities chosen should be reasonably similar. A continuous length without cross or junction roads, open and free from overhanging trees should be chosen.

The roads chosen for these first experiments should be such as are at present maintained at a cost of about £75 per annum. The desirability for subsequent experiments with suitable materials upon roads which necessitate a larger annual cost for maintenance is, however, quite recognised. The forms of road construction at present proposed are simple and inexpensive, and suitable for considerable lengths of road in Scotland.

They are eight in number, as follows:—

- (1) Ordinary water-bound macadam with metal as generally used in the locality—preferably whinstone.
- (2) The above, surface tarred with distilled tar to Road Board specification.
- (3) Macadam, 3 in. thick, grouted with a mixture of pitch and sand.
- (4) Macadam, 3 in. thick, grouted with pitch alone.
- (5) The above, surface sealed with prepared bituminous mixture.
- (6) Macadam, superimposed upon and rolled into a layer of tarred chippings, then grouted and surface sealed as above.
- (7) Tar-macadam—*i.e.*, tarred material—surface sealed with distilled tar.
- (8) The above, surface sealed with prepared bituminous mixture.

It is not desired to exclude other forms of construction, and the intention to employ such may be intimated to the secretary, but at present the cost should not exceed 2s. 6d. per square yard.

SPECIFICATION FOR SECTION NO. 1.

This should follow the ordinary practice of the surveyor, and so far as possible should conform with the specification issued by the Road Board for the construction of ordinary macadam roads.

Before laying the new surface of macadam the thickness of the old crust, including foundations, and the nature of the subsoil should be ascertained by opening two trial trenches in the section to be dealt with, extending from the haunch of the road to the centre, such trenches to be made on opposite sides of the road.

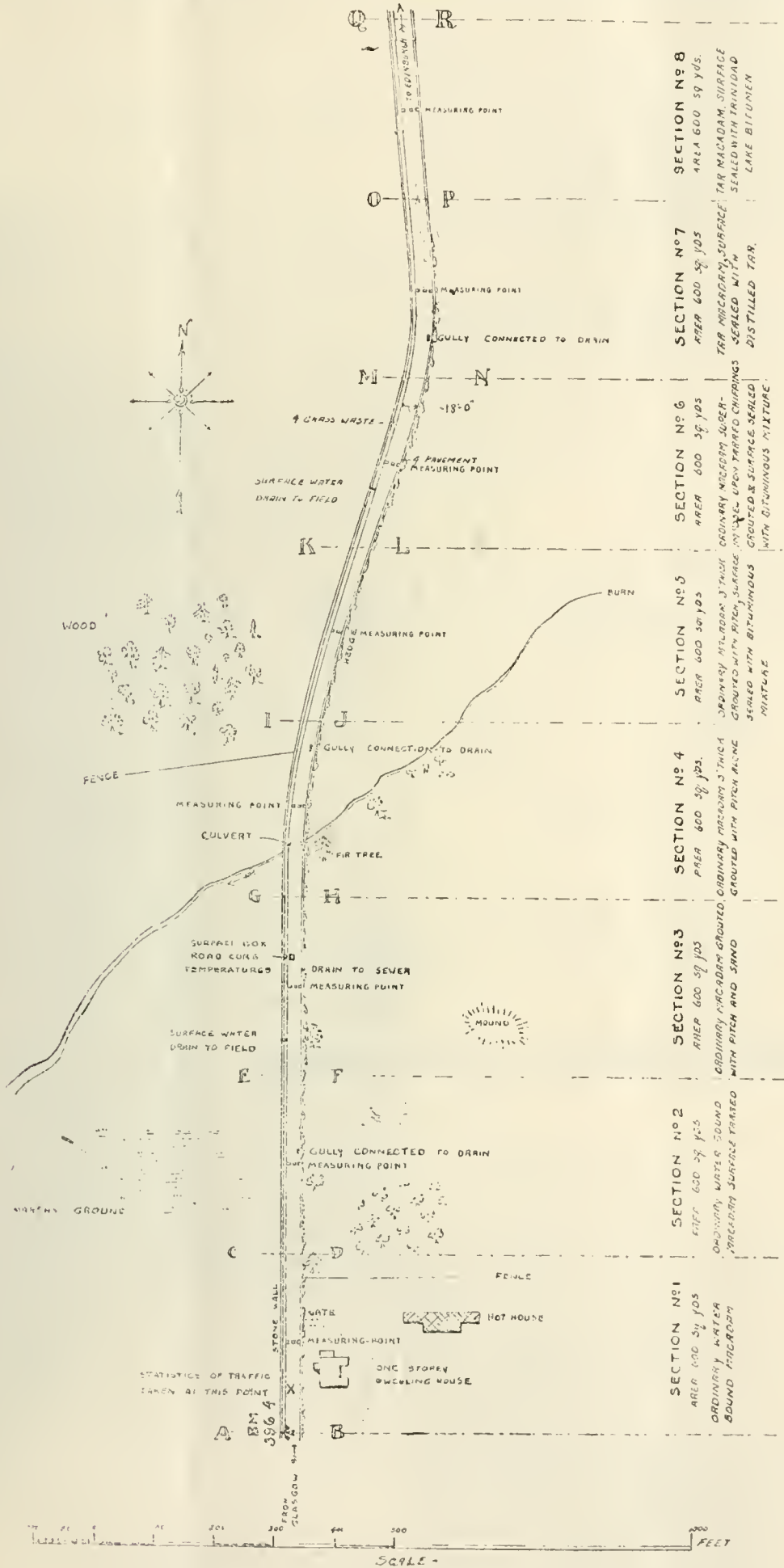
SPECIFICATION FOR SECTION NO. 2.

The new surface of ordinary macadam, prepared as for section No. 1 (with stone chippings as binder, and no fine material), is to be tarred and thoroughly dry, spraying machines being recommended; but hand-work gives good results, and could well be adopted for the small areas in question. The tar used must comply with Road Board specification for tar No. 1, applied hot, the desired temperature being probably between 220 and 240 deg. Fahr.

If the road must be opened for traffic before the tar has set hard, grit should be spread upon the surface to prevent the tar from adhering to the wheels of vehicles; but gritting should be delayed as long as possible, and the quantity of gritting material to be spread should be no more than sufficient to prevent the tar from adhering to the wheels. Stone chippings, crushed or pea gravel, coarse sand or other approved material, free from dust, and not larger than will pass through a 2-in. to 1½-in. mesh, should be used for gritting in quantity not exceeding 1 ton for 120 super. yds. if grit is used, and 1 ton for 200 to 250 super. yds. if coarse sand is used. If heavy grit or chippings

be used the surface should be very lightly rolled after the chippings have been spread.

In all cases careful record should be kept of the quantity of tar used, the superficial area covered, the



SCOTTISH EXPERIMENTAL ROAD SECTIONS: TYPE PLAN.
(Plate A.)

Precautions should be taken to prevent liquid tar passing directly through gratings or outlets.

state of the weather during the progress of the work, the time occupied in actual work and in waiting while

work is stopped owing to wet weather, the number of men employed and full details of the cost of labour, materials, haulage, &c.

SPECIFICATION FOR SECTION NO. 3.

The road which is to be surfaced with pitch-grouted macadam should have a good natural foundation of gravel or similar subsoil, and should be of sufficient strength to bear the traffic likely to use it. The thickness of the old crust should be ascertained. The thickness of the surface coating of pitch-grouted macadam, when finished and consolidated by rolling, should be 3 in. The finished surface should have a crossfall of about 1 in 32. If reasonably possible, and not prevented by considerations of levels, the old surface should be left intact and unscarified, and the new pitch-grouted macadam should be superimposed upon it.

Not more than 15 per cent passing through a 1½-in. ring in every direction; not less than 65 per cent over 1½ in., and not exceeding 2½ in., in greatest length by measurement; not more than 20 per cent over 2½ in. in greatest length by measurement. In addition to this, 5 per cent of chipping of the same stone, varying

SPECIFICATION FOR SECTION NO. 4.

As for No. 3, but with 1½ gallons of pitch per square yard. No sand will be added.

SPECIFICATION FOR SECTION NO. 5.

The same as for section No. 4, but with a sealing coat of bituminous mixture. It is suggested that this might be a preparation of Trinidad Lake asphalt, so that all the experimental lengths (No. 5) could be treated alike. The cost (Trinidad Lake asphalt) is estimated at about 6d. per square yard; £7 15s. per ton, covering 320 sq. yds.

SPECIFICATION FOR SECTION NO. 6.

As for No. 5, save that the existing road surface should first be tar-sprayed or painted with Road Board tar No. 1, and afterwards spread with a 1-in. layer of tarred chippings, treated with Road Board tar, No. 2; the dry macadam to be then spread, rolled and grouted.

SPECIFICATION FOR SECTION NO. 7.

The road which is to be surfaced with tar-macadam should have a good natural foundation of gravel or similar subsoil and should be of sufficient strength to bear the traffic likely to use it. The thickness of the old crust and foundation should be ascertained by opening two trial trenches. The thickness of the surface coating of tar-macadam when consolidated by rolling should be 3 in. The finished surface should have a crossfall of about 1 in 32. If reasonably possible, and not prevented by consideration of levels, the old surface should be left intact and unscarified, and the new coat of tar-macadam should be superimposed upon it. The aggregate of the new surface of tar-macadam should be composed of broken stone or selected slag of approved quality, and should conform with the British Standard specification for 1½-in. gongee as follows: Not more than 15 per cent passing through a 1-in. ring in every direction. Not less than 65 per cent over 1 in. and not exceeding 2 in. in greatest length by measurement. Not more than 20 per cent over 2 in. in greatest length by measurement. In addition there shall be used 10 per cent of ¾ in. to ½ in. for closing. The last-mentioned size should be kept separate, and used as a top dressing during rolling operations.

Tar No. 2 Road Board Specification to be used. The quantity of tar used should be approximately 11 gallons to a ton of stone.

The tar-macadam, after having been spread and levelled, should be rolled to a smooth surface, but too much rolling should be avoided.

Less rolling is required than in the case of water-bound macadam. A 10-ton roller is a suitable size for use in most cases, but good results can be obtained by using a 6-ton roller and finishing with a 10-ton roller. A coating of tar should be applied to the surface after the road has been used by traffic for about three weeks. This tar should be of the same quality as that used for the mixture, and should be poured or sprayed on the surface at a temperature of about 270 deg. Fahr. Stone chippings, crushed gravel, coarse sand, or other approved material (free from dust) not larger than will pass through a ¼ in. square mesh should be used for gritting in quantity not exceeding 1 ton for 300 to 350 super. yds. if grit is used, and 1 ton for 200 to 250 super. yds. if coarse sand is used.

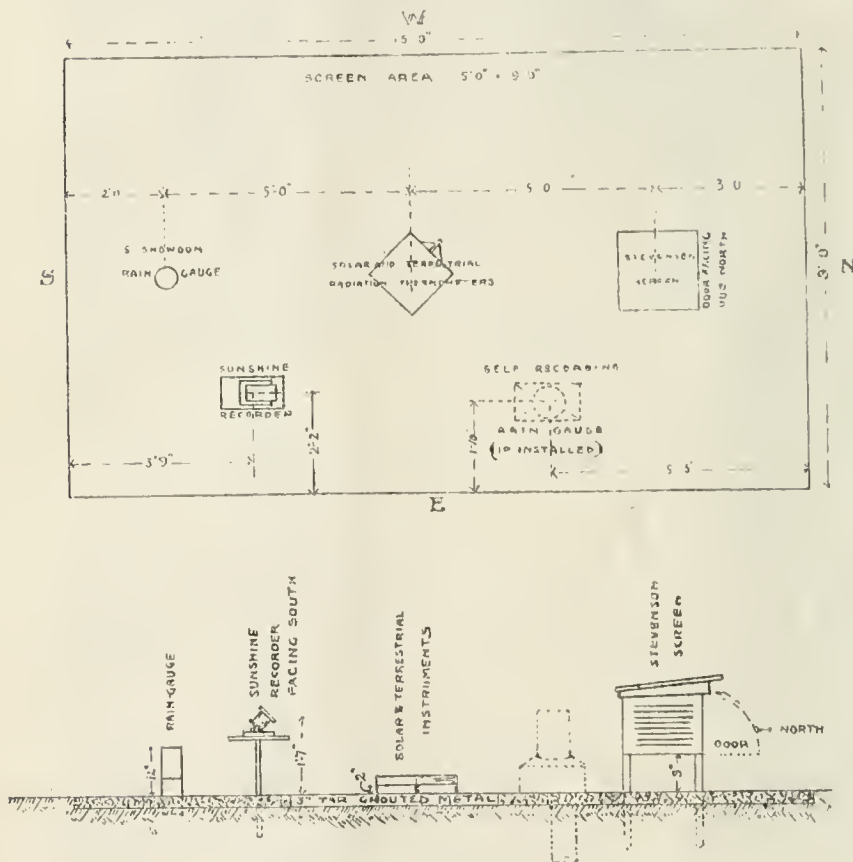
SPECIFICATION FOR SECTION NO. 8.

As for section No. 7, except that, instead of No. 2 tar, Trinidad Lake asphalt will be used for sealing the surface, as in the case of No. 5.

RECORDS.

Before any experimental lengths are put down the meteorological instruments should be installed.

Samples.—Samples of the stone used should be sent



SCOTTISH EXPERIMENTAL ROAD SECTIONS: ARRANGEMENT OF METEOROLOGICAL STATION.

(Plate II.)

from ¾ in. down to ¼ in. should be used for closing after the grouting with pitch. The pitch should comply with Road Board specifications, and the stone must be dry when the pitch is poured. The voids should be filled, and the quantity used recorded; it will be about 1½ gallons per square yard. The aggregate, having been spread and levelled, must be rolled down dry until the surface is formed, but without the addition of any small material. The pitch must be raised to a temperature of 300 deg. Fahr. Clean, sharp sand (pit sand is to be preferred) must be heated on sand heaters to a temperature of 400 deg. Fahr. A dandy or portable mixing vessel is then to be filled with 58 per cent by measurement of the heated pitch mixture, and 42 per cent hot sand (1½ pitch mixture, ¾ hot sand by volume), and the mixture, hereafter called the matrix, is to be kept well stirred while it is being emptied from the dandy or portable mixing vessel into pouring cans of from 2 to 3 gallons capacity, which are used for pouring the matrix on to the roadway. Not only during the process of mixing, but afterwards, up to the time of actual pouring, the matrix must be kept well stirred. The matrix prepared in the quantities specified above should be sufficient to fill the voids in the aggregate.

to the National Physical Laboratory for petrological description, determination of specific gravity, and dry and wet attrition tests, the name of the quarry being sent with the stone. The test sheet obtained from the laboratory should be forwarded to the secretary of the Roads Committee, Local Government Board, Edinburgh.

Tar Thermometer and Tar Tester.—Great care is to be exercised in the heating of pitch, tar and bitumen so that these may be brought to the temperatures set forth in the specifications, and for this purpose it is recommended that the surveyor should provide himself with a suitable thermometer, probably of the pattern or similar to that made by Mr. Hutchinson, Westminster. The cost of the instrument is about £1.

Viscosity tests of tar, pitch and oil should be made, and this might be most conveniently done by using Hutchinson's tar-tester. The cost of this instrument is £2 2s. The temperature at which the viscosity tests should be made for tar Nos. 1 and 2 is 70 deg. Fahr., and for mixtures of pitch and oil 77 deg. Fahr. The record of the viscosity tests should be carefully written up.

Traffic Census.—The traffic census upon the Road Board forms should be taken before the original surface has been disturbed, and at such intervals thereafter as may be necessary, having regard to the extent and fluctuation of the traffic. It is probable that, on the average, the census would require to be taken over a period of seven consecutive days once in every six months. A special note should be kept of any extraordinary traffic, heavy loads or any other abnormal factor tending to destroy the road surface.

METEOROLOGICAL OBSERVATIONS.

Under this heading there falls to be observed and recorded the effects of rainfall, atmospheric humidity, maximum and minimum shade temperatures, solar and terrestrial radiation, winds, fogs, mists; also extremes of temperature in the core of the road. Sheet H shows, in plan and elevation, the instruments as they are to be set up at the meteorological station. Sheet J shows the surface box and tubes to be placed in the roadway for the reception of thermometers to record road core temperatures. (Sheets H and J are reproduced herewith.)

It is proposed to instal a 5-in. Snowdon rain gauge, a Stevenson thermometer screen, a wet and dry bulb hydrometer, a self-registering maximum thermometer, and a minimum thermometer.

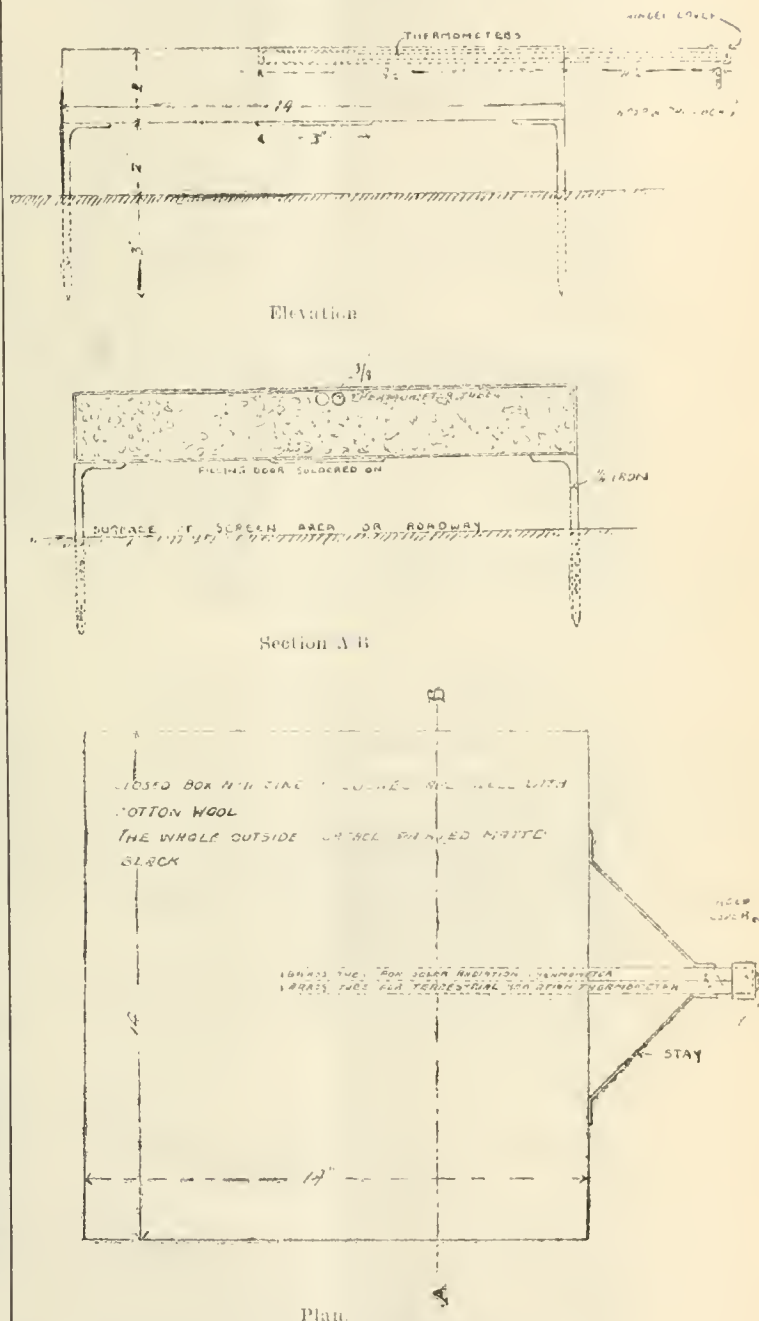
The observing station should be placed as near to the side of the experimental road as practicable, and not more than ¼ mile therefrom. The area, 15 ft. by 9 ft., upon which the instruments are to be set up is shown on sheet H. It is to be constructed of tarmacadam or pitch-grouted metal 3 in. in thickness. The level of this area should be, as nearly as possible, the same as the surface of the experimental road lengths, in order that the stratum of air over the station may be the same as that over the roadway.

The rain gauge should be set exactly 1 ft. above the ground level in an open situation on a level piece of ground free from air eddies and currents. If a perfectly open site cannot be obtained, shelter is the least harmful on the north-west, north and east. The gauge should be distant from the object forming the shelter at least twice the height of the object. These conditions should be kept in view when fixing the site for the station. The mode of reading the gauge does not require description, except that it and all the other instruments should be read at 9 a.m. each morning, and the reading entered in the record under the previous day's date; thus the reading at 9 a.m. on the 15th would be entered under the 14th. In the event of a snowfall, the snow in the funnel should be melted by adding a measured quantity of hot water, and this amount deducted from the gross reading. Approximately, 1 ft. of snow is equivalent to 1 in. of rain, and *pro rata*. The Stevenson screen should be set up so that the door faces north. For meteorological observations the general height of the thermometers is 4 ft., but for road work the temperature should be observed as near the road as possible.

The terrestrial radiation thermometer and solar radiation thermometer are to be placed inside a specially constructed metal box, which can be supplied by Messrs. R. & A. Main, Gothic Ironworks, Falkirk, at a cost of about 25s. The box (sheet I.) is to be set into the area previously referred to, and in the position shown on sheet H. The thermometers are placed in the tubes provided for the purpose. The terrestrial radiation thermometer (spirit filled) is to measure the minimum temperature near the level of the road surface, and the solar radiation

thermometer (mercury filled, scale reading to 160 deg.) is to measure the amount of solar heat near the level of the road surface. The reading of the solar radiation thermometer is to be entered in the proper column in the record, under the date previous to that of observation, as in the case of rainfall and maximum shade temperature, and the reading of the maximum thermometer in the shade deducted from it and entered in the proper column. The difference so obtained is the measure of solar radiation for the day. This measurement, however, does not give the duration of maximum solar heat, and an effort is to be made to get a measure of this by installing a sunshine recorder.

The sunshine recorder proposed to be installed is of the Jordan single-cylinder pattern, the principle



SCOTTISH EXPERIMENTAL ROAD SECTION MOUNTING OF RADIATION THERMOMETERS. (Plate I.)

of which is that the sun penetrates through two small oblong apertures in the cylinder, the rays falling on a chart of sensitised paper contained within the cylinder, leaving a trace resembling a blue print. Full instructions for setting up the instrument will be supplied by the makers, Messrs. Negretti & Zambra. The position the instrument is to occupy is shown on sheet H.

The six thermometers are combined maximum and minimum thermometers, and are to be used to ascertain the maximum and minimum temperatures in the body of the road at various depths. It is suggested that observations should be made at depths of 1, 2 and 3 in. The thermometers should be placed in

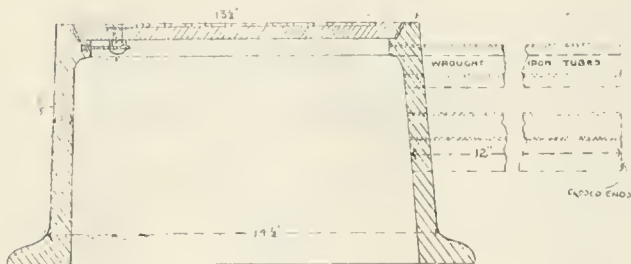
the iron tubes, to be set horizontally in the body of the tar-macadam or pitch-grouted road lengths at the depths previously stated, access being obtained to them from the surface box, after described. The maximum reading should be entered under the date previous to that of observation, and the minimum reading under the date of observation.

The surface box and tubes may be obtained from Messrs. Watson, Gow & Co., Elma Foundry, Falkirk. The surveyor is requested to state that these are for the "Scottish Road Experiments." The cost of the surface box and tubes is about 22s. 6d. The arrangement is shown on sheet J.

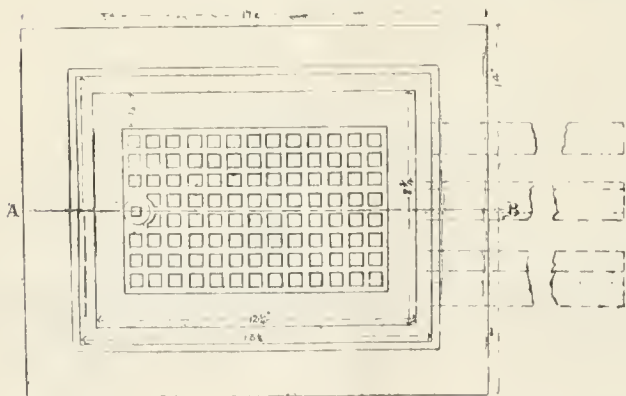
In addition to the records before described, a note should be made each morning of wind, its direction and force, also of fogs, dew, hoar frost, hail, snow,



End Elevation.



Section A B.



Plan.

SCOTTISH EXPERIMENTAL ROAD SECTIONS: BOX FOR ROAD CORE TEMPERATURES.

(Plate J.)

sultry weather and thunder. Columns for these entries are provided in the record sheet.

WIND VELOCITY TABLE.

- Dead calm denoted by "D.C.," 0 miles per hour.
- Calm denoted by "C.," 3 to 8 miles per hour.
- Light breeze denoted by "L.B.," 8 to 18 miles per hour.
- Moderate breeze denoted by "M.B.," 18 to 28 miles per hour.
- Strong breeze denoted by "S.B.," 28 to 34 miles per hour.
- Moderate gale denoted by "M.G.," 34 to 48 miles per hour.
- Strong gale denoted by "S.G.," 48 to 56 miles per hour.
- Whole gale denoted by "W.G.," 56 miles per hour and over.

These velocities can only be roughly estimated by the observer.

PARTICULARS TO BE FORWARDED.

Particulars to be sent to the secretary of the Roads Committee are entered as follows: Recorded by —, at —, in the county or burgh of —, latitude and longitude —, height of station above ordnance datum —, distance of station from road, in feet, and its direction —, height and distance of nearest obstruction to station; height in feet; breadth in feet; obstruction —.

MEASUREMENTS OF WEAR.

Profiles of the original surface and new surface are to be plotted from readings taken from the attrition gauge. The sections accompanying the plan A are to be taken with the dumpy level. An attrition gauge already used with success is the Davy & Maybury.

In each section one set (two in number) of measuring sockets is to be inserted—i.e., eight sets will be required for each series. One of these sockets is to be placed upon each side of the road, about 1 ft. 6 in. from each side, but always so as to leave a distance of 15 ft. between the sockets.

The sockets are to be well bedded upon and fixed to cement concrete. Light cast-iron covers are fixed upon the sockets, and great care must be taken that each pair is fixed at the same level. The arrangement for measurement of the wear is by straight-edge and micrometer gauge. The straight-edge will be 18 ft. in length, and when in use will be set upon brass standards. A more simple and inexpensive arrangement than the micrometer gauge is, however, being considered, and will be communicated at a later date.

Measurements are to be taken at every 1 ft.

Having obtained the measurements, they should at once be plotted on squared paper, as per example sheet G.

OBSERVATIONS OF CONDITION OF SURFACE.

A description of the condition of the road surface should be entered on sheet L (not reproduced), if possible, each day, and certainly not less than once per week. Herein there is, unfortunately, difficulty in eliminating the personal element from the equation, and care will need to be exercised in making comparisons. However, much could be done to unify recorded observation, which should include condition of slipperiness, muddiness, excessive hardness, softness, dustiness, resistance to traction, &c., under rain, hoar frost, heat, wind, &c. In the event of it being found impossible for the engineer or surveyor himself to make the weather observations this might be done by deputy; but while the reading of the instruments may be made each morning by deputy, it is imperative that the condition of the road surface should be observed by the engineer or surveyor. It is also essential that he should make an inspection of the roadway at a sudden change in the weather conditions, which might have a destructive effect on the road surface.

INITIAL AND MAINTENANCE COSTS.

A careful and accurate record of costs is to be kept showing as much detail as possible. It will be at once apparent to every one in charge of these trial lengths that this is a most important item in the experiments, and it is believed that great care will be taken with this part of the work so that the utility of the records may not be impaired.

These remarks will equally apply to maintenance. Sheet X (not reproduced) shows how the entries under this head might be made. Where a patch of roadway requires repairing, the extent thereof is to be entered in the maintenance sheet.

(EXTRACTS FROM EXAMPLE SHEET M.)

	£	s.	d.	£	s.	d.
1. Water-bound Macadam:—						
Metal delivered and used on road,						
tons at —						
Wages, spreading metal						
Binding—						
Chippings, — tons at —						
Other binder, — tons at —						
Wages, spreading and sweeping binder						
Watering						
Rolling						
Any other expenditure (to be specified)—e.g., strengthening foundations, scarifying, cleaning gutters, drains, &c.						
Add 5 per cent for supervision, use of plant, and tools						
Total	£					

Date of laying —
Area laid in square yards —

	£	s.	d.	£	s.	d.
3. Macadam Grouted with Pitch and Sand—						
Metal delivered and used on road.						
— tons at —						
Wages, spreading metal						
Pitch, — tons at —						
Oil, — gallons at —						
Sand, — tons at —						
Cost of drying sand—						
Fuel						
Labour						
Wages and fuel, preparing mixture of pitch, oil, and sand, together with grouting						
Whin chippings, delivered and spread on road, — tons at —						
Rolling, dry and after grouting						
Any other expenditure (to be specified)— <i>e.g.</i> , strengthening foundations, scarifying, cleaning gutters, drains, &c.						
Add 7½ per cent for supervision, use of plant, and tools						
Total ..	£					

Date of laying —
Area laid in square yards —

COST OF INSTRUMENTS.

1. Attrition Gauge, &c. :-						
At each section—	£	s.	d.			
3 Sockets at 8s. 6d. each ..	1	5	6			
1 Heavy cast-iron cover ..	0	6	6			
2 Light cast-iron covers at 1s. 9d. each ..	0	3	6			
8 Sections at	1	15	6			
				£11	4	0
For General Use—						
Steel straight-edge and arms ..	£5	0	0			
Davy and Maybury gauge	10	0	0			
				15	0	0
						£29 1 0
2. Thermometers (Hutchinson's Fig. 2, or similar) :-						
2 Instruments, each 17s. 6d. ..		1	15	0		
3. Viscosity gauge (Hutchinson's, or similar)		2	2	0		
4. Meteorological instruments (Negretti & Zambra, London) :-						
1 Rain gauge and measuring glass ..	£1	2	6			
1 Stevenson screen ..	3	10	0			
1 Maximum thermometer ..	1	1	0			
1 Minimum thermometer ..	1	1	0			
1 Terrestrial radiation thermometer ..	1	1	0			
1 Solar radiation thermometer ..	1	1	0			
1 Hygrometer ..	1	15	0			
3 Six's thermometers, each 13s. ..	1	19	0			
1 Sunshine recorder ..	1	7	6			
	£13	18	0			
Less 10 per cent ..	1	7	9			
	£12	10	3			12 10 3
5. 1 Metal box (R. and A. Main, Falkirk) for solar and terrestrial radiation thermometers ..		1	5	0		
6. Cast-iron surface-box and metal tubes (Watson, Gow & Co., Falkirk), to contain thermometers for road core temperatures ..		1	2	6		
						£47 18 9

Records to be forwarded to the Secretary—

1. Immediately after the road lengths have been laid down—
 - (a) Plan, cross-sections and longitudinal section of road lengths as per Sheet A.
 - (b) Census of traffic filled in on Sheets C. (These census forms may be obtained from the Road Board.)
 - (c) The test sheets obtained from the National Physical Laboratory.
 - (d) Any deviation from the percentages of different sizes of metal or quantities as set forth in the specifications.
 - (e) A note of the temperatures at which the tar, pitch, and asphalt have been used.
 - (f) A note of the viscosity tests that have been made.
 - (g) A note of the time elapsing between the completion of the road surface and the application of the sealing coats.
 - (h) A profile of the original roadway, and the finished surface as per Sheet B. (not reproduced).
 - (i) Particulars as to meteorological station.
 - (k) Cost sheets for each length as per Sheet M.
2. Not later than the 10th of each month following the month to which the records apply—
 - (a) The monthly record of meteorological observations.
 - (b) Condition of the road surface, Sheet L; a note of any abnormal traffic or other factor tending to destroy the road surface, should be recorded upon Sheet L. (not reproduced).
 - (c) Maintenance costs for each length.
3. As often as may be considered necessary, probably once every six months—
 - (a) A record of the measurement of road wear, as per Sheet G.
 - (b) A census of traffic, as per Sheets C. (neither reproduced).

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

READING WATERWORKS.

A PROFITABLE MUNICIPAL UNDERTAKING.

The profits of the waterworks department for the year ended March 31, 1913, were £3,283, of which £3,000 was carried to the credit of the district fund, the balance being applied in part payment of the expenses of the installation of the new filters at Southcote works.

The waterworks engineer to the corporation, Mr. Leslie C. Walker, reports that the most important event in connection with the undertaking was the completion and setting to work of the four additional Candy filters at the corporation's Southcote filtration and pumping station on December 6, 1912. They have now been working continuously ever since, with results which have in every way justified the expenditure incurred—an expenditure which has proved remunerative, inasmuch as by installing these filters full use is made of the available water-driven pumping machinery, thereby saving a considerable number of hours' pumping by steam power at Fobney works, and the consequent expense in coal. The outstanding features of the new filters are that, when compared with the old system of slow sand filters, and taking cost per 1,000,000 gallons filtered, their capital outlay is half, and their upkeep or maintenance is one-fifth, while the area of the land required is one-twentieth.

The purification of the water is of the highest degree, and is corroborated by the periodical examinations, both bacterial and chemical, which are undertaken by the Royal Institute of Public Health, under the direction of the principal, Prof. W. R. Smith, M.D., &c., and by Drs. John C. Thresh and John F. Beale, of the Public Health Laboratories of the London Hospital Medical College, who, in a report upon water from the Candy filters at Southcote, stated: "The waters were of the highest standard of bacterial purity."

Since its completion the installation has been visited by engineers and others interested in the efficient and economical purification of water from, among other places, Bloemfontein (South Africa), Shanghai (China), Fukuoka (Japan), and by several deputations from many important towns in this country.

INTERNATIONAL ROAD CONGRESS.

DIRECTION POST COMPETITION.

In connection with the International Road Congress held in London in June last, a competition was instituted by the Local Organising Council for designs for direction posts and plates, with a view to securing a standard type suitable for general adoption by highway authorities.

Fifty-nine entries were received, and the Judging Committee, presided over by Sir George Gibb, chairman of the Road Board, have issued their awards. The successful competitors are:—

- (1) E. S. Sinnott, M.INST.C.E., county surveyor of Gloucester, £16.
- (2) W. & F. Wills, Limited, Perseverance Works, Bridgwater, £12.
- (3) W. Weeks & Son, Limited, Perseverance Works, Maidstone, £7.

Captain H. P. Deasy, Weybridge, Surrey, also received special mention in consideration of the value of his reasoned study of the subject of directions for the guidance and information of travellers.

The designs and descriptions of the successful competitors have been reproduced by the committee in a pamphlet, of which a limited number of copies are available on application to Mr. Rees Jeffreys, the hon. general secretary, Queen Anne's Chambers, Westminster, S.W.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

DRAINAGE AND DISPOSAL OF WATER MATTERS AT PUBLIC ELEMENTARY SCHOOLS.

LOCAL GOVERNMENT BOARD MEMORANDUM.

[The Local Government Board have issued a memorandum on the arrangements for drainage and disposal of waste matters at public elementary schools for which loans under the board's sanction are required. The memorandum, which has special reference to schools in country places where sewers and water services are not available, is reproduced below.]

At a school, even where no one resides on the premises, provision will have to be made for the disposal and removal of the following matters:—

- (1) Excremental matters. (On the boys' side the urine may be in part dealt with separately from the faeces, but this will not usually be practicable on the girls' side.)
- (2) Ashes and other dry refuse.
- (3) Waste water, as from lavatories and floor washing.
- (4) Surface water from roofs, yards, &c.

The best means for disposing of these several matters will vary in different cases according to facilities of drainage and water supply and other local conditions, and in choosing the most suitable arrangements careful regard will have to be paid to the circumstances of each case.

1.—Where an efficient system of public sewers and a constant water supply under pressure are available, water-closets should be provided and their contents conveyed into the public sewers by drains, which should also receive the liquid waste from urinals, lavatories and sinks, and where permitted, the surface water.

Water-closets should be of a suitable and efficient type, with adequate separate flushing arrangements for each closet.

2.—Where a water supply for flushing is available, but there are no sewers, if water-closets are adopted they should be drained into a watertight tank with an overflow discharging on to an efficient filter or a suitable area of land for irrigation, or into a watertight cesspool without overflow, which should be so arranged that the contents can be readily removed by means of a suitable pump into a tank cart, or by some other efficient method.

In no case can disposal of sewage by subsoil irrigation or any system of leakage into the subsoil, or by its discharge untreated into a ditch or watercourse be regarded as satisfactory.

Where drainage is into a tank or cesspool, rain-water should be excluded from the sewage with a view to lessen its volume, and in the case of a cesspool, to avoid the need for frequent emptying.

3.—Where sewers are available, but no supply of water is laid on for flushing, it will generally be best to adopt some form of dry-closet, as described hereafter. Hand-flushed water-closets do not work satisfactorily.

4.—Where neither sewers nor water service are available, as is often the case in small villages, some form of dry-closet will be necessary. The closets may be furnished with movable receptacles (pail closets), or with small fixed receptacles on the lines set out in the board's Model By-laws with respect to new buildings in rural districts—*i.e.*, the receptacle should be of small capacity and watertight construction, with bottom at least 3 in. above the level of the ground, and with arrangements to facilitate the application of dry earth or other absorbent and the removal of the contents. Privies with large, deep pits or open middens cannot be approved.

The contents of the closets should be kept dry by excluding rainfall, and, as far as practicable, all other liquid, and by the use of a suitable absorbent, which will be especially needed in the girls' closets. The absorbent may be dry earth, ashes, sawdust, peat dust or road sweepings dried and sifted. (The ashes produced at a school are not usually sufficient in quantity alone, and there are none in summer.) A shed or other suitable accommodation should be set apart for the drying and storage of the absorbent.

Arrangements will have to be made for the supply and application of the absorbent, and for the frequent periodical removal and disposal of the contents of the closets.

Even where dry closets are provided and rainwater is separately dealt with, there will still be need for some means of disposing of foul waste liquids as from

urinals, sinks, lavatory basins and wash pails. If sewers are not available these liquids may be taken by drains to a filter or irrigation area, or into a small cesspool constructed as already mentioned.

In some instances, where there is no ground belonging to the school sufficient for the placing of a tank or cesspool, it may be necessary to use movable receptacles for the reception of waste liquids from lavatories, urinals, &c., the receptacle for urine being filled with some absorbent, such as sawdust. Such expedients, of course, require constant attention at least daily—if nuisance is to be avoided, and in the case of new schools, and, where possible, in all other cases, sufficient ground should be provided to render resort to them unnecessary.

Where there is no public water service, rain water from the roofs may often be usefully collected for washing purposes, being softer than well water. Where not so collected, if there is no sewer into which to take it, it should be excluded from the sewage, and may be discharged in any convenient method, as into a ditch or watercourse, or where the soil is porous, into a soakaway pit at a sufficient distance from the building so as not to cause dampness of the foundations.

Where possible it is desirable that the sewage from the schoolmaster's house should be dealt with by the same system as that from the school buildings, but where this is not feasible one or other of the methods for the disposal of excretal matters and liquid waste already mentioned should be adopted.

Where sewers and public water service are not available, it is desirable that there should be in connection with the house plenty of garden ground on which to dispose of refuse matters.

GENERALLY.

In connection with the drainage and sanitary arrangements for schools, the following points should receive special attention.

Generally.—The drainage and closet arrangements should be planned on the general lines embodied in the Model By-laws of the Local Government Board.

Drains.—The drains for foul water should be laid in straight lines between inspection chambers, and so as to be quite watertight; they should be properly ventilated and be disconnected, by means of a trap in an inspection chamber, from any cesspool or covered tank into which they discharge. Should a drain have, unavoidably, to be laid near a well, or other source of water supply, the drain, if of stoneware pipes, should be surrounded with cement concrete at least 6 in. in thickness, or should be of cast-iron pipe with lead joints. It is desirable that pipes of 4 in. diameter should have a fall of not less than 1 in 48, and 6-in. pipes of not less than 1 in 60.

Cesspools and tanks should have walls and floors so constructed as to be quite watertight (this also applies to the floors of filters and so much of their external walls as are below the surface of the ground). They should be not less than 50 ft. distant from the school or from any dwelling-house, and should be as far as possible from any well or other underground source of drinking water which might be in danger of being polluted by leakage. The sewage disposal works should be fenced in so that they cannot be interfered with by the children.

Cesspools and covered tanks should be properly ventilated and provided with a suitable pump, and should be in positions conveniently accessible by a tank cart for the purpose of emptying.

The capacity of tanks which overflow on to a filter bed or irrigation area need not exceed from one to two days' volume of sewage; this may generally be assumed at 2½ gallons per head of the accommodation provided (including teachers) at the school if water-closets are used, or at 1 gallon per head where only urine and slop water have to be dealt with. Cesspools which have to be emptied from time to time should be of larger capacity. Filter beds should be not less than 2 ft. 6 in. in depth, and the filtering medium should consist of some hard and clean material, care being taken that the liquid is evenly distributed over the surface of the filter bed by a suitable apparatus. Filters should in all cases have free outlets so as to drain the whole of the filtering media. If no land treatment is provided, the area of the filter bed should be sufficient to deal with the liquid at a rate not exceeding 40 gallons per square yard per day for a filter 2 ft. 6 in. deep, or at a proportionally greater rate for a deeper filter. When subsequent land treatment of the effluent is adopted, a rate of filtration twice as rapid as the above may be allowed.

Irrigation Areas.—Land for irrigation should have an adequate area and suitable soil, and should be at

a sufficient distance from any inhabited building or sources of water supply so as not to create a nuisance or to pollute the water. The nature of the soil should be stated in the application.

Land.—Where land outside the school premises is required for tanks, filter beds, irrigation, &c., its use should be secured by a definite legal agreement, and if the works are to be carried out by means of a loan, the land should be purchased or leased, the purchase or lease being made conditional on the board's sanction being obtained to the loan.

EARTH CLOSETS.

A footnote to the memorandum states that the following arrangement of earth-closets has been found to work satisfactorily at some rural schools:—

At the back of the range of closets is a covered "earth chamber," extending the whole length of the range, and measuring some 7 ft. from front to back. At the back the chamber is partially divided by a dwarf wall into two compartments—one for dry and the other for used earth—leaving space for a gangway between these compartments and the backs of the closets. In front the floor of the earth chamber is continued into the space under the closet seats with a slope towards the centre of the chamber. The space under the seats is open at the back for its full width to the earth chamber. Down the gangway runs a channel for urine which discharges into a small tank; this channel and tank are filled with peat moss or

Where this system is adopted careful attention must be given to the following points:—

(1) Impervious materials must be used in all places where earth or faecal matter is liable to come in contact with the structure. Wood should not be used.

(2) The earth chamber should be properly roofed to exclude rainfall, and well ventilated. Its floor should not be below the ground level.

(3) All urine should be conveyed away from the earth chamber, received in an absorbent, and removed.

(4) Suitable dry earth should be used, preferably top soil from a field or garden "in good heart." Ashes are unsuitable.

(5) Careful and intelligent attention must be paid to the working of the closets by a person specially detailed for this purpose, and the earth must be shifted and redistributed at least once a week. It must not be allowed to get saturated with liquid.

A door for access to the earth chamber will be needed, but should be kept locked when not in use.

THE SEPARATOR TREATMENT OF SEWAGE.

A STAFFORDSHIRE INSTALLATION.

By the courtesy of the engineer, Mr. Fred. J. Cummin, of Victoria-street, S.W., we are able to re-



SEPARATOR AT STONE SEWAGE WORKS.

sawdust to absorb the urine; when the absorbent is saturated it has to be removed, and fresh material substituted.

The mode of use is as follows:—

One or more loads of dry earth are placed in one of the compartments, and a layer of this earth, 6 in. deep, is spread on the floor under each closet seat, so as to receive the excreta upon it. Once a week, conveniently on Saturdays, the faecal matter is covered up with a fresh layer of the earth until in course of time the heap reaches a depth of about 2 ft. It is then removed to the empty compartment to dry, and a fresh layer of earth is spread under the seats. This process is repeated until all the earth has been shifted to the other compartment. It is then worked back again in like manner, using first the portions of earth which have been drying longest. When this process is properly carried out it has been found that faeces and paper are inoffensively disintegrated by the action of the earth with its contained organisms, and that the same earth can be used over and over again without the need for addition or removal.

produce a photograph of the separator now installed at Stone, Staffordshire, sewage disposal works.

Prior to the issue of the Fifth Report of the Royal Commission on Sewage Disposal, a scheme for dealing with the sewage from this town was investigated by the commission, together with a proposal to make use of a chemical process for the final treatment of the effluent, it being considered that the large amount of brewery refuse contained in the sewage rendered something of the kind necessary. The scheme actually carried out, of which the accompanying view shows part, was, we are given to understand, installed at rather less than a half the estimated cost of that referred to by the Royal Commission in their report. It has been working with thoroughly satisfactory results for the past twelve months.

Abertillery Water Scheme.—At a meeting of the Abertillery Water Board at Newport (Mon.) last week it was decided to apply next Session in Parliament for powers to construct an additional reservoir, and for other purposes.

FORMING FOUNDATIONS IN GRAVEL BY CEMENT INJECTION.

AN ACCOUNT OF SOME AMERICAN EXPERIMENTS.

Interesting experiments made in order to ascertain the value of the method of forming concrete in place by the injection of cement are described in an article by Mr. H. H. Cartwright, published in the *Engineering News* of New York. These experiments were carried out at Nashville for the Louisville and Nashville Railroad, under the supervision of the author, with the object of ascertaining the possibility of forming the foundations of bridge piers, &c., in river beds composed of sand and gravel deposits, by the method of forcing cement grout, under pressure, through pipes driven into the gravel under the water.

FIRST EXPERIMENT.

In the first experiment 2-in. pipes, each fitted with a perforated end 2 ft. long, and terminated with a point, were driven 23 ft. into gravel down to the bed rock. The water level in this gravel was 8 ft. below the surface. In order to be able to inspect the work when done, the grouting pipes were driven on the circumference of a circle 15 ft. diameter, there being sixteen pipes in all, about 3 ft. apart. By this method a buried hollow cylinder of concrete was formed. The gravel was as follows: Coarse material, 12 per cent; very fine gravel, 34 per cent; sand, 44 per cent; silt, 10 per cent. Fairly good concrete was thus formed.

The pipes were kept open by means of a water hose and air pressure.

In subsequent experiments it was found that clogging material could be best removed from the tubes by lowering a 3-in. water hose inside the pipe and washing the cement away. The perforations in each pipe covered a length of 17 ft., and after the quantity of cement assumed to be sufficient had been forced through the pipe, it was raised 17 ft. and the process was repeated. An average pressure of 20 lb. per square inch was sufficient for the grouting, but sometimes a pressure of 60 lb. would not clear the tube. Thus it was found to be necessary to insert the small water hose already mentioned, and to jet the point. One batch of cement was made of 1 sack of cement and 3½ cub. ft. of water, which was mixed almost instantaneously in the pneumatic machine to the consistency of rich cream.

It was found that when any pipe was left open at the top, and air forced into the next pipe, that water was forced out of the adjoining pipe sometimes 40 ft. high, indicating a good underground connection. This result would occur even where the pipes were 10 ft. apart. Considerable difficulty was experienced in raising the pipes. After the pipes were raised to water level, 8 ft. below the surface of the gravel, only 15 lb. pressure was required to eject the grout.

After the grouting work was done, the gravel from the centre of the concrete cylinder thus formed was excavated. Practically no concrete was struck for the first 4 ft., and from 4 ft. to 8 ft. deep solid concrete was encountered for the full diameter. This was very hard concrete. Below the water level the concrete was not nearly so good, being irregular like large lumps of clinker. There were many leaks in the walls, but it was found to be possible to pump the water down to within 2 ft. of the rock. The test proved that cement could be forced out at a depth of 23 ft. below the surface of the gravel under 15 ft. head of water; but the difficulty was that the cement would take the path of least resistance, which was upward, and would not spread laterally far enough to make a very tight wall. The illustration accompanying the paper shows a mud seam or stratum at about water level which could not have been made into concrete by the cement. The concrete also was not very well bonded owing to a film of mud surrounding each stone. However, we are told "it set very hard later, and would have made a strong foundation."

EXPERIMENT WITH A TANK.

In the next experiment an endeavour was made to work under a head of 57 ft. of water, and for this purpose a steel tank was made and filled with sand and gravel. The tank was made on a concrete base, 6 ft. square, and steel sheet piling of channel form; seven on each side formed the tank. After this had been made watertight, the tank was half filled with sand and gravel. Before filling, five pipes, 60 ft. long and 2 in. diameter, similar to those used in the previous experiment, were placed in the tank. The tank was then filled with water to within 3 ft. of the top.

There were 40 cub. yds. of sand and gravel in the tank. Five sacks of cement were forced through each pipe, and then the pipes were all lifted 2 ft. 6 in. and the process was repeated. This was continued till 200 sacks of cement had been used. It was found that a pressure of from 70 lb. to 80 lb. per square inch was required in order to clear the pipe, although 40 lb. was the expected pressure. Every time cement was forced down it appeared on the surface of the water, and caused it to boil up and splash out of the tank at times. At the end of the day the pipes were all raised several feet above the last shot of grout. Then forty-eight hours elapsed before work was resumed, when it was found that all the pipes were stopped up, and could not be drawn. All the water was then let out of the tank, and the pipes were unjointed at the top of the gravel. For 10 ft. above the gravel cement was set up solid in the pipes.

After the cement in the water had precipitated, the tank was found to contain 33 ft. of material. An 18-in. layer of gravel was then put in, then 7 ft. of clean sand, 3 ft. of gravel, 2½ ft. of sand, and 5½ ft. of gravel. Only one pipe was driven into this material in the centre of the tank. It was found that the sand entered the tube through the holes, and gave so much trouble that the pipe was withdrawn, and the perforated portion wrapped in with some 10-mesh wire gauge. This was found to be an effective remedy. Ninety-five sacks of cement were injected, and finally 3 ft. 6 in. of crushed stone was placed in the tank, and forty-seven sacks of cement were injected. After twelve days the sides of the tank were removed, when it appeared that very little of the material was solid, except the stone concrete at the top, and that neat cement had found its way to the sides in thin veins. However, after the loose material had been removed, it appeared that the lower half of the tank contained good concrete of about 66 per cent of its volume. Above this was a layer of neat cement from 3 ft. to 5 ft. thick. There was a core of concrete, 12 in. in diameter, through the sand where the single pipe had been, and which core increased in size towards the top; also a portion of the cement having run to the sides of the tank, good concrete had been formed against the steel. The stone concrete at the top was perfect. All concrete in the tank set, and was very difficult to blast to pieces.

It was thus demonstrated that cement could be forced into gravel under a head of 57 ft. of water as easily as where the depth of water was 10 ft. or 20 ft. As the cement was blown into the tubes by charges of air, and as this air could not escape laterally in a small tank, it carried much of the cement up to the surface. The best results also were obtained where the percentage of voids was the largest.

THIRD EXPERIMENT.

In another experiment two tanks of the same cross-section as that already described, and 20 ft. deep, were each filled with gravel and sand. Grout pipes placed close together were used, and also a larger quantity of cement per cubic yard. This gave a good result, the tanks being filled with concrete.

CONCLUSIONS AND RECOMMENDATIONS.

It was found, as a result of these experiments, that, since it is necessary to fill the voids in the gravel with the solid contents of the grout, it is necessary to use about three times the quantity of grout that would be required if the voids had to be filled merely with the liquid grout, seeing that 75 per cent of the grout is water. The gravel to be grouted should be enclosed by piling or by grouting a wall round the proposed foundation, as in the first experiment. This must be done to prevent the lateral escape of the grout. As the air coming out of the pipe induces an upward flow of the water, it may bring up mud or muddy water to the water level; if it does so, this is clear evidence of the presence of a layer of mud or silt of which concrete cannot be formed. Excessive air pressure is apt to remove a large quantity of cement already deposited, and thus to produce bad concrete. When a pipe clogs, it is best to lower a water hose into it, and to jet out the cement rather than to attempt to blow it out with air. The size of the perforations in the grouting point should be gauged to the size of the material into which it is to be inserted; thus, in a coarse gravel there should be large openings, and in sand small openings. The perforations should be just small enough to exclude the sand or gravel. A strong current of air should be passed through the grouting pipe while it is being driven, in order to keep out the fine material which will otherwise clog the pipe. The driving pipe should be heavy enough to stand

driving with a big hammer. The binding of the pipe is a frequent cause of trouble otherwise.

Finally, it is stated that there is no doubt that safe foundations can be made by this grouting process; but test borings must first be made to prove the quality of the gravel. If coarse gravel is found to exist, an excellent foundation can be made. It is, however, essential that when the work has been completed test borings should be made to prove the solidity of the work.

ELECTRIC ROAD VEHICLES.

A recent issue of the *Engineer* contains a short review of the progress of the past year with respect to electric vehicles. An Electric Vehicle Committee has been formed to look after the interests of the electric automobile generally, and is endeavouring to fix a uniform charging rate for storage batteries, and to make arrangements for charging at many convenient places in London and the Provinces. A car of the Arrol-Johnston Company made a successful run from Dumfries to London, the cells being charged at different places on the road. Several of the large trading concerns of London are now employing electric vehicles equipped with Edison cells, and they are being used by electric supply authorities in various parts of the Kingdom. In Glasgow a 1-ton van has been in use for some time. A roadster car has been supplied to the Blackburn electricity works, and a 1-ton tower wagon to the urban district council of Ilford. "Edison pleasure cars are in course of construction, and we are told that there are very strong possibilities of Edison electric omnibuses being put into public service." In New York there are now twenty-one manufacturers of electric vehicles, whereas two years ago there were only eight, and in the United States 12,000 commercial and 25,000 pleasure vehicles are in use.

It is contended by the *Engineer* that the introduction of electric traction into London would be a boon, that it would tend to reduce noise in the streets, and would improve the state of the atmosphere. According to the *Lawyer*, the "petrol haze" created by the exhaust from petrol engines is a grave menace to public health.

SOMERSET COUNTY SURVEYORSHIP.

At the meeting of the Somerset County Council on Tuesday the recommendation of the County Works Committee that Mr. Edward Stead, ASSOC.M.INST.C.E., be appointed county surveyor in succession to Mr. H. T. Chapman, who has been appointed county surveyor for Kent, was agreed to unanimously. At the same time the council placed on record their high appreciation of the faithful and valuable services rendered to the county by Mr. H. T. Chapman during the last five years.

Damp Walls.—It is not uncommon for churches to have damp walls, and we learn that Messrs. Bromley & Dahl have specified that in the repairs to St. Margaret's, at Folkestone, "Pudlo" should be included in the cement for the rough casting, to ensure the walls being damp-proof.

Worthing Municipal Schemes.—A special meeting of the Worthing Town Council on Tuesday confirmed the proposal to promote a Bill in Parliament for the purchase of Beach House estate, to confer further powers with regard to the provision of winter gardens, recreation grounds, and entertainments, water and electricity supply, and various improvements.

Nelson Town Planning Scheme.—On Wednesday the Nelson Town Council decided to make application to the Local Government Board for permission to prepare a town planning scheme. Councillor Rickard, who proposed the resolution, said the scheme was absolutely essential for the future development of the town.

Extension of Birkenhead Recreation Ground.—The Birkenhead Town Council on Wednesday decided to purchase from Mr. R. C. de Grey Vyner, for £6,000, a little over 8 acres of land adjoining Bidston Hill. It was announced by the mayor (Mr. James Moot), who presided, that the King had consented to open the land for the use of the public when he visited the town in March.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2.

MR. BOULNOIS' "GLOSSARY OF ROAD TERMS."

To the Editor of THE SURVEYOR.

SIR.—The traditions of the lexicographer reveal so much ingratitude on the part of those whom his labours are designed to benefit that anyone attempting to enlighten his fellows on the derivation or application of words must be prepared to get "more kicks than ha'pence." If, however, he possess the necessary patience and determination long to labour as a hewer of wood and drawer of water for others—so long and so thoroughly indeed as to compile a fairly complete work, giving only definitions which are almost beyond criticism—then he will be recognised as a benefactor to the community, and gain the lasting gratitude and golden opinions of all. At least, one likes to think so.

Unfortunately, one cannot feel that Mr. Boulnois' glossary places him in such a happy position. In your issue of November 21st Mr. J. A. Jenkinson has already passed some criticisms on the general English of the articles. Mr. Jenkinson's contribution to the discussion is most enlightening and valuable. I cannot, however, agree with his suggestion to omit such a word as "clay." We need a definition of "clay" such as will define it from all other earthy material and say what clay is; but our glossarist fails to give such information. Then there are several explanations of engineering terms given by Mr. Boulnois which one would like to have confirmed by other engineers before they find a place in a permanent record. And now one must consider the numerous chemical expressions which are included in the list. It is a pity that this part of the glossary was not submitted to a chemist for criticism before publication, for inaccuracy in the definitions can only intensify the regrettable confusion which already exists in this department of the literature on road making.

Happily, Mr. Boulnois invites criticism, so that I may perhaps be allowed to challenge some of the definitions given by him, especially those relating to the asphalt and similar industries. A few of them may be reviewed in alphabetical sequence.

Ammoniacal Liquor.—It would be quite correct to say that "an aqueous solution of ammonia and compounds of ammonia and of phenols" is an "ammoniacal liquor," but the converse cannot be accepted. The term as applied technically refers to a by-product of specific character obtained in the manufacture of coal-gas, and this is not evident in the definition given.

Anthracene is not "heavy tar oil." The heavier tar oils contain anthracene, which is quite another matter. The latter part of the description is correct, but it applies equally to at least a score of other "aromatic hydrocarbons," so that one is not much the wiser.

Artificial Asphalt.—Does it usually "contain more or less natural rock asphalt"? Of course it may; but do not most manufacturers take the utmost advantage of the adjective?

Asphalt.—"Sometimes spell 'asphalt.'" Is it not usually and preferably spelt without the "e"? The description is, in the main, satisfactory, but in a glossary intended to guide the inquirer into the way in which he should go it would have been better to omit the last sentence, or to point out the undesirability of applying the terms "to various bituminous mixtures"; or, again, to define the "various mixtures" to which it may be applied.

Asphaltens.—"A term applied to certain component of bitumens in petroleum products, &c." The light here is very diffuse. What is the nature of the "certain components"? The expression, as used by the asphalt chemist, has a perfectly well-known connotation, even if the pure chemistry of the substance is in question. True, asphaltene is obtained from bitumen—to be more explicit, from natural bitumen—but what is one to understand by the "bitumens in petroleum products, &c.," in which the asphaltenes occur? What evidence have we that bitumens are present in "petroleum products, &c."? We are told (quite rightly), under "Bitumen," that "the word is often applied wrongly to residuums of distillation." In "a glossary of road terms" what "petroleum products" is one likely to

imply other than those which are "residuum of distillation"?

Bitumen.—"A mineral substance of a resinous and viscous nature, chiefly composed of hydrogen, carbon, &c." It is extremely unsatisfactory to find such a fundamental term as "bitumen" so carelessly defined. On referring to "Resin," one is met with an equally unfortunate lack of accuracy. But has bitumen anything whatever in common with resin? Even its "viscous nature" is of a very different character. The " &c." spoils the one observation which is substantially correct, for bitumen is composed chiefly of hydrogen and carbon; but so are petroleum, turpentine, coal gas, &c.

Calcium Chloride.—The description applies equally to a multitude of other compounds of calcium.

Carbencs.—The description "components of bitumen petroleum, &c." is meaningless.* One requires to know which components.

Carbon.—"From 'Carbo,' a coal. It is insoluble and infusible." This is wellnigh, if not actually, the only word of which we are given any etymology, but the language of origin is not stated. Two of the properties—insolubility and infusibility—are mentioned, but the reader would like to know what carbon is, or something about its nature.

Cresote.—"A powerful antiseptic obtained from coal tar, and used extensively in the preservation of wood blocks." This is very inadequate. Similar antiseptic properties are exhibited by a hundred other substances obtained from coal tar, and several of them might be applied to the preservation of wood—some of them are. Moreover, there are numerous varieties of "cresote." They are characterised by the presence of cresol, or other phenolic bodies; yet this is not mentioned. But when the glossary is specifically of "road terms," the user most interested will look for some precise description of those varieties of cresote employed in road making.

Deliquescent.—"Capable of attracting moisture from the air, and retaining it." This definition applies to *hygroscopic*; the all-important distinction of simultaneous liquefaction which pertains to deliquescence fails of recognition.

It is hoped that these few criticisms on the chemical words occurring on the first four pages may be suggestive of what one may look for in the revised work. Mr. Boulnois has undoubtedly rendered service in compiling so large a vocabulary of the terms used in the road-making industries, and when editing the permanent publication, one wishes him all success in fathoming the depths of this area of the ocean of philology, and bringing to the surface some of those treasures of scientific definition which the faithful student is ever seeking.

No one who has not taken part in such work can appreciate the immense difficulties of the colossal task Mr. Boulnois has set himself.—Yours, &c.,

S. JUDD LEWIS, D.S.C., F.I.C.

London, W.C.

January 5, 1914.

MUTUAL DEFENCE.

To the Editor of THE SURVEYOR.

SIR,—I note in your columns that "the members of the Eastern District" of the Municipal and County Engineers "are giving a good lead in forcing the question of mutual defence again to the front." Seeing that the Institution of Municipal Engineers already has a Mutual Aid and Defence Fund, to which contribution is compulsory on the part of all corporate members and students resident in the British Isles, and that the fund has now, at the present moment, a separate account at the institution's bankers, with money in hand—I say, having regard to these facts, that the question of "a good lead" being given in other quarters is not a little misleading. It is nothing less than astonishing that with columns in the technical Press concerning a projected fund (which is still in the clouds), no mention is ever made of a working fund which actually exists!—Yours, &c.,

B. WYAND,

Secretary, Institution of Municipal Engineers,

39 Victoria-street, S.W.

January 6, 1914.

[We fail to see how the note referred to—which appeared in our "Minutes of Proceedings" of the 19th ult. (page 923)—suggests anything except that the members of the Eastern District of the Institution of Municipal and County Engineers are giving a lead

to those in the other districts of that body, for, in the concluding words of the sentence from which Mr. Wyand quotes, the hope is expressed that "when the position is fully realised the general body of members will see that the establishment of a fund would be in their best interests." Having succeeded in establishing a fund of their own, the younger institution obviously require no such "lead." As is well known, the present articles and by-laws of the older body prohibit the enforcement of a compulsory levy on the members for purposes of defence, and the observations in our issue of the 19th ult. had reference solely to the praiseworthy efforts of the Eastern District to obtain support for a voluntary scheme.—Ed. THE SURVEYOR.]

THE SOMERSET DIRECTION POST.

To the Editor of THE SURVEYOR.

SIR.—The description of this appliance on p. 10 of the current issue of your journal reminds me that I was lately cycling from Bath to Weston-super-Mare through Marksbury. About $\frac{1}{2}$ mile south-west of the latter place the road forks—one branch to Weston and the other to Wells. Some wag had reversed the Weston arm which pointed to Bath—that is, north-east instead of south-west. I am too well acquainted with the district to be misled by such a trick, but I can imagine a good many motorists and others were placed in some difficulty before the matter was rectified.

It is evident that the design should be varied to prevent such an occurrence, and I take it this could be easily accomplished either by shrinking the arm on the post, or providing a rib on one part running in a groove in the other.—Yours, &c.,

OLD BIRD.

January 6, 1914.

PORTLAND WATERWORKS: THE FRIAR WADDON BOREHOLE SCHEME.

To the Editor of THE SURVEYOR.

SIR.—In your report of the discussion on this paper in your issue of the 2nd instant I am reported as having stated that the cost of raising 1,000 gallons of water per 100 ft. was 13d., which is obviously an error, as it should be 13d. Then the fuel consumption of 140 lb. of anthracite is for raising 2,000,000 ft.-lb. of water.

I am also reported to have stated that the Weymouth Water Company's pumping station was 3 or 4 miles from Portland, whereas it should have been from the council's waterworks at Friar Waddon.

With reference to the decomposed sewage getting into the old well sunk on the island, this obtained access through the fissures in the Portland stone and not in the clay, which is not fissured, but forms a floor, as it were, upon which the water travels.

I might also add that at that time there were a large number of cesspools on the island, which probably added to the impurities found in the water.—Yours, &c.,

R. STEVENSON HENSHAW,
Engineer and Surveyor.

Portland, Dorset.

January 6, 1914.

House Refuse Collection in Kensington.—A report on the experimental daily collection of house refuse during the months of July, August and September in that portion of Golborne Ward, Kensington, north of the Great Western Railway, has been prepared by the borough engineer, Mr. A. R. Finch, Assoc. M. Inst. C.E. He states that a daily collection could not be effected in some 159 cases out of a total of 923. The actual weight of refuse collected was only 21 tons more than the estimated quantity for the corresponding period of the previous year. The cost per ton for collection and removal showed an increased expenditure of 4s. 0½d. This increased expenditure was largely accounted for by the fact that in the majority of cases it was found that there was very little refuse to be removed from day to day, and also by the extra labour involved by reason of the receptacles being unsuitable or being placed in positions not readily accessible to the dustmen. After considering the matter, the borough council has decided that, subject to the necessary provision being made in the annual estimates, a bi-weekly collection of house refuse shall be made throughout the borough between May 1st and October 31st next, the cost of which, the borough engineer estimates, would be met by the provision of a further sum of £1,500.

Institute of Sanitary Engineers.

PRESIDENTIAL ADDRESS OF MR. JOHN D. WATSON.

There was a large gathering at Caxton Hall, Westminster, on Wednesday evening, when Mr. John D. Watson, M.INST.C.E., engineer to the Birmingham, Tame and Rea District Drainage Board, delivered his inaugural address as president of the Institute of Sanitary Engineers in succession to Mr. H. Percy Boulnois, M.INST.C.E.

Mr. Boulnois, who occupied the chair at the opening of the proceedings, said it was unnecessary for him to introduce Mr. Watson to the members, for his successor in the chair had a world-wide reputation as an engineer, and possessed a knowledge of sewage disposal as great as that of any man in the country.

Mr. Watson having assumed the chair, Mr. A. J. Martin, past-president, rose to propose a vote of thanks to Mr. Boulnois for his services to the institute during the past year. Twelve months ago, in pursuance of his duty, he inducted Mr. Boulnois into the chair into which he had that evening inducted Mr. Watson. He congratulated the institute at the time on its choice of president. It was always a pleasure to say "I told you so," but he was quite sure that the members of the institute would agree that Mr. Boulnois had more than fulfilled their expectations in regard to him. He had not only presided with dignity and distinction over their proceedings, but had created a record by the way in which he had thrown himself into the everyday work of the institute. He did not think any president before him had taken the same close interest in the ordinary spade work of the institute, nor had any president made such a mark on its prosperity and well-being.

The vote of thanks was seconded by Mr. BLAKE, and on being put to the meeting was carried with acclamation.

In a short reply, Mr. BOULNOIS protested that he was not really worthy of all that Mr. Martin had said of him. He had tried to do his best, and a man could not do more than that. His year of office had been an exceedingly pleasant one, because he had had the unanimous support of the council of the institute and of Mr. Hasluck, their admirable secretary. Presidents, he added, might come and presidents might go, but without a good secretary it was impossible for any institute to thrive. He offered his congratulations to the members on having secured Mr. Watson as their president for the ensuing year.

MR. WATSON'S ADDRESS.

Mr. WATSON then delivered his address, speaking as follows:—

My first duty on rising to address you is to make fitting acknowledgment of the honour you have done me in electing me to be your president. I appreciate the distinction of being called upon to succeed men like Mr. Boulnois, Mr. Martin, and the many other distinguished sanitarians who have preceded me in this chair, and shall try during my year of office to promote the objects for which we are banded together.

The profession of a civil engineer is usually defined as "the art of directing the great sources of power in Nature for the use and convenience of man." This is a quotation from the original Charter of Incorporation granted nearly one hundred years ago to the Institution of Civil Engineers. Although this definition is, and was intended to be, comprehensive enough to embrace engineering of all kinds, the rapid development of applied science in recent years has induced hiving off from the parent institution both for the purpose of obtaining what may be termed more specialised pabulum, and of affording opportunities for specialists to promote their more immediate interests; therefore, we now have the mechanical engineer confining himself chiefly to mechanics, the electrical engineer to things electrical, the mining engineer to mining, and the sanitary engineer to works which have for their object the promotion and maintenance of public health. This object, however, is so comprehensive that it embraces waterworks, sewerage and sewage disposal works, refuse incinerating works, architecture in its relation to dwelling-houses, and the manufacture of articles needed to build and maintain structures required for the promotion of the health of the people.

A presidential address to a body whose functions and studies are so varied should, I apprehend, be made interesting to more than one section of its members; but I fear my remarks will be of interest chiefly to those engineers who are engaged in the purification of sewage.

HOUSING.

In inculcating sanitary reform, I heard our late King (Edward VII.) emphasise the catholicity of its nature. He said, *inter alia*: "Although the heaviest penalties of insanitary arrangements fall on the poor, who are themselves least able to prevent or bear them, no class is free from their dangers." These words are as true to-day as they were in 1891, but I think the general community are now better able to appreciate them than they were when they were spoken; yet we are a long way from being sufficiently careful to obviate those penalties which are the inevitable results of neglecting the laws of Nature, or, in other words, the laws of sanitation. The danger zone is almost invariably in the slum districts of our cities, and although the poor suffer most from the outbreak of infectious disease, the well-to-do reap their own share of the penalties. To circumscribe this danger zone, therefore, is in the interest not of one, but of all classes of the community. Who among us can contemplate the immense number of British people who are obliged to live in one-room dwellings without feeling that the existence of so many insanitary dwellings, as this fact implies, is a blot upon our national escutcheon which we should exert every nerve to remove? Whether the blot is due to poverty, ignorance, drink, or, what is more probable, to all three combined, it is evident that much remains for the sanitarian to do before he can be allowed to rest from his labours as propagandist, scientific guide or engineer.

To gain courage for greater efforts in the future by contemplating the gradual reduction of the death-rate is commendable; to attempt to apportion credit for what of late years appears to be an annual decrease is not only futile, but mischievous. Our duty is to work with all whose objects are in accord with our own for the realisation of our common aim. Whether the money required for building 100,000 or more cottages in the country is to be provided by Liberals or Conservatives is of no consequence to the sanitarian. The need for cottages in the country and habitable dwellings in the towns is so clamantly required that our duty is to press the work forward irrespective of party interests.

There is encouragement also in the reflection that King Edward's exhortation should be less difficult to obey now than it was in 1891; the nation is much richer, and knowledge of hygiene fuller and more scientifically directed than it was then; not only so, but the work of each generation, if it is good, renders the work of the next generation less arduous. For instance, the introduction of Loch Katrine water to Glasgow, nearly sixty years ago, is still a source of health and wealth to its citizens, and although extensions of the works have taken place from time to time, the rate originally imposed to pay for the scheme has been gradually reduced until now it costs occupiers of dwellings only 5d. per £ on their rental, and owners of all classes of property 1d. per £, while water sold to factories, workshops, &c., has been reduced in price from 1s. to 1d. per 1,000 gallons.

WATER SUPPLY.

To the waterworks engineer we owe facilities for keeping clean the houses of the poor; if, owing to ignorance or carelessness, advantage is not taken of these facilities, the estimable boon of having water upstairs, downstairs and in my lady's chamber still remains.

We speak of the work of the Romans with something like bated breath, but can it be maintained that their waterworks were either so great or so useful as the work of the modern engineer? The feat of introducing an abundant supply of water to almost every dwelling-house in a city of 7,000,000 people is unprecedented. It took several generations to accomplish. Now the London works are only second in magnitude to the colossal works of New York, where the authorities are just completing a duplication of their 500,000,000 gallon supply. When the

Catskill Mountains scheme is completed. New York will have a supply of potable water equal to 1,000 million gallons per day, or more than the volume of the river Thames at Teddington in summer.

Contemplate what it means to introduce water to the gold mining districts of Coalgardie and Kalgoorlie from a source 350 miles across the desert waste of Australia, or even the greater work of building the Los Angeles aqueduct, which extend through wild, rugged country for a distance of 250 miles. But even more than the feats of engineering represented by aqueducts and reservoirs is the almost universal manner in which water is laid on to every room in which it is wanted, even in the highest building of the highest part of every modern city. The Romans attached the utmost importance to the provision of public and private baths, but the introduction of water to the dwellings of the poorest formed no part of their ambition.

The engineer's work may appear at first sight to be restricted to the introduction of water, but it is also his duty, as well as that of every sanitarian, to check the widespread prodigality of its use.

The average consumption of water in England is from 25 to 30 gallons per head per day, but in Scotland, where the people are credited with being more frugal, it is double that quantity. In the United States generally it is about four times as much. If supplies were unlimited, and money available for public works inexhaustible, little need be said, but neither is the case, and it cannot be too definitely fixed in the minds of the people that to waste water is to waste money. . . .

I have had the pleasure of introducing water into not a few small towns and villages, and it has always been a gratification to witness the happiness of the people at receiving for the first time water laid on to their premises—this, too, when they had to pay as much as 2s. per £ for it. Before long, however, they ceased to husband the water as if it had ceased to be the precious liquid that it is; then came indifference to waste, with the inevitable consequence that either extensions of the works or retrenchment became essential. There is the widest difference between legitimate use and waste of water. The consumption will no doubt increase if the plunge bath becomes a recognised feature of the artisan's dwelling, but it is an increase that portends health and comfort much to be desired.

SEWAGE PURIFICATION.

In the purification of sewage change and uncertainty have played a conspicuous part during the past half century. In conjunction with the chemist and biologist, the engineer has had many problems to consider, not always with satisfactory results. During the first moiety of the last half century, engineers advocated irrigation as the only reliable method of disposition of sewage without detriment to a stream. Chemists generally advocated a chemical process, and they took out no fewer than 500 patents for that purpose. After a long fight, the Royal Commission of 1885 pronounced strongly in favour of land irrigation as the only reliable method. This decision ceased to be correct when the biological showed another way of efficiently purifying sewage, and for twenty years we have been constructing bacteria beds.

How do we stand to-day? Mr. A. J. Martin, speaking at Exeter last summer, summed up the present position by saying: "We can produce with certainty an effluent which is inoffensive and chemically stable. The putrescible solids in sewage can be converted, either by aerobic or by anaerobic methods, into a much smaller volume of inoffensive residuum. The effluent can be completely sterilised, although not without risk of upsetting the balance of life in the river into which it is discharged."

In order to arrive at these general dicta we have travelled many a controversial path. The conflicts have been severe, but none of the combatants have been mortally wounded. It is to the credit both of the chemist and the engineer that the contests were without rancour, notwithstanding the fact that engineers of eminence have had the soundness of their judgment impugned within sight and hearing of their clients. Good temper under such circumstances is highly commendable, and could have been preserved only when each party to the controversy recognised in his opponent perfect good faith and a single eye to the advancement of science.

Throughout the controversies two facts have stood out clear and undisputed—namely, that satisfactory

effluents could be produced by treating sewage on suitable land, and by treating it on well-constructed bacteria beds. In both cases the purification process is due to a combination of biological, chemical, and physical laws which hall-mark it, so to speak, with Nature's own stamp. The admission of these facts proves that differences were not fundamental in character, and the all but universal adherence to them now shows, not that further investigation and test are unnecessary, but that there is a good starting point from which definite scientific research may begin. At one of our sessional meetings last year Mr. Martin pleaded for the establishment of a Government department to undertake such work, and I venture to say that there is no more urgently required department. This institute should add the full weight of its authority to the advocacy of this work, as well as to the establishment of the central authority proposed by the Royal Commission on Sewage Disposal.

THE PROPOSED CENTRAL AUTHORITY.

There should be no assumption that because the Royal Commission have proposed that a central authority should be set up, Parliament will agree to it. The very fact that money will be required to equip such a department, and that the appointment of more Government officers is certain to be resented by a section of the Legislature, is the very reason why the institute should be vigilant and insistent. I am sure no one interested in the purification of sewage will misunderstand the proposal to establish a department which, in addition to performing the function allocated to it by the Royal Commission, should, as part of its usual and permanent routine, conduct scientific investigations in every phase of the work. This branch of work should be urged upon the Government; but if failure has to be admitted, that is no reason for relaxing every effort to induce Parliament to approve the proposal to establish a central authority. If that is conceded it is, in my view, only a question of time when the central authority will find it necessary to equip a research department. The present anomalous state of things is intolerable, whether due to the fault of the Statute or to its faulty administration, and should be remedied. The bare idea of compelling a township like Llanwrst to purify its sewage completely, although the effluent must be discharged into a river more than 2,000 times its volume shows that the wealth of the country is not husbanded properly. There is nothing so objectionable as a slavish obedience to the letter of the law when the spirit is not even remotely apprehended.

The great work of purifying the rivers of England is necessarily costly, and the nearer I come to understanding the problem the more am I convinced that we need an authority like the central authority to guide local bodies, as much as we need one to see that they obey the law. Cast-iron rules are applicable to some things (for instance, the breaking of other people's windows), but they are inapplicable to standards of sewage effluents. In my view it is nearly as bad to waste money upon perfect sewage effluent where that is not required as it is to neglect the work of purification altogether where it is required. Obviously it would be wrong to allow Birmingham, which is situated 120 miles from the sea, to discharge sewage into the nearest stream without treatment because Hull does so, or to allow a township on the Thames to pollute the river because it may be done with impunity at Dundee, where the queen of Scottish rivers is 2 miles wide.

A suggestion was once made to Mr. Balfour, when he was Prime Minister, that much money might be saved if local authorities would only construct their sewage works on plans to be provided by a Government department, and he retorted that the suggestion was unworkable, as it was in direct antagonism to the English character, which would rather work out its own salvation by blundering into success than accept specifications of a perfect scheme at Government dictation. This view must command respect, but there is the widest difference between the preparation of a specific scheme and the establishment of an authority which will be a scientific body skilled in all subjects relating to pollution of rivers, as ready to advise as control, and which will be the ultimate determining authority, beyond whom there will be Parliament only.

It is the creation of such an authority that the Royal Commission on Sewage Disposal recommend, and which, without unduly anticipating the report of

the municipal representatives appointed by the Association of Municipal Corporations, appeals to them as being the only workable alternative to setting up a standard of purification by Act of Parliament.

IMPROVEMENT OF RIVERS.

May I suggest that the incidence of taxation for maintaining clean rivers should not be beyond the cognisance of such an authority? If each sewage effluent is to be made to suit the needs of each stream for the benefit of the community at large, should not the community share part of the burden?

The analogy between rivers and roads is by no means complete, but the association of ideas leads me to remind you that it is not very long since the public were satisfied if a road were repaired from the tolls taken from the vehicles running over it. Now the county and district councils levy rates on all assessable property within their respective districts, and even this, it is now admitted on all hands, is too circumscribed an area of taxation.

To improve the condition of a river is sometimes as much national as local in its reach. Parliament has already accepted this principle, to some extent, in the Bill promoted by the corporation of Edinburgh. This Bill was opposed by millowners in both Houses of Parliament, but without success, and an Act was passed in 1889 constituting a special board charged with the duty of preserving the amenities of the water of Leith, and conferring power to rate all owners of property *ex adverso* of the river. This district, under the jurisdiction of this board, is a purely arbitrary one, and, roughly speaking, is about 12 miles long by 3 miles broad. The area is an irregular one, and seems to have been laid down on the plan so as to enable the board to deal with those mills, villages and properties whose refuse and sewage actually did or in the event of extension naturally would drain into the water of Leith. For the purposes of the Act, each of the portions of the landward district within the jurisdiction of the landward local authorities is declared to be a special drainage district under the Public Health Acts, and under the powers contained in these Acts the respective local authorities may extend and enlarge any such special drainage district. The assessable rental of the whole district is nearly £3,000,000.

It may be taken for granted that riparian owners would object to be rated for the elimination of impurities for which they disclaim all responsibility. It should be borne in mind, however, that some rivers would have been available as sources of water supply had it not been for the ramification of land drains, which, in these modern times, convey soakage from highly manured arable land direct to the nearest stream. The case of the city of Aberdeen comes to my mind. There the authorities propose to abandon an excellent water supply derived from the river Dee, and introduce one estimated to cost upwards of £1,000,000 in order to avoid the risk of impounding tainted water.

AERIAL NUISANCE.

Another sewage problem which has not yet been satisfactorily solved is that which relates to aerial nuisance. It is a problem which affects large communities more than small ones, as, to some extent, it is a question of atmospheric dilution. One of the schemes for treating the sewage of New York involved the construction of 1,400 acres of bacteria beds at one place, and in commenting upon this proposition I ventured to say: "I have grave doubts about the wisdom of placing so vast an area of bacteria beds so near to an industrial centre as they would be on Barren Island. In contemplating such a scheme one should take into account the after effects of the evaporation of so much foul liquid as there must necessarily be from such an area of filters. In 1911, when the summer weather in England was warmer than usual, there were complaints of smell nuisance from a small installation at Hanley, where the sewage is of about the same strength as the average American sewage, and where it is distributed over rectangular percolating beds by mechanical distributors moving backwards and forwards. Complaints were also made by residents near the 30-acre installation at Birmingham, where strong sewage is sprayed over the beds by fixed nozzles. The chief lesson to be learned from the 1911 experience is that an increase of flies is to be looked for in the neighbourhood of bacteria beds in hot weather, and that objectionable smell adjacent to them is more pronounced during prolonged hot weather than at other times—*e.g.*, seasons like the average English summer, when the temperature rarely exceeds 65 deg. Fahr. in the shade. But a much more serious drawback to a great area of bacteria beds dur-

ing spells of prolonged hot weather is the formation of vapour 'clouds,' due to the evaporation of sewage. These imperceptible clouds appear to form over the beds in quiet weather. They rise to some distance above the earth, and at sundown, when the earth begins to cool, they return not alone as refreshing dew, but with offensive odour. If this occurred only in the vicinity of the bacteria beds, where the land is generally less valuable than at some distance, it would not be so serious in its consequences; but it generally occurs at some distance from the bacteria beds, the direction and distance depending upon the tendency and velocity of the wind."

Of course, it is only the malodorous element in sewage that makes this phenomenon noticeable; evaporation from clean water would act precisely in a similar manner, but it would manifest itself in welcome dew on the grass. This led me to adopt at Birmingham the use of hypochlorite of calcium with excellent results, but the cost would be a serious matter where 700,000,000 gallons had to be treated each day; indeed, the bare probability of hypochlorite of either calcium or sodium (and the latter is even more effective) having to be used frequently would be sufficient in itself to retard the adoption of a scheme which would be many times as large as anything now in existence.

NEED FOR RESEARCH.

It is obvious that climate is of paramount importance. The weather experienced in England in the summer of 1911 stands by itself in our meteorological records, and it would be extravagant to build all our bacteria beds to suit the tropical conditions which obtained then. The question therefore arises how much money would be spent to meet the very occasional spells of hot weather experienced in England; but there should be no question as to the need for research to ascertain what is best to be done. I hoped to be ready to give to this meeting the results of experiments which are being made on the saturation of sewage with oxygen before applying it to the bacteria bed; but, unfortunately, the experiments are not yet complete, and as questions of cost enter so largely into the practicability of any scheme of this kind, it may be found that the economic will overbalance the scientific side of the problem.

Mr. Scott-Moncreiff, in a speech some years ago, asked whether the great cost entailed in the purification of sewage really paid a community. If there were only a limited definite sum available for the promotion of public health in this country, I would say, without hesitation, that there are other works which would probably produce greater benefit to a greater number than purifying our rivers; but in England there is plenty of money to pay for the maintenance of reasonably clean rivers, and the conservation of those delightful rural districts which no patriot would willingly see permanently injured. It is as essential for a local authority to maintain a clean town or district as it is for an individual to keep a clean home. Cleanliness is one of the chief characteristics of civilisation—not the surface cleaning merely as I have seen it in many towns abroad, and some, I am sorry to say, at home, but that cleanliness which is dear to the heart of a medical officer of health. The cholera plague at Hamburg a generation ago, and the more recent epidemics of typhoid fever at Maidstone and Lincoln, directed the minds of the least thoughtful of the community to the need for the absolute purity of the water supply, and indirectly to the disposal of sewage. In England, during the last generation, both subjects have received conspicuous attention, and we have, to some extent, merited such encomiums as Dr. W. Roth, of Saxony, paid us when he said: "It is unquestionable that, in the whole field of hygiene, England has been foremost in practical work, thanks to the great number of eminent men who have devoted their powers to the subject"; but I am seriously doubtful whether we are not at this moment prone to rest on our oars. Nothing succeeds like success; but if we rest content with having been successful once, we live in a fool's paradise. If we cannot individually prosecute scientific research, let us unitedly and wholeheartedly call upon the Government to establish a research laboratory which will take up or initiate subjects of investigation on our behalf.

I have been engaged in many inquiries as to the best method of disposing of sewage, but I frankly own that when I was engaged last year on the problem of how best to sewer New York and treat the sewage of that great population, I found a wealth of minute scientific and practical investigations already pre-

pared by the Metropolitan Sewerage Commission out of all proportion to anything ever prepared for a similar purpose in this country, and it made me feel that if the president's methods were typical of American practice, we are far behind in this respect. No question could be put in relation to facts, or line of investigation suggested, which Dr. Soper or his officers had not anticipated, and that, too, in the most complete and exhaustive manner.

National or local investigations of the kind I considerate might appear for the moment to be upsetting. A community may have completed its sewage purification scheme when a better way of doing part of the work is discovered, but even if this were so, there could be no suggestion of remissness. Hedley, when he built the "Rocket," was not guilty of short-sightedness in not constructing it with all the marvellous devices which go to make the modern decapod locomotive.

The sludge question, for example, has not been exhaustively studied. It is a very complex substance, which in one place may yield copper and in another grease in such quantity to pay for recovery, and it may be that in every case sufficient nitrogen can be obtained from it in quantities to be remunerative. As it is, we are usually content to get rid of it without creating nuisance, in some cases by pressing and burial, in others by pressing and burning, and burial alone, at coast towns by disposal at sea, and in at least one case in this country (Birmingham), and several in Germany, by septicising and air drying. All the processes are efficient as a means of getting rid of sludge without nuisance. From a hygienic point of view, dumping at sea is unrivalled; but this method is rarely available, and I doubt if it is always wise.

SLUDGE AS A FERTILISER.

When the British Association met at Bristol in 1898, Sir William Crookes delivered a presidential address which, to say the least, was distinctly alarming. He stated that wheat-growing land all over the world was becoming exhausted unless it became the universal practice to apply to the land a moderate dressing of chemical manure. From the time that speech was made until about 1906 foods of various kinds tended to rise in price, but the corresponding rise in wages and economies practised by purveyors, chiefly those relating to transportation and handling, kept the increased price from being felt by the poor consumer until about 1906, when he began to talk about the cost of living, a phrase which we have hardly had out of our hearing ever since, and, so far as one can forecast the future, not likely to have out of our hearing for some time to come.

I fear the cost of living is bound to go up, for the reason that the food-producing countries are having a greater demand for their produce by the world's ever-increasing population. Until recently North America was able to supply her own wants, and had a surplus to send to the English markets. Now all that they can produce is required to feed the rapidly increasing population of the States and Canada, the States alone having a population of almost 100,000,000 persons. To aggravate the situation, from the English point of view, the United States Legislature recently took the duty off foodstuffs, with the inevitable result of diverting food from various European States and British Colonies to New York and other ports where better prices can be obtained. Beef, for example, is sold in New York at 3s. per lb. Civilisation demands for the labourer, whether he speaks English, French, or German, a higher standard of living now than formerly, so that, in addition to the large increase of world population, there is a greater demand for foods, some of which the people of two or three generations back called luxuries. All this tends to increase the demand for farm produce without a corresponding increase of production. Unless the production of food is increased by the means suggested by Sir William Crookes, or by an even more intensive cultivation of the cultivable soil, prices are bound to rise, more especially if European countries are driven to follow the American example and encourage the free imports of edibles.

Now the question arises, Are we sanitary engineers doing our part as well as we might? Are we satisfied to rest content with converting a noxious product like sludge into an innocuous substance, knowing that it contains a nitrogenous base which might be utilised as a fertiliser? Probably Sir William Crookes was unnecessarily pessimistic, but his words were spoken with conviction, and that, too, long before emigration from the States into Canada became a commonplace

occurrence. The reason for this emigration is to be found in the fact that the tillers of virgin soil soon find that manure is essential if land is to continue to give a reasonable return for the labour expended upon it. Manure was found to be too costly, and its use involved new methods and new plant. They prefer, therefore, to migrate to "fresh fields and pastures new," accepting a gift of prairie land from the Government of Canada rather than change methods to which they have become accustomed. Even if there were only a modicum of truth in this, it shows what may be looked for. In England there is an upward tendency in manure prices. Until recently London alone provided farmers with enormous quantities of stable dung; now that the motor is fast driving the horse off the streets there is but little town manure available for the farmer. If this is true of London to-day it will be true of the provinces to-morrow, and it accentuates the need for the conservation of the fixed nitrogen in sewage sludge, so essential to the efficient cultivation of the soil.

If Sir William Crookes is right, we have to face the startling fact that in the United Kingdom we are content to hurry down our drains and watercourses into the sea fixed nitrogen to the value of no less than £16,000,000 per annum. In Birmingham alone upwards of 400,000 tons of liquid sludge are air dried and converted into a non-smelling residuum at a cost of £6,000 per annum, and the best use to which it has been put so far has been to use it as an auxiliary fuel during the protracted coal strike. Many will no doubt say that it is enough to control effectually the enormous potential nuisance in sewage from so vast a population as 1,000,000 persons, without establishing a huge municipal trading concern for the recovery of waste products. But if we have gone so far, and if the way seems open to go further by the possibility of converting sludge into a readily saleable fertilising substance, the local authority, and all who stand to gain by increasing our scanty wheat-growing area, or otherwise adding to the food-producing capabilities of the soil, should encourage such a project.

It has been felt for some years past that there is profit for someone who could invent a process to utilise the manurial value of sludge, but the difficulty has been to get a plant capable of converting wet sludge into a dry powder quickly, efficiently, and economically. I have examined machines at work in England, Scotland, Germany, and Belgium, without being satisfied with the results.

THE DUBLIN PROCESS.

Two years ago my attention was directed to the Dickson process as it was worked at the Dublin sewage outfall works. It was claimed for this process that the introduction of brewery yeast into the sludge promoted rapid fermentation, and rendered the sludge easily separated from the water. When attention is drawn to what appears to be one of the many patents that have already proved to be abortive, one is prone to brush aside a claim of this kind without sufficient attention. Fortunately I was induced last autumn to go to Dublin to see the process (which I shall describe anon), when I formed the opinion that the patentees were justified in claiming that they are able to make quickly and economically a fertiliser of which sewage sludge forms the base. At my instigation the Birmingham Drainage Board sent Mr. L. F. Mountfort, Assoc. M. Inst. C. E., to Dublin to make a fortnight's careful test of the process and the plant, and Mr. Mountfort's report fully confirms me in the opinion which I formed as the result of personal observation.

The process may be divided into two main sections:—

- (1) The fermenting of the crude sludge mixed with a small percentage of yeast, and the separation of as much water as possible by this means.
- (2) Drying the resulting sludge, mixed in this case with certain compounds containing phosphates and potash to produce a fertiliser.

The sludge produced from the fermentation has a water content of about 82—84 per cent. Thus in the case of a 95 per cent crude sludge, about two-thirds of the water is separated in the fermenting process, and the remaining one-third in the dryer.

It is found that this density figure is obtained whatever the quality of the crude sewage, and therefore the variation in the amount of water to be separated per pound of solid matter due to variation in density of crude sludge is entirely taken charge of by the fermenting process, and the work of the dryer remains practically constant per pound of solid matter.

In the present plant the sludge is pumped into an

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overhead tank, and from there a pipe is taken to an open trough leading to a small screen. At this point about 0.5 per cent of its weight of ordinary yeast is added to the sludge, this yeast being mixed with water to enable it to be supplied through a pipe.

The mixture of sludge and yeast is then pumped through a "heater" which consists of a number of pipes placed in the path of the hot air from the furnace, and is then delivered to the fermenting troughs, which are eight in number, each about 50 ft. long by 4 ft. wide, and holding about 3,000 gallons. Under each trough is a hot-air duct, and the sludge is kept as far as possible at a temperature of about 90 deg. Fahr. during the fermenting process. In about twenty-four hours it is found that, as the result of the fermentation, there is a distinct separation of water, the sludge at a density of about 83 per cent occupying the surface while the water can be readily drained away from underneath.

Before being taken to the dryer the fermented sludge is mixed with a compound of phosphates and potash in about equal proportions by weight of sludge and compound based on a dry, solid matter, because, although a satisfactory manure can be made from the sludge only, it is found that a greatly enhanced value is given to the final product at a much less than proportionate cost. The mixture, containing about 73 per cent water, is then pumped into the dryer, which is one of the most important pieces of apparatus in the whole plant. It consists essentially of a cylindrical vertical casing containing a series of arms and platforms revolving upon a centre shaft, and between fixed arms and platforms. The platforms have large perforations in the shape of sectors of a circle, and the mixture which is fed in at the top is scraped over the surface of the plates and gradually falls through the dryer to the outlet at the bottom. Air at a temperature of about 450 deg. Fahr. is blown in at the bottom and passes out at the top of the machine. The dried product then falls into a disintegrator, consisting of a revolving paddle, which beats up the product into a powder, which is blown out at one end of the machine by a draught of hot air.

I have referred to the process throughout as a fermentation one, but it is probably even more correct to speak of it as a digestive process. The introduction of yeast into the sludge evidently provides stimulating food for the putrefactive bacteria, as the rapidity with which the solid part of the sludge is separated from the liquid part is one of the extraordinary features of the process; but, however it may be designated, its

merits are sufficiently conspicuous to warrant me in saying that its discovery marks a decided advance in the treatment of sewage sludge which no engineer can afford to ignore. Apart from the hygienic and profit-making elements, I attach much importance to the utilisation of the nitrogen of sludge, which, up till now, has been literally thrown away.

I do not endorse the language, but I recommend to your notice the sentiments of Liebig, who wrote more than half a century ago words that now appear to have had a wonderful insight into the future: "Nothing will more certainly consummate the ruin of England than a scarcity of fertilisers—it means a scarcity of food. It is impossible that such a sinful violation of the Divine Laws of Nature should for ever remain unpunished, and the time will probably come for England sooner than for any other country, when, with all her wealth in gold, iron and coal, she will be unable to buy one-thousandth part of the food which she has during hundreds of years thrown recklessly away."

Liebig was probably much too pessimistic, but the very suggestion of possible calamity should stimulate us to do whatever is possible to avert even an echo of it. In conclusion, allow me to remind you again that an engineer's profession is the art of directing the great sources of power in Nature for the use and convenience of man.

In proposing a vote of thanks to Mr. Watson, Mr. A. P. I. COTTERELL said that in his masterly address the president had spoken emphatically as to the present from the basis of practical experience, and had taken them confidently into the future. The various phases of sewage purification with which the address dealt were phases as to which he was not speaking from the book, but from what he had actually ascertained by his own personal research on one of the largest, if not the largest, works in the world. The remarks which had been made upon the sludge question were such as warranted their very careful consideration; the problem was not one which should be regarded as insoluble.

Prof. BOSTOCK HILL, in seconding, said that everyone who knew Mr. Watson's work was aware that the sanitary world, and Great Britain in particular, were indebted to him for extraordinary advances in the treatment of sewage.

Mr. COLIN FRYE and Dr. S. RIDEAL having spoken in support, Mr. BOULNOIS put the vote of thanks to the meeting, remarking in doing so upon the practical nature of Mr. Watson's address. Dealing with the question of the utilisation of sludge, Mr. Boulnois observed that farmers, owing to the cost of labour and transport, favoured the use of concentrated manure, adding that, until sludge could be sold at a rate commensurate with the little manurial value it possessed, he doubted very much whether it would make much headway in the direction suggested. Concluding, Mr. Boulnois said he regarded Mr. Watson's address as an augury of the success of the institute in the future.

The vote of thanks was carried, and, Mr. Watson having replied, the proceedings terminated.

To Manufacturers.—Mr. L. W. Wynne-Roberts, B.Sc., of Regina, Canada, who is engaged in connection with various public works of importance in that city, and who is at present on a visit to England, is desirous of obtaining manufacturers' catalogues and other information referring to heating, lighting, ventilation, water softening and sewage disposal. Communications should be addressed to Mr. Wynne-Roberts, c/o The Editor.

Municipal Employees and Christmas Boxes.—At a meeting, last week, of the Bradford Cleansing and Team Labour Committee the following resolution was passed: "That from this date any workman employed by the Cleansing and Team Labour Committee soliciting Christmas Boxes, New Year gifts, or gratuities of any description at any time of the year, shall be instantly dismissed." The resolution is to be strictly enforced. We are given to understand that the question has not been brought forward by the committee of management to take away an old privilege from the men, but raised entirely by one of the men themselves who had been away from work for over five weeks before Christmas owing to an accident to his leg, spending his time, although in receipt of his full pay of 50s. per week, going about the city Christmas Boxing. The workman has been dismissed, and the committee have decided to stop the practice altogether.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. INST. C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

369. Tree Guards. Give sketches of an economical and sightly tree guard, suitable for good-class residential roads, with details of cost of same. Ordinary iron guards are barred because of "stiff" appearance and high initial cost. (Togun.)

370. Temporary Building Design.—A temporary building is required, 50 ft. long, 30 ft. wide, and 10 ft. to eaves. Design a suitable structure, with steel trusses and stanchions, to be covered with corrugated iron on boards and felt, the bays to be filled in with 4-in. reinforced brickwork. (J. M. N., *Hitchin*.)

372. Cemetery Lay-out. A new cemetery is to be provided in an urban district having a population of 17,000, increasing at the rate of 800 per annum. Flat, meadow land, in a suitable position, having frontage to a district road (sewered), can be obtained at £350 per acre; subsoil, 5 ft. ballast overlying stiff clay. State area of land which should be acquired; give an approximate estimate of the cost of laying out the same, including buildings; state also principles governing the lay-out, and describe in detail method of drainage, arrangement of plots, disposition of buildings, &c. (Togun.)

373. Strength of Shaft.—What is the safe diameter of a wrought-iron shaft to transmit 60-h p. at 120 revolutions per minute? (T. R.)

374. Magnetic North.—What is the difference in degrees between the magnetic and true north? (J. T. C., *Nottingham*.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

367. Building Construction.—What is the meaning of the following technical terms? Give sketches, if necessary: (a) Guide piles, (b) efflorescence, (c) lewis, (d) hollow roll, (e) couple close. (Puzzled.)

(a) Guide piles (Fig. 1) are 9-in. x 9-in. or 12-in. x 12-in. timbers, driven at intervals of 8 ft. to 10 ft.,

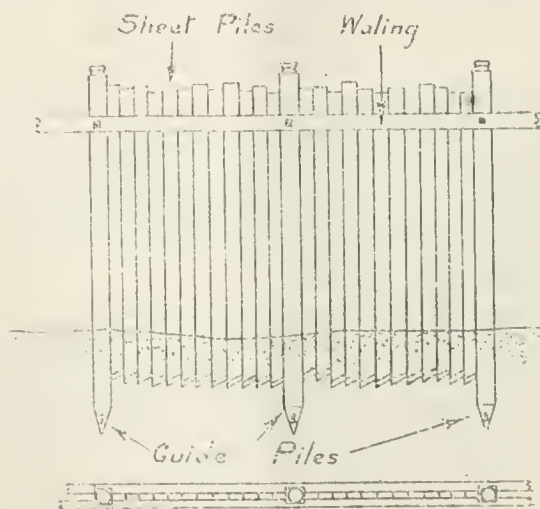


FIG. 1.

to which are attached the walings for the support of sheet piling.

(b) Efflorescence is the name given to the white patches which sometimes appear on the surface of brickwork when it is drying. The chemical composition varies, but crystals of the sulphates of

lime and magnesia are the commonest cause of efflorescence.

(c) A lewis, or lewis bolt, is used for lifting a block

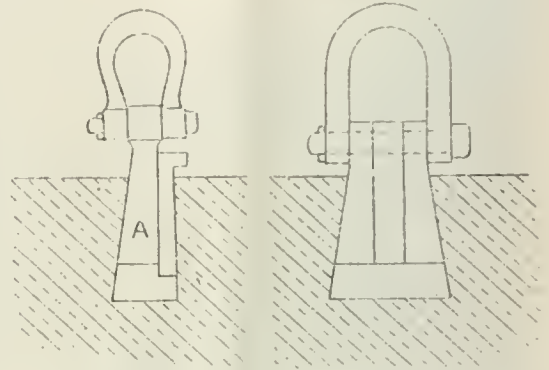


FIG. 2.

FIG. 3.

of stone by means of an undercut hole sunk in the upper surface. The lewis consists of a shackle

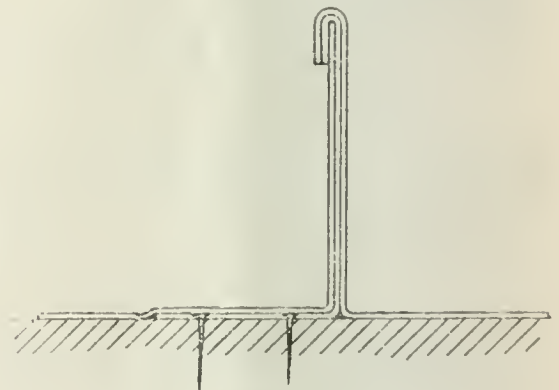


FIG. 4.

attached to a wedge A (Fig. 2), whose widest part is sufficiently narrow to enter the hole, and when in it

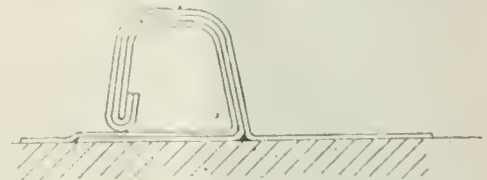


FIG. 5.

is held tightly by a loose key driven in at the side. To release the lewis, it is knocked down with a

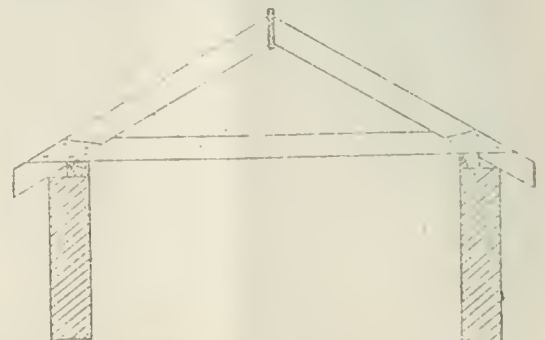


FIG. 6.

hammer, and the loose key can then be removed, and the wedge lifted out. Another form of lewis bolt is shown in Fig. 3.

(d) A hollow roll is employed to join the sheets of lead covering a roof, so as to allow of expansion and contraction without buckling. The edges of adjoining sheets are turned up about 6 in. and 7 in. respectively, and the 7-in. one is folded over the other as shown (Fig. 4). The flap of lead so formed is then bent over till the edge touches the roof, forming a hollow roll. Clips, about 2 in. wide, are nailed to the boarding at intervals of 2 ft., and are folded in between the sheets of lead, as shown in Figs. 4 and 5. They serve to secure the lead firmly to the boarding.

(e) A couple-close roof (Fig. 6) is one where the ceiling joists are nailed to the feet of the rafters. Sometimes the ceiling joists may be sunk and dove-tailed into the rafters as shown. This form of roof is only suitable for spans not exceeding 18 ft. or 20 ft. (W. H. H., *Southwark*.)

371. Testing Stoneware Pipes.—What is the maximum head of water which may safely be applied in the testing of stoneware pipes? Does the diameter of the pipe affect the safe head? If the head be excessive will failure occur first in the pipes themselves or at the joints—ordinary cement or Stanford and cement? Give references to publications, &c., where details of tests are set out. (Togun.)

The maximum head of water which may be safely applied to stoneware pipes, or pipes of other material, is found thus:—

$$H = \frac{46 \times t \times F}{f \times d}$$

- H = head in feet,
- t = thickness of pipe in inches,
- F = tensional breaking stress of material,
- f = factor of safety,
- d = diameter of pipe in inches.

A fairly large factor of safety should be used—say, about 25—as the pipes are brittle, and not always of even texture.

The diameter will certainly affect the safe head, as can be seen by the above formula.

If the joints are well made and undisturbed, fracture due to an excessive head may first occur in the pipes themselves; but if the pipes be affected by mechanical or earth tremors, the joints would be likely to give trouble first.

R.I.A. Horse Shoe Competition.—Over 750 horse shoes have been entered for the Roads Improvement Association's £100 Horse Shoe Competition for which the Royal Society for the Prevention of Cruelty to Animals have presented the prize money. Shoes have been received from the United States, Canada, China, Germany, Holland, France, Australia, South Africa, and all parts of the United Kingdom.

Hastings Tramways Condemned.—For many years past a tramway service has been maintained along the Hastings front, worked on the Dolter stud system. The tramway has now been condemned by the Board of Trade, and the town council have been informed that the order to stop the service must take effect forthwith. Recently the tramway company sought powers to instal the overhead system, but their Parliamentary Bill was thrown out.

Corporation's Profits in Properly Deal.—At the last meeting of Lancaster Town Council Mr. Bell (chairman of the Properties Committee) said a few years ago the corporation spent £25,294 in the purchase of property at the southern entrance to the town, and in carrying out street widening. They had received for the sale of land, and for the sites of two hotels, £23,538, and it was now proposed to sell other land for £400 and £2,900, so that already the receipts amounted to £26,438, or £1,143 more than the cost to the corporation. There was still 960 sq. yds. of land, with frontage to the main street, the value of which was about £2,000.

Designs for Chelmsford Schools.—The following architects have been invited by the Chelmsford Education Committee to submit designs for two elementary schools to be erected in the borough: Messrs. P. M. Beaumont, Maldon; J. T. Bressey & Son, 91 and 93 Bishopsgate, E.C.; P. Brockbank, 13, 14 and 15 County Chambers, Southend; H. J. Chetwood, 5 Bedford-row, W.C.; W. D. Clark, 3 High-street, Colchester; N. J. Dawson, 17 Duke-street, Chelmsford; C. J. Dawson, 11 Cranbrook-road, Ilford; Goodey & Cressal, St. Peter's Chambers, High-street, Colchester; H. Harrington, 234 Bishopsgate, E.C.; A. S. R. Ley, 214 Bishopsgate, E.C.; J. W. Start, High-street, Colchester, and L. T. Weaser, 132 High-street, Southend.

“THE SURVEYOR” SPECIAL ISSUE.

CHIEF FEATURES.

In the Special Annual Issue of THE SURVEYOR, to be published on January 30th, the customary comprehensive list of the works projected by the various local authorities for 1914 will, as usual, be preceded by a series of

ARTICLES CONTRIBUTED BY SPECIALISTS

reviewing the progress which has taken place during the past year in connection with sewerage and sewage disposal, road work, water supply, refuse disposal, street lighting, electricity supply, bridge construction and the provision of public buildings.

LAW AND LITERATURE.

The legal precedents and legislation of 1913 in relation to municipal engineering will be reviewed by the Law Editor, Mr. J. B. Reignier Conder, while another valuable feature of the issue will be a survey of the year's literature of municipal engineering.

In addition there will be the customary Law Notes, Reports of Municipal Work in Progress, Local Government Board Inquiries, Personal News, and the fullest information relating to Vacant Appointments, Municipal Contracts and Competitions.

WORKS PROJECTED.

As stated in our last issue, those of our readers who propose to comply with our request for particulars of works projected in their districts will greatly oblige us and facilitate the production of the Special Number by forwarding their returns without delay.

The form which these should take is now generally understood, but the exact nature of the information sought can be seen by reference to our issue of January 31st last, over thirty pages of which were devoted to the publication of these official forecasts.

We would repeat what we have said in previous years—that any other material which readers may consider sufficiently interesting for inclusion in the issue will be welcomed, and this matter also, particularly if its use involves the reproduction of drawings or photographs, should likewise reach us at the earliest possible moment.

To non-subscribers, it may be added, the price of the Special Issue will be 1s., but subscribers will receive their copies without extra charge.

The Adamant Stone Company's Diary.—We have to thank the Adamant Stone and Paving Company, Limited, for a 1914 pocket-book diary, which is quite one of the most tasteful and complete that have come under our notice. The firm have been established for over a quarter of a century, and the special merits of their reconstructed Aberdeen granite slabs are now so generally known that we need say nothing laudatory of them here. We would only add that the London offices of the company are at Palace Chambers, 9 Bridge-street, Westminster.

Lower Thames Valley District Surveyors' Association.—The usual monthly meeting of the above association was held at the Town Hall, Twickenham, on Saturday evening last, the 3rd instant, when a good number of members attended. Both the president and vice-president were unfortunately absent through illness, and Mr. M. Hainsworth was elected chairman for the evening. The proposed Superannuation Bill, promoted by the National Association of Local Government Officers, was discussed, and a sub-committee was appointed to consider the question of obtaining the support of the Members of Parliament for the Parliamentary Divisions comprised in the area represented by the association. Mr. E. Willis opened a discussion on the Middlesex County Council Western Road Bill, and the Brentford Gas Company's Bill, and gave an explanation of the various provisions of these measures. The question of connections to public sewers and the fixing of hydrants in streets was also discussed.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Aldershot U.D.C. (December 23rd. Major J. Stewart).—£765 for the erection of sanitary conveniences in Barrack-road and The Grove.—During the consideration of the details of the proposed underground convenience in The Grove, the inspector mentioned the strength of the roof, and asked what would happen if a motor bus broke through the railings and rested half-way on the roof? "Would it go through?" he asked. "Such things have happened, and I believe the effects have not been quite so bad as one expects." The surveyor (Mr. F. C. Uren) promised to reconstruct the roof to carry a greater weight.

Burnley T.C. (December 30th. Mr. M. K. North).—£5,000 for the waterworks undertaking.—The town clerk, Mr. P. Thomas, stated that the total was made up of £2,210 for construction of mains for supplying the Lowerhouse and Cheapside districts, and £2,790 for the general extension of mains.

Chapel-en-le-Frith R.D.C. (January 1st. Major J. Stewart).—£1,320 for water main extensions. It was stated by Mr. J. B. Boycott, clerk to the council, that during the last dry summer urgent necessity for the extensions was clearly proved. Representations had been made to the Local Government Board by property owners about the present unsatisfactory supply of water. Some of the extensions would be of considerable benefit, and would probably lead to further building. The schemes were explained in detail, and the plans presented by Messrs. Brady & Partington, the council's engineers. There was no opposition.

Kendal T.C. (December 17th. Mr. Edgar Dudley).—£3,875 for the widening and improving of Allhallows-lane.—The town clerk, Mr. J. E. Bolton, stated that the application was to borrow part of the sum (£3,000) for sixty years. He explained that Allhallows-lane ran up from High-street, opposite the town hall, and was formerly the main road to Underbarrow and Ulverston. There was a considerable amount of traffic there, and it was the central means of access to the west of the town. When they advanced on that road a little distance there was a hill with a steep gradient. The borough surveyor (Mr. F. W. Oxberry) said the length of the proposed improvement was 118 ft. The maximum width at present was 19 ft., the new minimum will be 36 ft., and the new maximum 43 ft. 5 in. In the course of the inquiry the inspector asked why the council preferred to give £3,500, nearly double what it seems to him the site was worth, when they had only to go to the board for compulsory powers, which would cost at the outside £20.

Oldham T.C. (December 18th. Mr. M. K. North).—£3,300 for the purpose of providing public wash-houses on a site adjoining Robin Hill Baths.—The town clerk, Mr. J. H. Hallsworth, stated that the corporation had powers to construct wash-houses, but they had not been exercised up to the present time. The Baths Committee felt they had good reason why a scheme of this kind should be tried. Public wash-houses had been established in large towns, and in the neighbouring city of Manchester six had been very successful and much appreciated. Oldham was essentially a working-class town. There were mostly four-roomed cottages for the people, and there was no very adequate provision in these houses for the carrying out of the family washing. The baths at Robin Hill adjoined the refuse destructor, and it was proposed to use the waste steam from the destructor for the purpose of boiling water used for washing the clothes. Electric motors would be used for the purpose of driving the machinery. The town clerk added that the £3,300 was made up as follows: Cost of building £1,902, plant and equipment £1,158, contingencies £240. The plant would consist of a steam boiler, three electric motors, four hydro-extractors, twenty wash-stalls, twenty drying-horses, two mangles, and one calorifier.

Rathmines U.D.C. (December 18th. Mr. P. C. Cowan).—£12,160 and £13,660 for the purpose of extending the electricity works and purchasing a free wiring installation, and constructing sewers.—There was no opposition to either of the proposals. Mr.

Dixon, engineer to the council, gave evidence as to the manner in which it was proposed to carry out the sewerage scheme. He said that portions of the district were served with old, antiquated sewers, and it was a matter of great importance that a more modern system should be introduced. The inspector: This scheme is the second instalment of a proposed improvement in the sewerage of the district? Mr. Dixon: Yes, that is so. Mr. G. F. Pilditch, electrical engineer, stated the case for the proposed extension of the electricity works.

APPLICATIONS FOR LOANS.

Beckenham U.D.C.—£5,000 for resurfacing Bromley-road.

Belfast T.C.—£15,000 for laying out lands at Drumbadrought as a park.

Beverley R.D.C.—£9,583 for a drainage scheme.

Bristol T.C.—£1,110 for street widenings.

Coventry T.C.—£999 for road improvement purposes.

Dover T.C.—£6,065 for working-class dwellings, and £2,665 for paving works.

Highworth R.D.C.—£785 for working-class dwellings.

Lowisham B.C.—£1,000 for new hot-water apparatus at Forest Hill baths.

Leyburn R.D.C.—£2,400 for the Middleham sewage disposal scheme.

Loftus U.D.C.—£2,000 for street improvements.

Rochdale T.C.—£68,500 for the extension of the electricity plant.

Wells R.D.C.—£1,500 for the provision of dwellings.

Winchester T.C.—£358 for surface-water drainage.

LOANS SANCTIONED.

Chester T.C.—£2,100, repayable in eighty years, for the purchase of 12½ acres in Saltney for the provision of workmen's cottages.

Doncaster T.C.—£12,000 for the purchase of property for the widening of St. Sepulchre Gate.

Ludlow R.D.C.—£351 for sinking a borehole and making tests in connection with the Craven Arms water supply.

Market Bosworth R.D.C.—£2,189 for the erection of twelve working-class dwellings.

Northwich U.D.C.—£8,500 for the purchase of land and the erection of forty-eight cottages.

Precsall U.D.C.—£500 for improvements to the promenade.

Todmorden T.C.—£8,050 for electricity and road widening purposes.

York T.C.—£1,765 for laying out public gardens, and £8,370 for road improvement works.

Ystradgynlais R.D.C.—£11,925 for the provision of workmen's houses.

Winchester T.C.—£320 for road widening.

FORTHCOMING INQUIRIES.

	£
13.— Braintree. For the erection of a bridge (Mr. H. Shelford Bidwell)	1,000
13.— Derby. For the purchase of property for road widening (Mr. F. H. Tulloch)	5,272
13.— Easington. For works of sewerage (Mr. P. M. Crosthwaite)	23,000
13.— Liverpool. For municipal buildings extension (Major C. E. Norton)	19,400
13.— Market Bosworth. For sewage disposal purposes (Mr. R. G. Hetherington)	—
14.— Nottingham. For works of paving (Mr. F. H. Tulloch)	23,000
15.— Bournemouth. For laying out a cemetery (Mr. W. O. E. Meade-King)	5,000
15.— Morpeth. For works of sewerage (Mr. P. M. Crosthwaite)	9,000
15.— Woodhall Spa. For works of sewerage (Mr. F. H. Tulloch)	560
16.— Ardley. For works of sewage disposal (Mr. R. G. Hetherington)	600
16.— Itchen. For the purchase of a Mann combination steam roller (Mr. W. O. E. Meade-King)	650
16.— Sevenoaks. For the provision of public conveniences (Mr. F. H. Tulloch)	600
16.— Whitefield. For housing purposes (Mr. C. H. Eyles)	14,600

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Brighton, Essex £3,800, Wealdstone £2,000; housing and town planning—Dover £6,065; roads and materials—Birmingham, Grimsby, Keighley £2,200, Middlesbrough £3,600, Salisbury £3,380, Stepney; sewerage and sewage disposal—Bishop's Stortford £3,000, Leyburn £2,400, Stowmarket £6,000, Swansea £19,000; water, gas and electricity—Basingstoke £14,000, Cardiff £48,330, Dunoon £6,970.—Particulars of other projected works will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Brighton T.C.—The plans for the proposed kursaal have been prepared by Messrs. Clayton & Black, of Brighton.

Cardiff T.C.—A modified scheme, estimated to cost £500, has been agreed upon by the Parks Committee for the building of a bridge over the lake out-wash in Roath Park, and adding to the accommodation round the bandstand.—The Finance Committee have decided, at the request of the Waterworks Committee, to recommend the council to ask the Local Government Board to sanction a loan of £500 for a house for the use of the manager at the western sewerage works, and £560 for a shed at the works for fuel and for sheltering the stokers. The house, it was pointed out, was needed in order that the manager might reside on the spot, and a rent would be charged him for it.

Eccles T.C.—It is proposed to carry out extensions of the town hall for the purpose of Health Committee offices, at a cost of £1,140.

Essex C.C.—The Education Committee have approved the plans for the extension of the county high school for girls at Chelmsford, at an estimated cost of £3,800.

Farnham R.D.C.—It has been agreed to proceed with the rebuilding of Ash Vale bridge. The War Office has promised a contribution of £200 towards the cost.

Londonderry C.C.—The new technical school at Magherafelt was formally opened last week. The building and equipment are estimated to cost £2,200.

Norfolk C.C.—Mr. Harvey Mason, in moving the adoption of the report of the Joint Bridges Committee at a meeting on Saturday last, said he hoped the council would appreciate the work the county surveyor (Mr. T. H. B. Heslop) had done in regard to the bridges. He had had a great deal to do, and his health had further broken down under the strain. He hoped the bridges would be found to be satisfactory when finished. There had not been much public discussion upon the subject, but some complaints had been made because a temporary bridge was not erected at once. That, however, was put right after a time. Then there was some discussion about the appearance of one or two of the bridges. The modern forms of construction did not add to the artistic appearance of bridges. They had to be constructed to meet modern traffic, and he was glad to be able to say that the bridges built by the county surveyor would withstand any future floods, as those he had previously put up resisted the flood of 1912.

Rotherham T.C.—It is proposed to build a new administrative block at the Kimberworth hospital, at an estimated cost of £1,250.

Shoreham U.D.C.—A scheme has been adopted for the construction of two additional rooms at the town hall, and also public baths.

Wealdstone U.D.C.—Improvements are to be carried out at the municipal offices, at an estimated cost of £2,000.

HOUSING AND TOWN PLANNING.

Bristol T.C.—The council have adopted an instruction to the Health Committee to frame a scheme under the Housing of the Working Classes Act, 1890 (Part III.), with the view to providing suitable dwellings for the working classes where required.

Dover T.C.—A scheme for the erection of twenty-four cottages in Beach-street is to be carried out, at an estimated cost of £6,065.

Foleshill R.D.C.—The surveyor, Mr. A. E. Newey, has received instructions to prepare a scheme for the building of working-class dwellings.

Haverfordwest R.D.C.—It has been agreed to build sixty-six houses in the various parishes of the rural district.

Narberth R.D.C.—At the monthly meeting on Monday a letter was read from the Local Government Board relative to the provision of workmen's cottages for St. Issill's parish. The board stated that they could not allow the matter to be further postponed, and the council must therefore submit within two months a scheme to be approved by the board. If that was not done the board would issue an Order declaring the council in default. The chairman (Mr. Lewis Thomas) said they had appointed an architect, and he would prepare plans.

Scalby U.D.C.—An offer by the Duchy of Lancaster of 12 acres of land fronting on Hackness-road for housing purposes has been accepted, and it is proposed to erect dwellings from plans prepared by the surveyor, Mr. J. A. Iveson. Councillor Hill, referring to these plans, said he thought they reflected great credit on the surveyor. He was on a building committee elsewhere, but no such plan had been brought before them so neat and so well thought-out as Mr. Iveson's.

Stoke-on-Trent T.C.—A letter has been received from the Local Government Board calling attention to the default of the council in the systematic inspection of houses. It was stated in explanation that, owing to the reduction of the health department's staff on the ground of expense, it was found impossible to carry out the work, and if an improvement were desired, there would have to be a reorganisation.

Tonbridge R.D.C.—The surveyor, Mr. Frank Harris, has submitted a balance-sheet for the proposed cottages in the parishes of Brenehley, Hadlow, Hildenborough, Harmondton and Pembury, showing the cost of the cottages to be £165 respectively in two designs and £170 in one. The surveyor reported that he had studied every detail with a view to economy. It was somewhat difficult to acquire suitable sites in Hildenborough and Pembury, the land being of a higher value than in other parts of the district.

PARKS AND OPEN SPACES.

Birmingham T.C.—The city council have accepted the offer of Mr. George Cadbury of 5 acres of freehold land at King's Norton for a recreation ground.

Oldham T.C.—The borough surveyor, Mr. E. C. Foote, has reported that the cost of the scheme for Waterhead Park will probably be about £2,600. The area consists of about 15 acres. The matter is under the consideration of the Parks Committee.

Scarborough T.C.—It has been agreed to lay out a tournament bowling green, at an estimated cost of £500.

Sidmouth U.D.C.—It has been agreed to offer £4,250 for the Blackmore Hall estate for conversion into a public park.

Southgate U.D.C.—The laying out of Broomfield Park, at an estimated cost of £2,000, is under consideration.

ROADS AND MATERIALS.

Amersham R.D.C.—It is proposed to make up Long Park-avenue, at an estimated cost of £793.

Ashburton U.D.C.—The council have adopted a recommendation of the Highways Committee that, in preparing the specifications for main and other road contracts for the next three years, the surveyor, Mr. A. Wilson, should insert a clause making it compulsory for the contractor to pay not less than 1s. 6d. per yard for the breaking of Chuley Quarry stone.

Belfast T.C.—After inspecting the site of the proposed public improvement and the plan for laying out streets, the Improvements Committee have adopted the scheme with slight modifications.

Birmingham T.C.—The Finance Committee have been authorised to borrow the sum of £7,550 to cover the cost of constructing the corporation's portion of that section of the new road from Salford Bridge to Kingsbury-road lying between Salford Bridge and Wheelwright-road, together with the length of the

extension between Wheelwright-road and Broadford-lane.

East Kerrier R.D.C.—On the recommendation of the Finance Committee, it was decided to grant the council workmen a general advance in wages of 4d. per day, the increase to commence from January 1st. The surveyor, Mr. J. H. Chubb, was instructed to inform the men that they were expected to work from 7.30 a.m. to 5 p.m., with an hour for dinner, the hours on Saturday to be from 7.30 to 1 p.m. By this arrangement three foremen would receive 21s. per week against 19s. previously, and the other men 20s. against 18s.

Eccles T.C.—Plans have been passed for a new street between Barton-lane and Trafford-road.

Exeter T.C.—The council have asked the Streets Committee to report upon a street improvement scheme, estimated to cost £3,000.

Grimsby T.C.—A £22,000 scheme for the widening and straightening of Weelsby-road and the construction of a subway under the Great Northern Railway has been considered by the Highways Committee. The borough surveyor, Mr. H. Gilbert Whyatt, submitted sketches. The purchase price of the land required for the widening and the cost of straightening the road would be £11,000, and the cost of the subway proposals a further £11,200. The subway would be 60 ft. wide, and it would be necessary to raise the railway track 8 ft. for a considerable length. The committee have resolved to approach the Development Commissioners and the railway company with a view to ascertaining what proportion of the cost they might be prepared to bear.

Halifax T.C.—Road improvement works are to be carried out, at an estimated cost of £1,926.

Horsham U.D.C.—The surveyor, Mr. R. Renwick, has prepared an estimate of the cost of completing a number of roads on the Grandford estate, and a sub-committee has been appointed to consider the details of the scheme.

Hull T.C.—Negotiations are in progress for the purchase of land for the purpose of improvements at Marfleet.

Kcighley T.C.—A new road is to be made from West-lane to Devonshire-street, at an estimated cost of £2,200.

Leeds T.C.—It is proposed to purchase for improvement purposes, at a cost of £2,800, property abutting upon Burley-street and Newton-street, comprising an approximate area of 1,077 sq. yds., and property in Burley-road, between Newton-street and Pembroke-street, comprising an approximate area of 230 sq. yds.

Middlesbrough T.C.—Upon the advice of the borough engineer, Mr. S. E. Burgess, it has been decided to pave Smeaton-street with whinstone cubes, at an estimated cost of £3,600.

Newton Abbot R.D.C.—It has been resolved to carry out a further improvement in the Widecombe-road at an estimated cost of £70.

Norfolk C.C.—At a meeting of the council on Saturday a proposition was carried that the salaries of the district surveyors should be £110 a year upon appointment, to include all travelling expenses, instead of £130 a.s. at present, and should be increased by £10 for the year ending December 31, 1914, and thereafter should be increased at the rate of £5 a year up to £180. The Road Development Committee submitted a report stating that they had considered a scheme from the county surveyor, Mr. T. H. B. Heslop. The letter from the Road Board, dated April 25th, stated that the board would favourably consider an application for a grant of £14,000 towards road reconstruction work, to be carried out in the year ending March 31, 1915. The committee therefore recommend the council to make application to the Road Board for a grant in respect of this scheme, and that if such grant be given the work be proceeded with as recommended by the county surveyor.

Salisbury T.C.—The General Purposes Committee have been requested to consider a scheme of main roads improvement, estimated to cost £3,380.

Sidmouth U.D.C.—The question of the extension and widening of the Esplanade, and the provision of suitable lavatory accommodation, at an estimated cost of £3,000, has been referred to the General Purposes Committee for report.

Stepney B.C.—The Road Board have promised a grant of £4,750 towards the cost of an extension scheme of road improvement which it is intended to carry out.

Stockton R.D.C.—The tender of Mr. G. A. Revell, Stockton, at £317, has been accepted for private street works.

Todmorden T.C.—The proposed loan for the widening of Burnley-road has been sanctioned by the Local Government Board.

SEWERAGE AND SEWAGE DISPOSAL.

Belper R.D.C.—A sewage scheme for Denby is to be carried out at an estimated cost of £350.

Bishop's Stortford U.D.C.—A new sewerage scheme for the Hockerill district is to be carried out at an estimated cost of £3,000.

Elland U.D.C.—An engineer has been called in to advise the council with respect to the sewage disposal works, which had been inefficient for some time past.

Hexham R.D.C.—The tender of Mr. Isaac Lishman, at £220, has been accepted for the execution of the Horsley sewerage scheme.

Leyburn R.D.C.—A sewage disposal scheme for Middleham is to be carried out at a cost of £2,100.

Sheffield T.C.—It is announced that it is the intention of the corporation to prepare, ready for submission to the Local Government Board by January 31, 1915, a complete scheme for the full treatment of the city's sewage.

Stowmarket U.D.C.—The proposed scheme of sewerage, for which Mr. G. Midgley Taylor is engineer, is estimated to cost £6,000.

Swansea R.D.C.—The council have approved a drainage scheme which is estimated to cost £19,000.

Weetslade U.D.C.—It has been agreed to proceed with the scheme of Mr. C. Murphy, of Morpeth, for dealing with the whole of the council's sewage at Amnitsford.

WATER, GAS, AND ELECTRICITY.

Barnstaple R.D.C.—It has been agreed to adopt the Shencombe scheme for the purpose of the Coombe Martin water supply, and Messrs. Montague, Luke & Partners have been requested to proceed with the necessary plans and details.

Basingstoke T.C.—A scheme for lighting the town by electricity, estimated to cost £14,000, has been prepared by the borough surveyor and waterworks engineer, Mr. F. R. Phipps.

Cardiff T.C.—The waterworks engineer, Mr. C. H. Priestley, has submitted a report to the Waterworks Committee advising the construction of new trunk mains from Llanishen or Lisvane reservoirs to the Heath filter beds, at an estimated cost of £48,380.

Coleraine U.D.C.—A report by the gas manager with regard to the extension and improvement of the gas-works, at an estimated cost of £3,000 has been referred to a committee for consideration.

Dewsbury T.C.—The Gas and Water Committee have decided to extend the gas mains from Whitley to Briestfield, and from the Wool Pack Inn to the Bebo at Whitley, at an estimated cost of £1,000, for the lighting of those districts. The Dewsbury gas manager has also been directed to write to the Grange Moor District Council, asking them to receive a deputation with respect to the lighting of that district, which is outside the Dewsbury Borough area.

Dunoon T.C.—It has been agreed to proceed with the erection of a new reservoir above the present one in order to give an addition of 17,500,000 gallons. The cost is estimated at £6,970.

Newton Abbot R.D.C.—The question of the extension of the Chudleigh water main to the station has been referred to the Parochial Committee for consideration.

MISCELLANEOUS.

Liverpool T.C.—An important scheme for dealing with the traffic problem of the city and port of Liverpool was presented last week to the Liverpool Tramways Committee by Mr. C. W. Mallins, general manager of the city tramway. With the view of relieving the street congestion in the centre of the city, and improving communication with Birkenhead and Wallasey, he suggests the construction of a new tunnel under the Mersey, of sufficient width to accommodate fast and slow traffic. A site adjoining the Old Haymarket is proposed as the starting-point on the Liverpool side, and the cost is estimated at £3,000,000.

Todmorden T.C.—It has been agreed to purchase a motor fire engine and motor ambulance carriage at an estimated cost of £1,600.

PERSONAL.

Mr. P. C. Woodhall, borough engineer and surveyor of Blandford, has been voted an increase of salary.

Mr. G. W. Egglestone, surveyor to the Weardale Rural District Council, has had his salary increased from £130 to £150 a year.

Mr. W. Auerbach has been appointed director of Claridge's Patent Asphalt Company, Limited, in place of Mr. F. T. Cutbill, deceased.

Mr. F. Court, for eight and a-half years surveyor to the Bilston Urban District Council, has resigned with the object of taking service with a firm of contractors.

Mr. Henry Jones Lanchester, F.R.I.C.E., who was responsible for laying out, forty-three years ago, the best part of Hove, died, we regret to state, last week.

Mr. H. T. Chapman, the recently elected county surveyor of Kent, entered upon his new office on January 1st, but he will also give attention to Somerset county affairs until his successor, Mr. Stead, commences his duties.

Mr. Glover, county surveyor of Kildare, has been granted three months' leave of absence to recuperate, and Mr. L. J. Fullam, who has been acting during Mr. Glover's illness, has been appointed temporary county surveyor.

Mr. F. W. Duckworth, surveyor to the Blackburn Rural District Council, has had his salary increased for the current quarter by the sum of £45 for extra and special services as engineer in connection with the Orphanage district sewerage scheme.

Mr. E. Graham, temporary assistant to Mr. J. H. Mole, sanitary surveyor to the Chester-le-Street (Durham) Rural District Council, has been appointed a permanent officer, at a salary of £2 2s. per week. The council have also resolved to appoint a costs clerk in the sanitary surveyor's department, to be under the direct supervision of the clerk to the council.

Mr. J. Williams, for thirty-four years surveyor and sanitary inspector to the Llangollen Rural District Council, has resigned, and at the last meeting the chairman, Mr. D. W. Roberts, and the members generally, spoke in high terms of his services to the district, the hope being expressed unanimously that he might live many years to enjoy his well-earned retirement.

FOR OTHER ADVERTISEMENTS

See End of Paper.

METROPOLITAN BOROUGH OF ISLINGTON.

Wanted, in the Borough Engineer and Surveyor's Department, an Assistant. Must have had experience in the Office of an Engineer and Surveyor, and be able to survey, level, and prepare plans. Selected candidates will be examined as to their professional knowledge.

Salary to commence at £90 per annum, rising by annual increments of £7 10s. to £120 per annum.

Applications, in the handwriting of the candidates, stating age, present employment, and past experience, accompanied by copies of not more than three testimonials of recent date, and endorsed "Engineer's Assistant," must be received by the undersigned not later than 12 noon on Monday, January 26th, 1914.

WM. F. DEWEY,
Town Clerk.

Town Hall, Upper-street,
Islington, N.
January, 1914. (I,133)

SINGAPORE, STRAITS SETTLEMENTS. MUNICIPAL ENGINEER'S DEPARTMENT.

The Municipal Commissioners of the Town of Singapore require an Assistant Engineer, between 25 and 30 years of age, of sound constitution. He must have had a good technical education, a regular training as a Civil Engineer, and have a practical knowledge of Surveying, Levelling and Estimating, and experience in ordinary Municipal work, including the collection, filtration, pumping and distribution of water, and in Sewerage Works, both in the design and in the construction of new works and in ordinary maintenance. Preference will be given to an Assistant connected with the Institution of Civil Engineers.

The engagement will be for three years, and the

applicant is to state the earliest date upon which he could be free to leave for Singapore. The selected candidate must pass a medical examination.

A second-class passage will be provided by mail steamer, or a first-class passage by other steamer, with half-pay during the voyage out.

The salary will be 300 dollars per month for the first, 320 dollars per month for the second, and 340 dollars per month for the third year, paid monthly in dollars, the currency of the Colony, the value of the dollar being two shillings and fourpence sterling. Local transport duty allowance of 60 dollars per month will be paid.

Applications, stating age and place of birth, and giving details of education, training and experience generally, and in Waterworks, Sewerage and Municipal Engineering, and referring to the above requirements seriatim, accompanied by copies (only) of testimonials, and also personal references, to be lodged with C. C. Lindsay, Esq., M.INST.C.E., 180 Hope-street, Glasgow (who will give further particulars if requested), not later than Tuesday, 20th January, 1914. (I,130)

ASSISTANT ENGINEERS and DRAUGHTSMEN required by Sierra Leone Government for Public Works Department for two tours of twelve months, with possible extension.

Engineers, £300—£450—£400. Draughtsmen, £300—£10—£350.

Furnished quarters or allowance.

Free first-class passages. Liberal leave. Age, 25-40.

Candidates for Engineer vacancies should have served articles with an Associate-member of the Institute of Civil Engineers, possess a diploma from some recognised Engineering College, or have been engaged for at least three years from completion of articles on Public Works in British Colony. Must be neat and expeditious draughtsmen, capable of designing and carrying out buildings, bridges and other structures, and of taking out Bills of Quantities and preparing detailed estimates; should have some knowledge of bookkeeping and accounting and office routine, and be competent to execute surveys, take sections, and lay out and construct roads; should have some knowledge of sanitary and water engineering.

Candidates for Draughtsmen vacancies should have had considerable experience in architectural and engineering draughting, and should have held a responsible position in the drawing office of an architect and surveyor or civil engineer in good general practice. Neat and expeditious draughtsmen. They should also have had experience in control of a drawing office staff, and be capable of getting out designs and details of buildings, including steel-frame work, bridges, &c., with some experience in architectural design; should be well up in building construction, the preparation of specifications, bills of quantities and estimates, and preference given to those who have served articles with an architect, surveyor or civil engineer.

Candidates should apply at once to the Crown Agents for the Colonies, Whitehall-gardens, London, S.W. (I,131)

ASSISTANT required in a Civil Engineer's Office, Plymouth. Must be a good Draughtsman, with experience in Levelling. Salary 30s. a week. Apply, giving experience and qualifications, Box 1361, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (I,124)

CANNOCK URBAN DISTRICT COUNCIL. APPOINTMENT OF SURVEYOR'S CLERK.

The Council invite applications for the above appointment. Applicants must have had experience in a Municipal Surveyor's Office, including the keeping of all the various books, and be an efficient shorthand-typist.

The salary will be 25s. per week.

Applications, in candidate's own handwriting, stating age and qualifications, to be addressed and delivered to the undersigned, accompanied by copies of three testimonials, not later than 10 a.m. on Friday, the 30th inst., endorsed, "Surveyor's Clerk." Canvassing will be deemed a disqualification.

C. A. LOXTON,
Clerk to the Council.

Council Offices,
Cannock.
January 7, 1914. (I,129)

CITY OF SHEFFIELD.

DEPARTMENT OF HIGHWAYS AND SEWERS.

ANNUAL CONTRACTS, 1914-15.

The Highway and Sewerage Committee of the City Council are prepared to receive Tenders for the under-mentioned Labour or Materials for the year ending March 25, 1915:—

- Contract No. 1.—Asphalting or Tar Paving (Labour and Materials), for two years.
 Contract No. 2.—Bricks, Red, Blue, Square and Radiated.
 Contract No. 3.—Castings for Sewer and other Work (Manhole Covers, &c.).
 Contract No. 4.—Cement.
 Contract No. 5.—Earthenware Pipes, Blocks, Traps, &c.
 Contract No. 6.—Freestone and Gritstone Kerb and Setts, Flags, Quarry Sand, &c.
 Contract No. 7.—Concrete Flags.
 Contract No. 8.—Granite Setts, Kerb, Ringsmall, Gravel and Chips.
 Contract No. 9.—Limestone (Lump and Chippings).
 Contract No. 10.—Slag Shingle.
 Contract No. 11.—Pitch, Tar, and Creosote Oil.
 Contract No. 12.—Timber (Deals, Cart and Barrow Timber, &c.).
 Contract No. 13.—Iron, Steel, Tools and Sundries.
 Contract No. 14.—General Stores (Oils, Paints, Brushes, &c.).

Particulars and Forms of Tender may be obtained at the office of Mr. W. J. Hadfield, Surveyor of Highways, Town Hall, Sheffield, on payment of the sum of 10s., which will be returned on receipt of a *bonâ-fide* Tender. All applications for and correspondence relating to Tender Forms should be addressed as above. Tenders enclosed in official envelope provided, and (where not otherwise specified) accompanied by samples, addressed to "The Chairman of the Highway and Sewerage Committee," to be delivered at the Surveyor of Highways' Office, not later than 10 o'clock a.m. on Monday, the 26th day of January, 1914. Persons wishing to Tender for Cement are requested to send in sample at the earliest possible date.

The Committee do not bind themselves to accept the lowest or any Tender, and reserve the right to divide the quantities between various Contractors.

(By order)

WILLIAM E. HART,
Town Clerk.

Town Hall, Sheffield.
January 7, 1914.

The Contracts will comprise the Fair Wages and Conditions of Labour Clause which has been adopted by the Sheffield Corporation, particulars of which will appear in the Conditions of Contract. (1,128)

RURAL DISTRICT COUNCIL OF EAST GRINSTEAD.

The above Council invite Tenders for the Supply of 400 cubic yards, more or less, of Fine Compo. Sand, Flint Grit, or other Material suitable for use in connection with the Surface Tarring of Roads.

Tenders should state price per cubic yard, delivered in such quantities and at such times as may be required by the Council's Surveyor, before the 30th September next, to the following Stations, carriage paid:—

- Three Bridges, Rowfant, Grange-road, East Grinstead.
 Forest Row, Hartfield, Withyham, Groombridge, Ashurst.
 Crowborough, West Hoathly, Crawley and Kingscote.

Tenders, sealed and endorsed "Tender for Sand," should reach me on or before Monday, February 2nd, 1914, at my Office at 6 High-street, East Grinstead.

Samples of the Material quoted for must be sent, addressed to me, at the Union Workhouse, East Grinstead.

The Council do not bind themselves to accept the lowest or any Tender.

(Signed) FRANCIS S. WHITE,
Clerk to the Council.

6 High-street,
East Grinstead. (1,127)

RURAL DISTRICT OF CLAYPOLE.

TENDERS FOR ROAD MATERIALS.

The above Council invite TENDERS for the Supply of about 1,850 tons of Granite, and 1,200 tons of Slag, to be delivered in such quantities and at such times and places in their district as the Council or their District Surveyor shall require and direct.

Sealed Tenders, marked "Tender for Road Material," to be delivered to me, the undersigned, not later than Thursday, the 22nd inst.

Samples must be delivered, free of expense, at the Board Room, The Ossington, Newark, on Monday, the 26th inst.

The Council do not bind themselves to accept the lowest or any Tender, and they reserve to themselves the right to accept such part of any Tender as they may deem proper.

The Contractor will be required to enter into a bond for the due fulfilment of his Contract.

Further particulars may be obtained upon application to the District Surveyor, Mr. P. A. Watford, 13 Milner-street, Newark, upon receipt of a stamped and addressed foolscap envelope.

By order of the Council,

A. J. FRANKS, Clerk.

Union Offices, 24 Lombard-street,
Newark, January 6, 1914. (1,126)

CROYDON RURAL DISTRICT COUNCIL.
REBUILDING HACK BRIDGE, WALLINGTON.

The above Council invite Tenders from Contractors licensed to execute Ferro-concrete construction on the Hennebique System for the removal of the present Hack Bridge over the Wandle at Wallington, and the provision of a new ferro-concrete bridge.

Plans and Specifications, prepared by the Council's Surveyor, Mr. Robert Chart, junr., can be inspected, and Forms of Tender obtained at his Office, Katharine-street, Croydon, on payment of £2 (which sum will be returned on receipt of a *bonâ-fide* Tender).

Sealed Tenders, endorsed, "Tender for Hack Bridge," must be delivered to the undersigned before Twelve o'clock noon on Thursday, January 22nd, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

E. J. GOWEN,

Clerk of the Council.

Council Offices,
Katharine-street, Croydon.
January 3, 1914. (1,125)

BOROUGH OF WIMBLEDON.

PRIVATE STREET WORKS.

The Corporation of Wimbledon invite Tenders for the making up of both or either of the following streets—namely:—

- Wilton-grove,
Compton-road (Section 11).

Plans and Specification may be seen, and Form of Tender obtained, at the office of the Borough Engineer and Surveyor, Town Hall, Wimbledon.

A separate Tender for each street must be submitted, and sent in a separate envelope, endorsed "Tender for — Road," addressed to the Chairman of the Buildings and Improvements Committee, Town Hall, Wimbledon.

Last day for receipt of Tenders, Tuesday, 27th January, 1914, at 12 o'clock noon.

The Corporation does not bind itself to accept the lowest or any Tender.

A. STEELE SHELDON,

Town Clerk.

Town Clerk's Office,
Wimbledon.
January 7, 1914. (1,132)

BOROUGH OF BRACKLEY.

SUPPLY OF GRANITE.

The Town Council of the above Borough invite Tenders for the Supply of Granite for the Year ending 31st March, 1915.

Particulars and forms of Tender may be obtained on application to Mr. A. A. Green, Borough Surveyor. Tenders to be delivered at my office on or before the 30th January.

The Town Council do not bind themselves to accept the lowest or any Tender.

C. E. BARNES,

Brackley, Northants.
January 6, 1914. (1,123)

Institution of Water Engineers.

WINTER GENERAL MEETING IN LONDON.

(Conclusion.)

The closing business at the recent winter general meeting of the Institution of Water Engineers, held at Burlington House, was the consideration of a paper on

THE TREATMENT OF PLUMBO-SOLVENT WATER BY MEANS OF MECHANICAL FILTERS.

By FREDERIC JOHN DIXON, ASSOC. M. INST. C.E.

The works of the Ashton-under-Lyne, Stalybridge and Unkinfield (District) Waterworks Joint Committee, where the treatment in question was carried out, were very fully described in our issue of October 12, 1912. For fourteen or fifteen years prior to that date the committee had been treating certain water in the Swineshaw Valley with a neutralising reagent for the purpose of rendering the water non-plumbo-solvent, but as the discoloration and turbidity was not in any way removed under this method of treatment, the joint committee decided, in 1908, to make exhaustive inquiries as to a more up-to-date plant, by which the process of mechanical filtration and chemical treatment could be advantageously applied.

The results of the investigation were incorporated in a report presented by the engineer, when the joint committee immediately decided to put down a small experimental plant at Ashway Gap, for the treatment of the water from the Greenfield reservoir. Three pressure filters with a chemical apparatus capable of dealing with a maximum flow of 432,000 gallons per twenty-four hours, were installed in June, 1909, under Messrs. Mather & Platt's patent.

The results given by the experimental plant during the period under observation were so satisfactory that the joint committee decided to take steps to deal with all the water supplied in their district. The joint committee visited and inspected similar plants installed by other water authorities, and, after careful consideration, decided to instal in both valleys mechanical filters of Messrs. Mather & Platt's pressure type, fitted with patent washing apparatus.

The two installations comprise thirty-six pressure filters, designed to purify collectively 5,352,000 gallons of water per day, and together form one of the largest pressure-filtration schemes in the country. Each installation consists of two major parts—viz., the filters and the chemical plant.

In Mr. Dixon's paper are given tables prepared by Prof. Delépine giving the average results of eight sets of analyses of the unfiltered and filtered water, and the author, in conclusion, submits the following points which have come under his personal notice during the period of working:—

(1) That, where possible, it is advisable to provide means for sedimentation of the raw water prior to treatment and filtration.

(2) That the installation should be fixed on by-pass mains in preference to being fixed direct on trunk mains.

(3) That the apparatus for injecting the chemicals should be provided in duplicate, and so designed as to operate only in direct proportion to the actual rate of flow of the water to be treated.

(4) That every part of the apparatus in contact with chemical solutions should consist of a metal unaffected by such solutions.

(5) That, where possible, a clear-water well should be provided for the filtrate prior to actual distribution. In the author's case it was impracticable to provide this, and the filtrate had to go direct into consumption from the filters, as the reduction of pressure was an important factor in the area to be supplied.

(6) That all chemical tanks should be in duplicate, and each capable of dealing with a twenty-four hours' flow, with facilities for accurate measurements.

(7) That lime tanks are suitable if constructed of iron or steel; but those for alumina should either be built in wood, stoneware or reinforced concrete, so as to be unaffected by the action of the chemicals. The author, however, prefers a reinforced-concrete tank.

(8) That the maximum rate of filtration through an 8-ft. filter should not exceed 6,000 gallons per hour, and provision should be made in the installation, by stand-by plant, for dealing with periods occupied in cleansing.

(9) That all filters, after washing, should be allowed

to "soak" for at least ten minutes, ample provision being made for thoroughly draining off each filter.

(10) That it is essential for the proper cleansing of the medium to have a scouring action in conjunction with actual washing, the water so used being equal in quality to that of the filtrate.

(11) That it is absolutely essential for the mechanical filtration of a plumbo-solvent water to provide a coagulant; the author found that without this the removal of acidity and discoloration is extremely doubtful.

(12) The author finds very little advantage in using graded quartz as a medium over that of Leighton Buzzard sand (or sand of an equal quality). The Leighton Buzzard sand, perhaps, uses slightly more water for efficient cleansing, but the percentage of loss of medium by washing, at any rate in the initial stage of maintenance, was found to be greater in the case of quartz than that of Leighton Buzzard sand.

(13) It is of the greatest importance that the man in charge should be competent to carry out all repairs, manipulate the plant efficiently, and make daily tests of the character of the waters treated for the purpose of correctly ascertaining the quantity of chemicals required from time to time.

DISCUSSION OF MR. DIXON'S PAPER.

The PRESIDENT (Mr. C. Clemesha Smith) said the institution was indebted to Mr. Dixon for his full and complete account of methods adopted by him to deal with a plumbo-solvent water. As he was dealing with a water from the eastern slope of the Pennines, within a few miles of the catchment area referred to in the paper, which had similar characteristics, it might be of some slight interest if he gave one or two comparisons. Wakefield water was the more plumbo-solvent, taking up from 1½ to 2½ grains of lead per gallon, whereas the Ashton water dissolved up to three-quarters of a grain per gallon; hence it was necessary for him to increase the hardness by 1 degree (from 3 to 4 on the average), against an increase of not more than half a degree at Ashton. After filtration and treatment, the water at Wakefield was capable of taking up from 0 to .03 grains per gallon, the Ashton water varying from 0 to .5 per gallon. The sand filters at Wakefield apparently effected a greater chemical change in the water than the mechanical filters at Ashton, for he noticed in his own case that the free ammonia was reduced from .07 parts per 100,000 before filtration to .001 parts per 100,000 after filtration, and the albuminoid ammonia was reduced from .015 parts before filtration to .001 parts after filtration. At Ashton the reduction in the case of free ammonia varied at the different works, the amounts before filtration being .0133, .0074, .0078, .0414, and after filtration .0128, .0072, .0076, and .0019; whereas the albuminoid ammonia before filtration was .0080, .0057, .0065, and .0045, and after filtration .0032, .0025, .0028, and .0020. This greater chemical change in the case of the sand filter was, he thought, to be expected. A few details showing comparative working costs might also be of interest. The cost of treatment and maintenance per 1,000,000 gallons filtered was as follows:—

	Ashton-under-Lyne.	Wakefield.
	s. d.	s. d.
Total cost	7 10	7 0½
Chemicals only	1 11	2 7½
Percentage of water used in washing	.91	.5

Dr. S. WOLFE (Manchester) said he had examined plumbo-solvent water at regular periods, and had adopted the same methods as Professor Delépine, and had found them one of the best means of determining lead in water. The advantages of using carbonate of lime was that it was a neutral substance, and it was very slightly soluble in water, so that even if an excess of carbonate of lime was added no ill-effects could happen as it would be removed by the filters. Another advantage of its use was that no nasty alkalinity got into the water. It was interesting to know that not only soft moorland water, but also that waters which had a permanent hardness, could have an action on lead. It appeared that both should be carefully examined for lead sol-

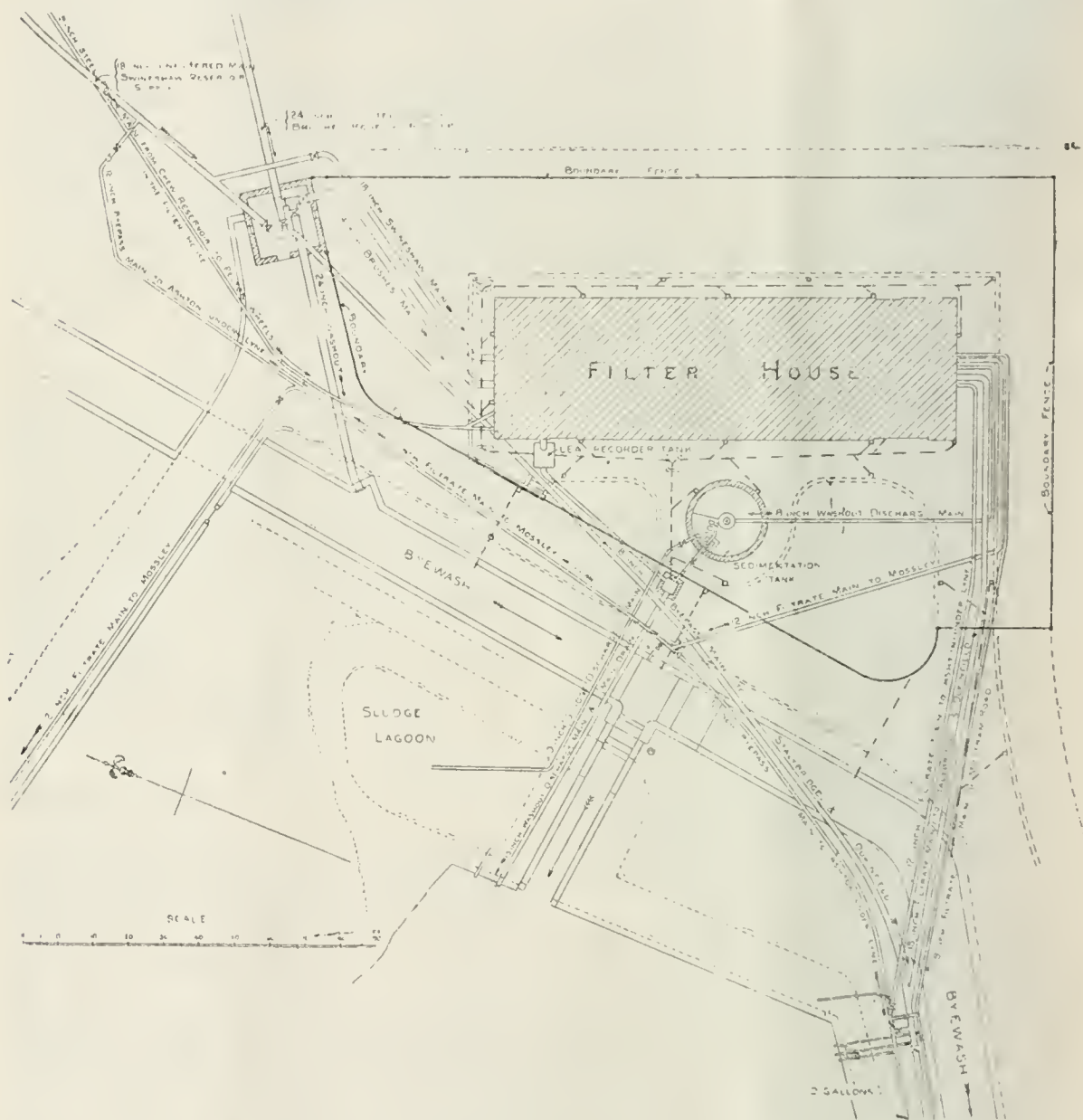
vency, and that the results of the examinations of raw water should be properly recorded, which, in his experience, was seldom done.

Mr. J. C. WALKER (Reading) said the president had made a comparison between sand and mechanical filters. He had had the advantage of having experience of both the ordinary sand filter and the Candy mechanical filter. The president said the mechanical filter had the advantage over the sand filter as to capital cost, and that was generally admitted; but, on the other hand, the president seemed to think the mechanical filter was not so lasting. He differed with the president on that point, and thought the mechanical filter was quite as lasting as the sand filter. As to maintenance, he found that mechanical filtration, as in use, coupled with a preliminary

enter into the controversy, for he thought each case had to be considered on its own merits. Another point was the trouble sometimes caused by dealing with the wash water containing sulphate of alumina. He knew a case where the water authority had been sued by a neighbouring proprietor for poisoning his cattle.

Mr. F. H. BRIST (Rochdale) remarked that a great point to be considered in relation to mechanical filters was that they could be worked at any time.

Mr. J. S. PICKERING (Cheltenham) said it struck him, from the opening remarks of the author, that his authority was unwilling to embark on the scheme, as it seemed to have taken them twenty years to deal with it. He doubted if any water company would have been allowed to continue to supply the water men-



TREATMENT OF PLUMBO-SOLVENT WATER: GENERAL PLAN OF "BRUSHES" INSTALLATION.

system of filtration, cost about 3s. 6d. per 1,000,000 gallons, while sand filtration cost about 15s. per 1,000,000 gallons.

Mr. C. H. ROBERTS (Aberdeen) said it must not be forgotten that in most cases the conditions differed. In Edinburgh and in the North they had been putting down mechanical filters, and there had been a considerable amount of controversy over them. The engineers of the Edinburgh Water Board contended that the total cost of sand filtration—the interest on capital and working charges—was less than the total charges of mechanical filtration. On the other side it was contended that the mechanical filters were the cheapest. As to the life of mechanical filters, as compared with sand filters, it must not be forgotten that the Local Government Board would not grant a loan for the same period for mechanical as for sand filters, and the engineer had to consider the question of loan. He did not, however, wish to

mentioned for so long a time. The title of the paper was a little misleading. He gathered from the author that what was of equal importance was the removal of discoloration, and he noticed that the conditions of the contract were that 95 per cent should be reserved. In the tables they had such expressions as the water being "yellow," "less yellow," "yellowish" and "colourless." To his mind these expressions were not very valuable, and it would be far better if the colour of the water could be reduced to figures, the same as the analyses of the author's had been. He did not know if the author was familiar with the Lovibond tintometer, and if not he recommended it to his notice. The colour of the water could be indicated by that instrument by a series of clocks. He had a very turbid water, and by the tintometer he kept a record every day. The tables given were very interesting, and particularly one which showed the weakness in the mechanical filters, which was the time imme-

diately after the filters had been washed. It was a weakness with all filters, as in the case of the sand filter when the film was taken off the surface. Another table showed the plumbo-solvent action on unfiltered water was 0.14, and it was only reduced in filtered water to 0.07, and in one case to 0.05. It might be pointed out that these were taken out at different intervals varying from five to sixty minutes after the filters had been started, and that the average as shown by the other tables was all that could be desired. Still it would have been more interesting if the author could have gone a little further, and given the time when the effluent from the filter gave a plumbo-solvent action. He noticed that permanent hardness had to be increased in less than 10 per cent. He presumed it was correct to say permanent hardness. In the same table he noticed that the hardness had not been increased at all, but it had been decreased by the filter working thirty minutes, and was about the same when the filter had worked sixty minutes. The author would naturally see that one must take the average and not the time when the filters were working at their worst. The author had no coagulating tank prior to the water passing on to his filters, so that the filters would require washing out more than they otherwise would, and perhaps he would tell them at what periods, roughly speaking, the filters required washing out. In his conclusions the author rather suggested that he would prefer a clear-water tank for the filter water prior to passing it on for distribution, and also suggested that he would prefer not to have his filters on a trunk main. He gathered from that that if practical he would have adopted mechanical gravity filters instead of pressure filters. There was, no doubt, an advantage in seeing what was taking place in a gravity filter. The author also referred to the necessity of having a competent man in charge to regulate the supply of chemicals, and to test the water on its leaving the works. He would like to know if he had any written regulations as to what the manager of the works was required to do in regard to adjusting the quantity of chemicals. It was stated that the water varied very considerably, and he wondered how the foreman regulated the supply of chemicals to meet the varying conditions. Was any test also made to ascertain whether any alumina escaped through the mechanical filters? Even if it did, he supposed there would be no serious objection to a small quantity.

Mr. F. W. Hodson (Loughborough) asked if the tintometer acted in a regular circle or did it take samples intermittently.

Mr. Dixon said that, on account of the time, his reply must be short. He was driven for time in the preparation of the paper, and did it hastily. He had also prepared fourteen photographs of drawings for insertion with the paper, but the money at the disposal of the Plans Committee did not allow of them all being produced. Unfortunately, he was not consulted as to what plans should be produced, and those relating to the compound weir were not given. He would have liked to have had inserted a diagram showing the loss of head due to the process of filtration—a most important question. He did take into account the velocity of approach when calculating the discharge of the weir. He had had experience of the Candy filters, and there was a medium called oxididium, which was part of the filtering medium, and there was no cost of chemicals. At Harrogate he used both chemical and sand filters, and, in his opinion, the mechanical filters far surpassed the sand filters, with the exception of the bacteriological test. Those who lived in the North of England would readily understand the difficulties of sand filters when there were hard frosts; while with mechanical filters they could work no matter what the climatic conditions were. Mr. Roberts had referred to the period of loan granted by the Local Government Board, but the Local Government Board were not the sole judges of the life of a mechanical filter, and in his opinion they did not understand it. He considered there was far more life in a mechanical filter than many people realised. He noticed that at Paignton a loan for a period of sixty years had been granted for mechanical filters. He thought when the Local Government Board knew more of mechanical filters and their construction they would extend the period of the loans. He had had no difficulty in dealing with the wash water. He had to deal with Dr. Maclean Wilson, who took samples of his decanted water and tested them, and at present he had had no complaint, which showed that they satisfied the West Riding Rivers Board. In his case sand filters were impossible. Any loss of head would mean pumping 5,000,000 gallons a day at a high elevation. Mr. Pickering was quite right about his authority not being

anxious to embark on the scheme until the West Riding authorities insisted on it. When dealing with plumbo-solvency they dealt with discoloration as well. Permanent hardness had been alluded to, and if he could have his way he would include it in the conditions of contract. The man in charge was a fully qualified mechanic, and also knew a little bit of chemistry, and he regulated the amount of chemicals which went in every day. Every morning he made a careful analysis, and he knew what chemicals to use. The failures at works where mechanical filters were adopted was largely due to the incapacity of the men in charge. In reply to Mr. Hodson, the tintometer was working day and night.

On the motion of the president a vote of thanks was passed to the Geological Society for the use of the rooms, and to the authors of the papers.

SOME RECENT PUBLICATIONS.*

APPLIED MECHANICS AND MECHANICAL ENGINEERING. Vol. V.: The Theory of Machines. By Andrew Jamieson, M.INST.C.E. Price 7s. 6d. nett. London: Charles Griffin & Co., Limited.

The popularity of Prof. Jamieson's well-known work on applied mechanics and mechanical engineering—increased, if possible, since its division into five volumes—is shown by the frequency with which new editions are demanded. The present is the eighth edition of volume V., dealing with the theory of machines, and incorporates the author's latest additions and alterations, although no substantial rearrangement has been found necessary. In drawing up the several lectures the author has generally followed the syllabus of the final B.Sc. examination in engineering for external students at London University. This also covers the ground prescribed for the Theory of Machines paper at the A.M.I.C.E. examination, and includes the following subjects: Tooth, friction, belt, rope, chain and miscellaneous gearing, with their applications to machines; shapes and strength of teeth; automatic tooth-cutting machines; velocity ratio and power transmitted by gearing; motion and energy; and practical applications to governors, flywheels and centrifugal machines. All these matters are dealt with in the author's well-known lucid manner, and the volume, being well illustrated and indexed, fully maintains the standard of former editions as a student's textbook on the subject.

GODALMING BOROUGH SURVEYORSHIP VACANT.

RESIGNATION OF MR. J. H. NORRIS.

Mr. J. Herbert Norris has resigned his position as borough surveyor of Godalming. Mr. Norris has arranged to go into private practice as an architect and surveyor in association with Mr. S. Welman, his uncle, who has practised in the town for very many years.

A Telephone Companion.—Messrs. Bristowe & Co., Limited, of Broad Sanctuary Chambers, 11 Tothill-street, Westminster, S.W., send us a most useful and elaborate pad record for noting the names and exchange numbers of firms regularly communicated with by telephone, with index pages and tear-off sheets of memoranda paper. The only suggestion of advertising conveyed is the one word stamped in gold letters on the front of the pad—viz., "Tarvia," the material now so well known to road engineers.

Russian Garden Cities.—The movement in favour of rational settlements of the garden city type is growing very rapidly in Russia. A Garden Cities Association is to be formed in St. Petersburg as soon as the necessary sanction has been obtained. Many other cities (says the *Times* Russian Supplement) propose to establish garden suburbs to be connected by tramways with the city. Garden cities are already being laid down near Moscow, Warsaw and Odessa, while Riga already has a garden city named Kaiserwald. The problem of town planning in connection with the decentralisation of fast-growing cities is one that will demand solution in the near future.

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

THE ESSEX ROAD IMPROVEMENT SCHEME.

£300,000 EXPENDITURE IN FIVE YEARS.

As briefly reported in our last issue, an important scheme for resurfacing the principal main roads in Essex has been prepared by the county council and approved by the Road Board. About 150 miles of road are involved, and the work will be spread over a period of five years. The total cost of reconstructing the surfaces of these highways is estimated at something like £300,000.

THE SCHEME DESCRIBED.

The scheme had its genesis in the desire of the Road Board to deal with the question of road improvement in a comprehensive and systematic fashion. Hitherto the Essex County Council and various local bodies have put forward a number of comparatively small proposals. The feeling of the board was that more permanent good would result by a method which, while involving a heavy initial outlay, would result in some lasting improvements. Accordingly, the county council were asked to submit plans with this end in view, and the county surveyor, Mr. Percy J. Sheldon, and his staff prepared the necessary particulars from which the present scheme, after many months of negotiation, has been formulated.

Three trunk roads and two branches are included in the scheme, and they may be indicated as follows:

(1) From London to Stratford St. Mary (Suffolk), being the main road from the county boundary at West Ham to Ipswich, passing through portions of the urban districts of East Ham, Romford, Chelmsford, Witham and Colchester.

(2) From London to Newmarket and Cambridge, being the main road from the county boundary at Lea Bridge, passing through portions of the urban districts of Leyton, Walthamstow, Woodford and Saffron Walden.

(3) From London to Southend, being the main road from the county boundary at East Ham (Anne Boleyn's Tower), passing through portions of the urban districts of East Ham, Barking and Grays.

(4) From Epping Forest to Chelmsford, being the branch road from London to the East Coast, leaving the Epping new road at Epping Plain, and terminating at its junction with the London to Ipswich main road in the borough of Chelmsford at Springfield-road-corner, High-street, Chelmsford.

(5) From Colchester to Harwich, being the main road from London to Harwich, commencing at its junction with the London to Ipswich main road in East-street, Colchester, terminating in Harwich at the end of the existing main road known as Church-street.

COST OF THE WORK.

Towards the total cost of this great scheme, amounting to £300,000, the Road Board are willing to pay £125,000, and to lend, free of interest, an additional sum of about £175,000, repayable in five years. The difference will, of course, have to be provided out of the county rates, but the scheme is being so arranged that the annual demand on the ratepayers will be no greater than it is at present for the upkeep of the existing surfaces.

The material to be used in reconstructing the surfaces will be some form of bitumen (tar-macadam or asphalted granite, possibly both—according to local circumstances and requirements. A certain amount of work will be carried out each year, the period allowed for the total being, as already stated, five years from October 1st last.

The increase of motor-omnibus and other heavy motor traffic is primarily responsible for making some large scheme of this kind necessary. Already the highways in the extra-Metropolitan area of Essex are being worn almost to the point of destruction by heavy traffic, which is growing greater every day. The Essex County Council naturally see possibilities of still further developments in this direction, and they desire to embrace a favourable opportunity which is now presented of putting the trunk roads in such a condition as to withstand the demands of the future. Those sections nearest London will be first put in hand, and probably the highways in the north and east of Essex will not be dealt with until the fourth or fifth year.

One fairly extensive piece of work has already been carried out in Essex under Road Board auspices. This was the resurfacing, some two or three years ago, of about 7 miles of road in the neighbourhood of Marks Tey, at a cost of £10,000. The surface has worn mag-

nificently, not £d. having been spent on it since it was originally remade, and, in Mr. Sheldon's opinion, there is probably not a better piece of road in England.

ENTIRE FUNDS EARMARKED.

A circular letter explanatory of the scheme is being sent out to the various urban district councils directly concerned by direction of the Highways Committee of the county council. In this document the committee state:

"The scheme is one that has been submitted by the council to the Road Board with the view of carrying out the suggestion contained in the annual report of the board, and with which the council are in entire agreement, that the present most pressing problem in connection with main roads is the reconstruction of surfaces with materials calculated to withstand the wear of heavy motor traffic.

"The board have expressed their approval of the scheme, and to enable it to be carried out have earmarked the entire funds of the board that are available, so far as can be foreseen at present, for the administrative county during the period in question (five years), and nothing further will be available for either the county or other road authority within the administrative area for any other class of improvement the county having, therefore, to forego several important widenings and diversions until the completion of this scheme.

"The routes selected will pass through the districts of a number of urban authorities claiming to maintain their main roads, and the board have intimated to the committee their willingness to make grants up to 25 per cent of the capital cost of such resurfacings within these districts provided the works contemplated are approved by the county council through the county surveyor; no schemes other than resurfacings can be considered, and no separate schemes will, during the period in question, be favourably considered by the board.

"It is quite possible that it will prove more advantageous to urban authorities to pave, either with stone or wood, certain sections of the prescribed routes, in which case no grants will be made by the board, their opinion being that the cost can be more properly and favourably dealt with under long-period loans raised under sanction of the Local Government Board.

"In all such cases, where the schemes have been previously approved by the county council, the loan repayments would be favourably considered by the county council when renewing the maintenance contracts with the urban councils.

"Where bituminous materials are to be used, these must be under the sanction and approval of the county surveyor, and the county council will be prepared to negotiate with the urban authorities with the view to an equitable apportionment of the balance of the cost not covered by the grant from the board."

The circular concludes by inviting urban councils who may be contemplating any resurfacings upon the routes mentioned and are prepared to fall in with the conditions and proposals of the board as defined to the county council and outlined above, to open up communications with the county surveyor, who will consider any schemes submitted to him at the earliest possible date.

Birmingham Motor Omnibuses. In a recent report Birmingham Tramways Committee deal with the question of the acquisition by the corporation of the interests within the city of the Birmingham and Midland Motor Omnibus Company and the various allied companies concerned. They state that as a result of negotiations the company are willing to sell to the corporation, upon terms set out in a draft agreement which has been approved by the committee and the company, for £30,000, their leasehold interest in the premises comprising the garage and buildings (suitable for the accommodation of eighty motor omnibuses) in Tennant-street, Birmingham (the lease of which expires in 1951, the annual rental being £80 16s. 8d.), together with thirteen 30-h.p. and seventeen 40-h.p. Tilling-Stevens motor omnibuses. The agreement provides for a deduction for depreciation at the rate of 20 per cent per annum as from January 1, 1914, until the date of completion in respect of the cost of the motor omnibuses. In addition, a portion of the machinery, tools, plant, and stores applicable to these motor omnibuses is to be purchased at a valuation. The agreement is conditional upon the corporation obtaining during 1914 an Act authorising them to run a general service of motor omnibuses within the city.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

WEST MIDLAND DISTRICT.

A West Midland District meeting will be held at Birmingham on Thursday, January 15th.

PROGRAMME.

5 p.m.—Meet at the Council House, Birmingham—
To consider letter from the South-Western District asking for the opinion of members in regard to the new institution journal;
Paper by Mr. H. J. Coleby (Atherstone), entitled "Some Notes on Water Supply in the Rural District of Atherstone."

Mr. Coleby's paper is of very general interest, and it is hoped there will be a good attendance.

F. C. COOK, A.M.I.C.E., <i>Hon. District Secretary,</i> Borough Surveyor, Nuneaton.	A. T. DAVIS, M.I.C.E., <i>District Chairman,</i> County Surveyor, Salop.
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SOUTH-EASTERN DISTRICT.

A South-Eastern District Meeting will be held at 92 Victoria-street, Westminster, S.W., on Saturday, January 17th.

PROGRAMME.

5 p.m. Meet at the offices of the institution, 92 Victoria-street, S.W.—
To elect a junior representative for Sussex;
Chairman's report on arrangements for future meetings;
General business.

6.30 p.m.—Dinner at Westminster Palace Hotel, to be followed by a musical entertainment. Tickets, 3s. 6d. each.)

H. W. BOWEN, A.M.I.C.E., <i>Hon. District Secretary,</i> County Surveyor's Office, Horsham.	A. DRYLAND, M.I.C.E., <i>District Chairman,</i> County Surveyor, Surrey.
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NORTH-WESTERN DISTRICT.

A meeting of the institution is to be held in the North-Western District at Manchester on February 20th and 21st.

92 Victoria-street, S.W. **THOMAS COLE,**
Secretary.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

NORTHERN DISTRICT.

The annual general meeting of this district will be held at the town hall, Newcastle-upon-Tyne, at 3.15 p.m., on Saturday, January 10, 1914, when the papers read at the annual meeting held in London on November 7, 1913, will be discussed. Copies of the papers referred to may be obtained on application to the undersigned. They are—

- "The Need for Standardisation in Drainage Details," by Arthur Palmer, F.A.S.T., M.R.SAN.I.
- "Electricity as a By-product," by R. J. Spencer-Phillips, ASSOC.M.INST.C.E.
- "Temporary Buildings in Relation to By-laws," by T. C. Barralet, M.R.SAN.I.

The meeting will be followed by the annual dinner, to be held at the Royal Turk's Head Hotel, Grey-street, at 6.30 p.m. Evening dress optional.

JOHN ROBINSON,
Hon. District Secretary.

Union Offices,
Darlington.
January 1, 1914.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District of the Institution of Municipal Engineers will be held at Manchester on Saturday, January 31st.

PROGRAMME.

1.30 p.m.—Business meeting at the Mitre Hotel, Cathedral-close, to elect district chairman and hon. district secretary, and to arrange programme.

3 p.m.—Visit to the Stuart-street station of the Manchester Corporation electricity works, by kind permission of Mr. S. L. Pearce, M.INST.C.E., M.I.E.E., the chief engineer. Members are requested to assemble at 3 o'clock sharp.

B. WYAND,
39 Victoria-street, S.W. *Secretary.*

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

ASSISTANT.—January 10th.—Water engineer and surveyor's department, Bilston Urban District Council. £100—£120.—Mr. Joseph L. Arlidge, clerk.

MANAGER OF SEWAGE DISPOSAL WORKS.—January 10th.—Corporation of Bath. 50s. per week with residence.—Mr. F. D. Wardle, town clerk.

WATERWORKS ENGINEER.—January 12th.—Bridlington Town Council. £100—£120.—Mr. A. E. Matthewman, town clerk.

CLERK OF WORKS.—January 12th.—Llanelli Education Committee. £3 per week.—Mr. I. W. Watkins, clerk.

ASSISTANT ELECTRICAL ENGINEER.—January 13th.—Singapore Municipal Commissioners. 250—300 dols. per month.—Mr. C. C. Lindsay, 180 Hope-street, Glasgow.

CLERK OF WORKS.—January 13th.—Swansea Rural District Council. £2 10s. per week. Mr. E. Harris, clerk, Alexandra-road, Swansea.

BUILDING INSPECTOR.—January 14th.—Corporation of Bridlington. 36s.—10s. per week.—Borough Surveyor.

CITY ENGINEER.—January 17th.—City of Cape Town. £1,500 per annum.—Messrs. Davis & Soper, agents for the corporation, 54 St. Mary-axe, London, E.C.

TEMPORARY ASSISTANT.—January 20th.—Corporation of Warrington. £3 3s. per week.—Mr. Andrew M. Ker, borough engineer and surveyor.

ASSISTANT IN ENGINEER'S DEPARTMENT.—January 22nd.—Willesden Urban District Council. £150 per annum.—Mr. O. Claude Robson, engineer.

TOWN PLANNING ASSISTANT.—January 23rd.—Corporation of Sheffield.—Mr. Charles F. Wike, city engineer and surveyor.

ENGINEER AND SURVEYOR.—January 31st.—Rhondda Urban District Council. £500—£750.—Mr. W. P. Nicholas, clerk, Pentre, Rhondda.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

DRAUGHTSMAN.—£2 10s.—£3 10s. per week.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W. Communications to be marked "Z., 168 2" in top left-hand corner.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

COVENTRY.—February 1st.—Sketch plans for a technical institute, for the corporation.—Education Offices, 44 Bayley-lane.

HENDON.—March 2nd.—Designs for public baths, for the urban district council. Premiums £100, £75, and £50.—The Clerk.

BELFAST.—March 20th.—Designs for an art gallery and museum, for the corporation.—Mr. R. Meyer, town clerk.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

DUNMOW.—January 10th.—For repairs to a bridge, for the rural district council.—Mr. A. E. Floyd, clerk

LEWES.—January 10th.—For the erection of a school, for the Education Committee.—Mr. E. H. Fuller, architect, 19 High-street.

SLEAFORD.—January 10th.—For a deep boring in Kirkby-la-Thorpe, for the rural district council.—Mr Edmund Clements, clerk.

CROMPTON.—January 10th.—Schemes and tenders for refuse destructor and steam disinfector, for the urban district council.—Mr. F. F. Gartside, clerk and surveyor, Town Hall, Shaw, near Oldham.

EDINBURGH.—January 12th.—For alterations at 25 Waterloo-place, for the Gas Commissioners.—Engineer, 15 Calton Hill.

INVERNESS.—January 13th.—For the construction of new waterworks, for the county council.—Messrs. Geo. Gordon & Co., civil engineers, Inverness.

DURHAM.—January 13th.—For the erection of a new school, for the county council.—Mr. W. Rushworth, Shire Hall, Durham.

DURHAM.—January 13th.—For extensions of a school, for the county council.—Mr. W. Rushworth, Shire Hall, Durham.

BARKING.—January 13th.—For the erection of workmen's dwellings, for the urban district council.—Mr. C. J. Dawson, architect, Clock House Chambers, East-street, Barking.

BIRMINGHAM.—January 14th.—For the supply of railway material, laying and ballasting 950 lin. yds. of permanent way, construction of a brick and concrete bridge, and other works, for the Birmingham, Tame and Rea District Drainage Board.—Mr. John D. Watson, engineer to the board, Tyburn, Birmingham.

GLASGOW.—January 14th.—For alterations and additions to police buildings, for the corporation.—Mr. J. Lindsay, town clerk.

RICHMOND (Surrey).—January 14th.—For the erection of a cookery centre, for the Education Committee.—Mr. J. H. Brierley, borough surveyor.

BOURNEMOUTH.—January 14th.—For the erection of conveniences and shelters, for the corporation.—Mr. F. W. Lacey, borough engineer and surveyor.

KENT.—January 15th.—For the erection of two blocks of asylum buildings, for the Asylums Committee.—Mr. F. R. Howlett, clerk, 9a King-street, Maidstone.

HACKNEY.—January 15th.—For the construction of an additional vapour bath and refreshment room, and alterations to offices, for the borough council.—Mr. Norman Scorgie, deputy town clerk.

BELFAST.—January 15th.—For the erection of 252 houses, for the corporation.—City Surveyor.

LANCASTER.—January 16th.—For taking down a chimney and building a new chimney, for the corporation.—Town Clerk.

WARRINGTON.—January 16th.—For the erection of a school, for the corporation.—Mr. I. Moore Murray, Education Office.

RADCLIFFE.—January 17th.—For the erection of sixteen dwellings, for the urban district council.—Mr. W. L. Rothwell, engineer and surveyor.

MARGAM.—January 17th.—For the building of new gasworks, for the urban district council.—The Surveyor.

GLASGOW.—January 17th.—For the construction of tunnels, cutting trenches, and laying water pipes, for the corporation.—Mr. J. R. Sutherland, engineer, Water Department, 45 John-street, Glasgow.

NEWPORT PAGNELL.—January 17th.—For the erection of eight houses, for the rural district council.—Mr. W. J. Budds, surveyor.

WEST RIDING.—January 19th.—For the erection of a boiler-house, chimney shaft, and boiler seating at the Menston Asylum, for the Asylums Board.—Mr. W. E. H. Burton, engineer, Wakefield.

ALTRINCHAM.—January 19th.—For the erection of public conveniences, for the urban district council.—Mr. H. E. Brown, surveyor.

CARNARVON.—January 19th.—For the erection of a school, for the Education Committee.—Mr. R. Lloyd Jones, county architect, Carnarvon.

RAMSGATE.—January 19th.—For the erection of a shelter, for the corporation.—Mr. T. G. Taylor, borough engineer.

CHELMSFORD.—January 20th.—For the provision and laying of 2,500 lin. yds. of 3-in. water mains and fittings, for the rural district council.—Mr. W. Almond, surveyor.

SWANSEA.—January 26th.—For the construction of masonry and concrete approaches, piers, for a bow-string truss steel girder footbridge, and also for the supply and erection of the bridge, for the corporation.—Mr. H. Howard Humphreys, 28 Victoria-street, Westminster, S.W.

BARNET.—January 29th.—For the erection of new council offices, and an underground convenience, for the urban district council.—Mr. W. F. Wilkins, surveyor.

DORSET.—January 30th.—For the erection of a school, for the Education Committee.—Messrs. Fletcher & Bratt, Wimborne.

WHARFEDALE.—January 30th.—For the erection of a diphtheria pavilion, and additions to administration block at isolation hospital, for the Joint Hospital Committee.—Mr. Phil. S. Wade, clerk, Union Offices, Otley.

EGREMONT.—January 30th.—For the erection of seventy-six houses, for the urban district council.—Mr. J. S. Stout, architect, 36 Lowther-street, Whitehaven.

Iron and Steel.

SPRINGHEAD.—January 10th.—For the supply of 260 manhole and lamphole covers, for the urban district council.—Mr. R. Kilner, 25 Queen's-street, Oldham.

BOOTLE.—January 14th.—For the supply and erection of wrought-iron railings, for the corporation.—Borough Engineer.

NEWPORT (Mon.).—January 15th.—For supplying and fixing wrought-iron unclimbable fencing and ornamental fencing and gates, for the corporation.—Borough Engineer.

HARTSHORNE AND SEALS.—January 16th.—For laying 5,000 yds. lineal of 4-in. and 3-in. cast-iron spigot and socket pipes, fixing valves and hydrants, constructing service reservoir and pump well, and erecting windmill and pumps, for the rural district council.—Mr. Norman F. Spence, engineer and surveyor.

WORTHING.—January 22nd.—For the supply of 30-in. and 36-in. diameter cast-iron pipes, valves, tidal flaps, and other special castings, for the town council.—The Borough Surveyor.

SLEAFORD.—January 24th.—For the supply, laying and jointing of about 8½ miles of cast-iron mains and specials, 4-in. and 3-in. diameter respectively, the provision and fixing of sluice and air valves, stand posts, and other works of water supply, for the rural district council.—Mr. W. B. Marsden, engineer and surveyor.

LONDON.—January 27th.—For the supply of 584 tons of special section-rolled steel bar for magnetic brake shoes, for the county council.—Chief Officer, London County Council Tramways, 62 Finsbury-pavement, E.C.

WARSAW.—February 16th.—For the supply of two vertical compound engines, with plunger, piston, or differential pumps, or of two turbines, with centrifugal or turbo-pumps, for the Municipality.—Sir William H. Lindley, 29 Blittersdorpherplatz, Frankfort-on-Maine.

Roads.

BISHOPSTHORPE.—January 9th.—For the supply of the best hand-broken 2½-in. whinstone and slag, for the rural district council.—Mr. F. Ware, clerk.

HARDINGSTONE.—January 9th.—For the supply of road materials, for the rural district council.—Mr. J. R. Phillips, clerk, 2 St. Giles'-square, Northampton.

HASTINGS.—January 10th.—For the supply of best unbroken blue stone, for the rural district council.—Mr. David Paine, surveyor, Stonelynk Farm, Fairlight.

ABERSYCHAN.—January 10th.—For the execution of private street works, for the urban district council.—Mr. W. H. V. Bythway, clerk.

BOURNE.—January 10th.—For the supply of roadmen's barrows and tools, for the rural district council.—Mr. T. Lake, district surveyor.

BRIDLINGTON.—January 10th.—For making up certain roads, for the corporation.—Borough Surveyor.

ROYTON.—January 12th.—For the supply of non-slippery granite setts, pitch, oil and cement, for the urban district council.—The Surveyor.

HUNTLY (Aberdeen).—January 12th.—For works of formation and macadamising, for the corporation.—Mr. J. Allan, burgh surveyor.

ESSEX.—January 12th.—For works of paving and kerbing at Ilford, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

WOODSTOCK.—January 12th.—For the supply of hand-picked unbroken stone, best broken stone (2-in. gauge, clean and free from chippings), best double-screened nuts for patching purposes (1½-in. gauge), best double-screened coarse chippings and binding chippings, and best rubble, for the rural district council.—Mr. A. G. Higgs, clerk.

TRING.—January 12th.—For the supply of 12,000 gallons of refined coal tar, for the urban district council.—Mr. S. S. Gettings, surveyor.

FLINTSHIRE.—January 12th.—For the supply of broken granite, chippings, and local stone, for the county council.—Mr. S. Evans, county surveyor, County Buildings, Mold.

EDMONTON.—January 13th.—For resurfacing roadways with Roadamant and Smith's Trinidad asphalt-macadam, for the urban district council.—Mr. C. Brown, surveyor.

PERRY BAR.—January 13th.—For the supply of Rowley rag and blast furnace cinder, for the urban district council.—Mr. E. Bailey, surveyor, Green-lane, Hamstead, near Birmingham.

BRIXHAM.—January 13th.—For relaying footpaths, for the urban district council.—The Surveyor.

STOKE-ON-TRENT.—January 14th.—For making up certain streets, for the corporation.—Borough Surveyor.

EASINGWOLD.—January 14th.—For the supply of whinstone slag, for the rural district council.—Mr. F. J. H. Robinson, clerk.

WEYMOUTH.—January 14th.—For the supply of distilled tar and tar paving, for the corporation.—Town Clerk.

GLAMORGAN.—January 14th.—For executing a main road improvement, for the county council.—Mr. T. Mansel Franklen, clerk, County Hall, Cardiff.

BIRMINGHAM.—January 14th.—For the reconstruction of a portion of a street, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

ENFIELD.—January 14th.—For making up the following private streets—viz., Drapers'-road, Enfield, and Warwick-road, Enfield Lock, for the urban district council.—Mr. Richard Collins, surveyor.

HAMMERSMITH.—January 14th.—For paving work in Foliot-street, Fitzneal-street and Erconwald-street, for the borough council.—Mr. H. Mair, borough surveyor.

WEST BRIDGFORD.—January 15th.—For making up certain streets, for the urban district council.—Mr. W. Pare, surveyor.

LEEDS.—January 15th.—For the construction of portions of the tramway track, for the corporation.—Mr. J. B. Hamilton, tramways manager, Standard Buildings, City-square, Leeds.

SPILSBY.—January 16th.—For the supply of about 5,000 tons of broken granite, 9,500 tons of broken slag, and 500 tons of slag chippings, for the rural district council.—Mr. W. Cook Brakenbridge, district surveyor of highways, Spilsby.

HALIFAX.—January 17th.—For the execution of private improvement works, for the corporation.—Mr. J. Lord, borough engineer.

NORFOLK.—January 17th.—For the supply of local materials in pits or delivered to the various stations and staithes, for the county council.—Mr. T. H. B. Heslop, county surveyor, Norwich.

MIDHURST.—January 17th.—For the supply of granite, tar-macadam and tar, for the rural district council.—Mr. A. G. Gibbs, surveyor.

HAILE.—January 17th.—For making up a street, for the urban district council.—Mr. T. Blagburn, surveyor.

EAST COWES.—January 19th.—For the supply of 200 cub. yds. of granite, for the urban district council.—Mr. A. E. Barton, surveyor.

CHERTSEY.—January 19th.—For road construction, drainage, kerbing, and fencing, for the rural district council.—Mr. H. Beeeny, surveyor, West Byfleet.

GLOUCESTER.—January 19th.—For the supply of stone for use on main roads, for the county council.—Mr. E. S. Sinnott, county surveyor, Shire Hall, Gloucester.

WANDSWORTH.—January 19th.—For road repairs in certain roads, for the borough council.—Mr. P. Dodd, borough engineer.

SURREY.—January 20th.—For the supply of high-class granites, basalts, limestone, slag, tar-macadam, bitumen, pitch, tar, and tar oils, for the county council.—Mr. A. Dryland, county surveyor, Kingston-on-Thames.

LONDON.—January 20th.—For work of road construction at Tottenham, for the county council.—Architects' Department (Housing Section), 19 Charing Cross-road, W.C.

SKIPTON.—January 20th.—For the supply of road materials, for the rural district council.—Mr. A. Rodwell, surveyor.

LEWISHAM.—January 20th.—For laying wood paving in Bromley-road, for the borough council.—The Surveyor.

CLUTTON.—January 20th.—For the supply of 15,000 gallons of dehydrated refined coal tar for surface tarring, complying with the Road Board Specification for tar No. 14, for the rural district council.—Mr. J. Sumner Dury, clerk.

BOURNEMOUTH.—January 21st.—For relaying wood block paving, for the corporation.—Mr. F. W. Lacey, borough engineer and surveyor.

WORTHING.—January 22nd.—For the supply of broken granite, granite chippings, and granite dust, for the corporation.—Borough Surveyor.

ESSEX.—January 24th.—For the supply of team labour, stoneware pipes, Norwegian granite kerb and setts, York korb, and distilled tar, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

BIRMINGHAM.—January 24th.—For the supply of granite kerbs, setts, crossing stones, chippings, flags, paving bricks, wood paving blocks, ragstone, limestone, tarred limestone, gravel, sand, and slag, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

WORKSOP.—January 26th.—For the supply of slag, for the urban district council.—Mr. G. Featherstone, clerk.

CUCKFIELD.—January 26th.—For the supply of about 6,500 tons of broken granite, tarred material, and flints, for the rural district council.—Mr. A. Macarthur, surveyor, Haywards Heath.

DEVON.—January 26th.—For steam rolling and scarifying on the main roads in the Bideford Rural District, for the county council.—Mr. Edward Stead, county surveyor, No. 1 Division, Barnstaple.

EPSOM.—January 26th.—For the supply of about 100,000 gallons of coal tar, for the rural district council.—Mr. T. E. Ware, surveyor.

PLOMESGATE.—January 26th.—For the supply of broken granite, and flint, broken or unbroken, for the rural district council.—Mr. David R. Read, clerk.

BROMLEY (Kent).—February 2nd.—For the execution of sewerage, levelling, paving, metalling, channelling and making good portion of a road, for the rural district council.—The Surveyor, Maulden House, Sidecup-hill, Sidecup.

HERTFORDSHIRE.—February 5th.—For the supply of broken granite, slag and tar-macadam required for the main roads during the year ending March 31, 1915, for the county council.—Mr. Urban A. Smith, county surveyor, Hatfield.

Sanitary.

DOWNPATRICK.—January 10th.—For the construction of a sewer, for the rural district council.—The Clerk.

SMALLTHORNE.—January 12th.—For the construction of new sewers, for the urban district council.—Mr. J. W. Deane, surveyor.

CHORLEY.—January 12th.—For emptying privies, ashpits, and cesspools, for the rural district council.—Mr. R. E. Aspden, clerk.

LEWES.—January 12th.—For the construction of main sewers, for the corporation.—Messrs. Brierley, Holt & Co., 46 Abingdon-street, Blackpool.

ST. MELLONS.—January 13th.—For the construction of stoneware pipe sewers, for the rural district council.—Mr. G. S. Morgan, engineer, Pontypridd.

EBBW VALE.—January 13th.—For work of scavenging, for the urban district council. Mr. T. Hughes, clerk.

BOOTLE.—January 14th.—For the execution of drainage work, for the corporation. Borough Engineer.

ROCHDALE.—January 14th.—For work of sewerage, for the corporation.—Borough Surveyor.

TENTERDEN.—February 14th.—For the construction of about 5 miles of stoneware and iron pipe intercepting sewers, of 9-in. and 12-in. diameter, with manholes, flushing tanks, and other appurtenances, driving a deep tunnel heading, and constructing purification works, for the corporation. Messrs. John Taylor & Sons, Caxton House, Westminster, S.W.

HACKNEY. January 15th. For the collection and removal of house and other refuse, for the borough council.—Mr. N. Seorgie, deputy town clerk and borough engineer.

WHITBY.—January 16th.—For the construction of an automatic sewage filter, for the rural district council.—Mr. W. Seaton Gray, clerk.

CLAYTON.—January 16th-19th.—For the construction of 224 yds. of sewers, for the urban district council. Mr. B. Ashton, clerk.

HALIFAX.—January 17th.—For the extension of sewage disposal works, for the corporation.—Mr. J. Lord, borough engineer.

CROYDON.—January 19th.—For the supply of stoneware drain pipes, for the corporation.—Borough Engineer.

MIRFIELD.—January 19th.—For the extension of sewage disposal works, for the urban district council.—Mr. E. Gill, engineer and surveyor.

WALTHAMSTOW.—January 22nd.—For drainage and other works, for the parochial charities.—Mr. W. Houghton, surveyor, 58 Old Broad-street, E.C.

SHARDLOW.—January 23rd.—For the construction of 3 miles of stoneware pipes (12-in. to 6-in.), with manholes and other appurtenant works, three ejector chambers, with 1½ miles of 8-in. and 2½-in. compressed air main, 1,815 yds. of 7-in. and 5-in. rising main, with air compressor stations, and purification works, for the rural district council.—Messrs. Elliott & Brown, Burton Buildings, Parliament-street, Nottingham.

DOWNHAM MARKET. January 26th.—For constructing 2,100 yds. of stoneware pipe sewers, manholes and appurtenant works, storage chamber, pumping station, 712 yds. of 5-in. rising main, tanks, and bacterial filters, for the urban district council.—Messrs. Elliott & Brown, Burton Buildings, Parliament-street, Nottingham.

WESTHAMPTON.—January 29th.—For laying sewers, building manholes and lamp-holes, and all necessary work connected with the main drainage of Felpham, for the rural district council.—Mr. H. Howard Humphreys, 28 Victoria-street, Westminster, S.W.

NEWCASTLE (Co. Down).—January 31st.—For the construction of a complete sewerage scheme, for the urban district council.—Messrs. Swiney & Crossdale, Avenue Chambers, Belfast.

LONDON.—February 2nd.—For the execution of works for three years in the reparation, maintenance, and reconstruction of sewers and drains, for the corporation of the city. Bell, Guildhall, E.C.

Stores.

ST. PANCRAS.—January 12th.—For the removal of road-sweepings and gully soil, horsing water vans, horsing road-sweeping and other machines, cartage, and the supply of timber, creosoted deal blocks, jarrah wood blocks, barrows, trucks, handles, paints, oils,

ironmongery, smiths' and founders' works, tools, Yorkshire stone and artificial paving slabs, granite kerbs, paving setts, broken granite and Kentish rag, gravel and other roadway materials, bass brooms and horse brush stocks, tarpaulins, hemp, rubber goods, pitch, tar, creosote oil, and carbolic powder, and coke, for the borough council.—Mr. W. Nisbet Blair, borough engineer and surveyor.

LAMBETH.—January 15th.—For the supply of men, horses, carts, cartage and materials, for the borough council.—Mr. Henry Edwards, borough engineer.

PLYMOUTH.—January 17th.—For the supply of paints, varnishes, ironwork, petroleum oil, broom-heads, household brushes, iron and steel, pitchpine, deals, flooring, carbolic powder, Portland cement, lubricating oils, tar, pitch, painters' brushes, explosives, soap, softwood blocks, creosote, disinfectant fluid, granite kerbs, setts, white and red lead, re-filling machine-revolving brooms, benzoline, motor spirit, tools, indiarubber goods, hose, and ship chandler's goods, for the corporation.—Mr. James Paton, borough engineer and surveyor.

BERMONDSEY.—January 19th.—For the supply of road and sanitary materials, wood blocks and York paving, for the borough council.—Mr. F. Ryall, town clerk.

MIDDLESBROUGH.—January 19th.—For the supply of annealed scoria blocks, bricks, castings, concrete flags and kerbs, Portland cement, pitch and tar, sanitary pipes, gullies, junctions, broken slag, domestic coal, timber, whinstone and granite (broken), whinstone and granite setts and kerbs, brushes, bolts, nuts, disinfectants, general stores, glass, hardware, indiarubber goods, iron, steel, leather belting, oils, paints, varnishes, packings, picks, shovels, hatts, polishes, cleaning materials, and ropes, for the corporation.—Mr. S. E. Burgess, borough engineer.

CHELSEA.—January 21st.—For the supply of water-proof goods, broken granite from the Channel Islands, wood blocks, hoggins and ballast, removal of trade refuse, scavengers' tools, dust baskets, tools, and carbolic disinfectants, for the borough council.—Mr. T. W. E. Higgins, borough surveyor.

ACTON.—January 23rd.—For the execution of works and supply of Portland cement, ground blue lias lime, stoneware pipes, granite, flints, household coal, shoeing horses, manhole covers, granite kerb and channel, artificial stone paving, York stone, cycle repairs and accessories, prints, oils, team labour, horsing fire brigade, brooms, disinfectants, wood blocks, and tarpaving materials, for the urban district council.—Mr. W. Hodson, clerk.

BIRMINGHAM.—January 24th.—For the supply of lias lime, Portland cement, drain pipes, gullies, gully pans, brown bricks, timber, drysaltery, malleable-iron castings, iron castings, galvanised goods, iron and steel ware, lamps, glass, enamelling, brooms, hose pipes, hose coupling, rubber goods, incandescant mantles, and miscellaneous stores, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

CHELTENHAM.—January 31st.—For the supply of Portland cement, forage, stoneware pipes, broken stone, kerbs, setts, disinfectants, oils, colours, ironmongery, timber, indiarubber goods, lead, brass fittings, tools for highways, wrought iron, steel, tiles, electric light fittings, road brooms, lias lime, bricks, clothing, and cast-iron pipes, for the corporation.—Mr. J. S. Pickering, borough engineer.

STEPNEY.—February 10th.—For the supply of bricks, lime, fireclay, brooms, east-iron work, colours, varnishes, painters' brushes, drainage materials, oilman's goods, Portland cement, pitch, tar, green oil, bitumen, timber, tools, implements, ironmongery, wheelwrights' materials, ballast, shingle, sand, hoggins, flints, uniform clothing, boots, disinfectants, paving materials, horse hire, and squaring and re-dressing old paving materials, for the borough council.—Mr. M. W. Jameson, borough engineer.

HASTINGS.—December 29th.—For the supply of manhole covers, gullies, brooms, and brushes, for the corporation.—Mr. P. H. Palmer, borough engineer.

Miscellaneous.

MATLOCK.—January 10th.—For the purchase by the urban district council of a second-hand fire engine.—Mr. Joseph Turner, engineer and surveyor.

NORTHAMPTON.—January 12th.—For the construction of a double line of tramways to Far Cotton, and the doubling of a section of the Kingsthorpe

route, together with the necessary overhead equipment, underground feeders, and telephones, for the corporation.—Mr. Alfred Fidler, borough engineer.

CHESTERFIELD.—January 19th.—For sinking a trial borehole, for the Gas and Water Board.—Mr. J. Middleton, clerk.

TREDEGAR.—January 20th.—For the supply of a 5-ton steam tractor and two side-tipping wagons or trailers to carry 4 tons each, and the immediate hire of a similar tractor, with driver, or two similar wagons or trailers, for the urban district council.—Mr. H. J. C. Shepard, clerk.

BIRMINGHAM.—January 24th.—For the supply of uniform clothing, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

RAMSGATE.—January 28th.—For fixing a hydraulic flag-making plant, and revolving mixer and grinding mill, for the corporation.—Mr. T. G. Taylor, borough engineer.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

CHISWICK.—For making up two roads, for the urban district council.—Mr. Edward Willis, engineer and surveyor:—

F. G. Brummell.—Elmwood-road: Council paving, £1,513; Croft, £1,565; Excelsior, £1,533; Atlas, £1,546. Park-road, fourth section: Council paving, £1,240; Croft, £1,271; Excelsior, £1,251; Atlas, £1,259.	
G. Wimpey & Co.—Elmwood-road: Croft paving, £1,591. Park-road, fourth section: Croft paving, £1,357.	

DOVER.—For the collection of house refuse, for the corporation.—Mr. W. C. Hawke, borough engineer:—

S. Terry, Dover	£36
C. Gambill, Dover	27
W. J. Kennett, Dover	21
J. T. Bright, Dover	20

DUNMOW.—For the construction of sewerage and sewage disposal works, for the rural district council.—Messrs. Sands & Walker, engineers, Nottingham:—

E. Ireland, Bath	£8,125
A. Brown & Son, Braintree	8,100
T. Wood & Sons, Swanley, Kent	8,066
F. Osman & Co., Southampton	7,998
G. Bell & Sons, Limited, Tottenham, N.	7,993
G. P. Trentham, Limited, Birmingham	7,987
H. Farrow, Brixton, S.W.	7,927
W. & C. French, Buckhurst Hill, Essex	7,820
Laue Brothers, Mansfield	7,724
J. Moran & Son, Kensington High-street, London	7,559
T. W. Pedrette, Enfield, N.	7,150

KESWICK.—For the erection of a common lodging-house, for the urban district council.—Mr. W. Hodgson, surveyor:—

W. Cowperthwaite (Builder), Keswick	£438
I. & R. Hodgson (Builder), Keswick	424
T. Hodgson & Sons (Builder), Keswick	382
Cutts & Dixon (Builder), Keswick	309
J. Millern & Sons (Joiners), Keswick	112
F. & W. Green (Joiners), Keswick	111
T. Walker (Plumber), Keswick	64
C. Greenwood (Plumber), Keswick	65
J. R. Raiton (Painter), Keswick	25

PATELEY BRIDGE.—For laying earthenware pipe sewers, and constructing manholes and sewage disposal works, for the rural district council.—Messrs. Spinks, Pilling & Rodwell, Leeds:—

Bushby & Sons, Headingley	£4,040
Naylor & Son, Bradford	3,696
Middleton & Hopper, Aspatria	3,324
Hannam & Co., Otley	3,240
A. Schofield, Leeds	3,237
M. Arundel, East Ardsley	3,167
Dougill & Son, Bedale	3,071
J. H. Grange, Pateley Bridge*	3,069

ROCHDALE.—For making good certain roads, for the corporation.—Mr. S. S. Platt, borough surveyor:—
Contract No. 414.—R. & T. Howarth, Rochdale.

SOUTHGATE.—Accepted for the execution of private street works in Andurley and St. George's roads, for the urban district council.—Mr. C. G. Lawson, surveyor:—
W. & C. Hampton, Palmer's Green, N.

STONE.—For the conversion of pail closets and privies into water-closets, for the urban district council.—Mr. A. R. Ridout, surveyor:—

Swift & Sons, Stone, Staffs	£2,041
W. Smallwood, Stone, Staffs	1,834
W. A. Hales, junr., Stoke-on-Trent	1,781

WEMBLEY.—For constructing 6 miles of pipe sewers and manholes at Northern Wembley, for the urban district council.—Mr. C. R. W. Chapman, surveyor:—

T. W. Pedrette, Enfield	£9,827
E. T. Bloomfield, Tottenham	9,549
J. Ford, Willesden	9,202
F. W. Southern, Harpenden	8,795
T. Adams, Wood Green	8,635
F. E. Binns, Croydon	8,580

J. Stone, Balham	£8,390
J. Dickson, St. Albans	8,322
A. E. Palmer, Leicester	8,307
A. Thompson, Finchley	8,198
E. Free & Sons, Maidenhead	8,086
S. W. S. Saunders, Bournemouth	8,058
W. Jackson, Forest Gate	7,811
D. R. Paterson, Limited, Camden Town	7,668
G. Bell & Sons, Limited, Tottenham	7,360
G. P. Trentham, Limited, Birmingham	7,337
W. Wright, Chesham	7,292
H. Farrow, Brixton	7,185
W. & C. French, Buckhurst Hill	7,034
T. J. Davies & Co., Penarth	6,790
J. M. Vine, Eastbourne	6,725
Willis & Powis, Wembley	6,306

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JANUARY.

- 9.—Junior Institution of Engineers: Mr. C. H. Woodfield on "The Future of the Institution." 8 p.m.
- 10.—Institution of Municipal Engineers: Annual General Meeting of Northern District, Town Hall, Newcastle-on-Tyne. 3.15 p.m.
- 12.—Surveyors' Institution: Mr. Graham Mould, Barrister-at-Law, on "The Law of Dilapidations."
- 15.—Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham.
- 15.—Society of Architects: Annual General Meeting. 8 p.m.
- 15.—Illuminating Engineering Society: Mr. P. J. Waldram, F.S.I., on "Some Problems in Daylight Illumination, with Special Reference to School Planning." Royal Society of Arts, 8 p.m.
- 17.—Institution of Municipal and County Engineers: South-Eastern District Meeting at Institution Offices.
- 19.—Surveyors' Institution (Junior Meeting): Mr. H. J. Smith on "The Housing and Town Planning Act in Working." 7 p.m.
- 26.—Surveyors' Institution: Mr. George Corderoy on "Measuring and Quantity Surveying."
- 29.—Concrete Institute: Discussion on Joint Report of the Reinforced Concrete Practice Committee and the Quantity Surveyors' Association, on "Standard Methods of Measurement for Reinforced Concrete Work." 7.30 p.m.
- 31.—Institution of Municipal Engineers: North-Western District Meeting, Mitre Hotel, Manchester. 1.30 p.m.

FEBRUARY.

- 4.—Institute of Sanitary Engineers: Annual Dinner, Holborn Restaurant.
- 16.—Institute of Sanitary Engineers: Mr. F. R. O'Shaughnessy, F.I.C., on "The Significance of Colloidal Matter in the Problem of Sewage Disposal." Caxton Hall, Westminster. 8 p.m.
- 20-21.—Institution of Municipal and County Engineers: Meeting at Manchester.
- 23.—Surveyors' Institution: Annual Dinner, Whitehall Rooms. 7 p.m.

EXAMINATIONS.

ROYAL SANITARY INSTITUTE.

PATRON - - HIS MAJESTY THE KING.

EXAMINATIONS—

SANITARY SCIENCE.

INSPECTORS OF NUISANCES,

SMOKE INSPECTORS,

MEAT INSPECTORS.

SCHOOL HYGIENE.

HEALTH VISITORS AND SCHOOL NURSES.

Centres for 1914 (those marked * are for Meat Inspectors only):—

Plymouth—January.	Cardiff—June.
Hull—February.	Liverpool—June.
Preston—February.	*Leeds—July.
Hereford—February.	London—July.
Southampton—March.	*Birmingham—October.
*Hull—March.	Aberdeen—October.
Bristol—March.	Nottingham—October.
Edinburgh—March.	*Dublin—October.
Norwich—April.	Liverpool—October.
*Liverpool—April.	*Cardiff—November.
London—April.	Sheffield—November.
Manchester—May.	Newcastle—November.
*London—May.	Manchester—December.
Leeds—May.	London—December.
Dublin—June.	*London—December.
Birmingham—June.	

The Examinations are officially recognised as qualifications for appointments by Government Departments and Municipal Authorities.

COURSES OF LECTURES for candidates preparing for Examinations are held by the Institute in London in the Spring and Autumn.

Application Forms and full particulars can be had from the Secretary, 90 Buckingham Palace-road, London, S.W. (1.113)

APPOINTMENTS OPEN.

RHONDDA URBAN DISTRICT COUNCIL. APPOINTMENT OF ENGINEER AND SURVEYOR.

The Rhondda Urban District Council invite applications for the position of Engineer and Surveyor to the Council.

Candidates must have gained experience in the duties relating to the office in a large and developing Urban Sanitary District, and must be Members of the Institute of Civil Engineers.

The gentleman appointed to the position will be required to devote the whole of his time to the duties of the office, and must reside within the Rhondda Urban area.

Candidates must not be under 30 nor more than 45 years of age.

Commencing salary £500 per annum, rising by annual increments of £50 to a maximum of £750 per annum.

Offices will be provided by the Council, who will also find all the necessary clerical and other assistance.

Applications must be made on the Form provided for the purpose, which may be obtained from the undersigned, and which Form, accompanied by copies of three recent testimonials, enclosed in an envelope, and endorsed "Engineer and Surveyor," must be delivered to me, the undersigned, on or before the 31st day of January, 1914.

Canvassing Members of the Council, or asking from them letters of introduction or recommendation, is absolutely prohibited, and any applicant canvassing a Member by circular or otherwise, or obtaining from him a letter of recommendation to any other Member or Officer of the Council, will be disqualified.

Candidates, if they so desire, may print the prescribed Form of Application as filled in by them and the testimonials submitted in support thereof, and may send 40 copies thereof to the undersigned, who will distribute the same to the Members of the Council.

W. P. NICHOLAS,
Clerk of the Council.

The Council Offices,
Pentre, Rhondda.
December 22, 1913. (1,077)

WILLESDEN DISTRICT COUNCIL.

The services of an Assistant in the Engineer's Department of the Willesden District Council are required forthwith.

Applicants should state if they have had any experience in the preparation of Town Planning schemes, and it will be necessary for selected candidates to submit specimens of their draughtsmanship. It is likewise desirable that they should have passed the Examination of the Institution of Municipal and County Engineers.

The commencing salary will be £150 per annum.

Applications, accompanied by copies only of three testimonials, to be delivered to the undersigned not later than Thursday, January 22nd, 1914.

O. CLAUDE ROBSON,
Engineer to the Council.

Municipal Offices,
Dyne-road, Kilburn, N.W.
January 6, 1914. (1,106)

CITY OF SHEFFIELD. APPOINTMENT OF TOWN PLANNING ASSISTANT.

The Corporation of Sheffield invites applications for the post of Assistant in the Town Planning Department of the City Engineer and Surveyor's Office.

Preference will be given to applicants who have had previous experience in the preparation of Town Planning Schemes and who are well acquainted with the Housing and Town Planning Act, 1909.

Candidates must be good draughtsmen and experienced levellers and surveyors, and have a good knowledge of road and sewer construction.

Applications, stating age, qualifications and salary required, to be made on forms which may be obtained from the undersigned, accompanied by copies of not more than three testimonials, to be sent in not later than Friday, January 23, 1914.

CHARLES F. WIKE,
City Engineer and Surveyor.

Town Hall,
Sheffield (1,117)

COUNTY BOROUGH OF WARRINGTON.

The Street Improvement Committee of the Council of the County Borough of Warrington invite applications for the appointment of a Temporary Assistant for a period of not less than 6 months, with experience in Town Planning. Salary £3 3s. per week.

Applications, in candidate's own handwriting, stating age, and giving full particulars of experience and present employment, and accompanied by copies of not more than three recent testimonials, to be sent to the undersigned, endorsed "Application for Town Planning Assistant," not later than Tuesday, the 20th day of January, 1914.

Canvassing, either directly or indirectly, will be a disqualification.

ANDREW M. KER,
Borough Engineer and Surveyor.

Town Hall, Warrington.
January 6, 1914. (1,116)

MISCELLANEOUS.

WANTED, to borrow or buy set of Coaching Papers for the Institution of Municipal and County Engineers Examination.—Box 1,390, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,120)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

ACTON URBAN DISTRICT COUNCIL. ANNUAL CONTRACTS.

Tenders are invited for the Execution of Works and Supply of Goods for one year from the 1st April, 1914, as follows: Portland Cement; Ground Blue Lias Lime; Stoneware Pipes; Granite; Flints; Household Coal; Shoeing Horses and Ponies; Man-hole Covers; Granite Kerb and Channel; Artificial Stone Paving; York Stone; Cycle Repairs and Accessories; Paints, &c.; Oils; Team Labour; Horsing Fire Brigade; Brooms, &c.; Disinfectants; Wood Blocks; Tar-paving Materials; Coke; Coke Breeze; Tools and Plant; Plumbing Work and Material; Iron and Steel, &c.; Ironmongery, &c.; Wheelwright's Work; Winding and Maintenance of Clocks.

Full particulars and Forms of Tender may be obtained, and Forms of Contract and Bond required to be entered into, may be seen at the Offices upon application to the Surveyor to the Council.

Tenders, in sealed envelopes, endorsed "Tender for —," must be delivered to me not later than 3 p.m. on Friday, the 23rd January, 1914.

The Council do not bind themselves to accept the lowest or any Tender, and canvassing Members of the Council, either directly or indirectly, will disqualify.

(By order)
WM. HODSON,
Clerk to the Council.

Council Offices,
Winchester-street, Acton, W.
January 5, 1914. (1,108)

ESSEX COUNTY COUNCIL. HIGHWAYS COMMITTEE.

The Essex County Council are prepared to receive Tenders for the Year ending 31st March, 1915, for the Supply of Materials, Team Labour, &c., as set out in the Schedule below:—

- (1) Team Labour.
- (2) Stoneware Pipes.
- (3) Norwegian Granite Kerb and Setts, York Kerb, &c.
- (4) Distilled Tar.

Forms of Tender, with the special envelope in which Tenders are to be delivered, and all other information and particulars, can be obtained at the County Surveyor's Office at Chelmsford.

Tenders to be delivered on or before Saturday, the 24th day of January, 1914.

PERCY J. SHELDON, M. INST. C.E.,
County Surveyor.

Office of the County Surveyor,
Chelmsford.
January 1, 1914. (1,118)

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

JANUARY 16, 1914.

No. 1,148.

Minutes of Proceedings.

Sewage Disposal and the Sludge Problem.

Evidence of the great interest that is taken in this subject is afforded by the fact that within the past few weeks two presidential addresses have been devoted to this matter. We recently discussed the address of Dr. Bostock Hill, the new president of the Association of Managers of Sewage Disposal Works, and last week we printed the address of Mr. J. D. Watson, M.INST.C.E., of Birmingham, the new president of the Institute of Sanitary Engineers. Although Mr. Watson dealt with housing and water supply to some extent, his address was, as he himself stated, mainly of interest to those engaged in the purification of sewage. His remarks upon the proposed central authority and the need for scientific research merit careful consideration, and it was gratifying to note that Mr. Watson's high opinion of the thoroughly practical and scientific manner in which the investigations into the conditions of New York Harbour have been carried out by the Metropolitan Sewerage Commission coincide closely with the views we have expressed on several occasions. The extent of the experiments made and information obtained in the case of New York Harbour is a measure of the magnitude of the problem to be solved, and while it may be out of all proportion to anything ever prepared for a similar purpose in this country, we need not despair so long as we possess an organisation capable not only of initiating and carrying out the very practical investigations recorded in the appendix to the Eighth Report of the Royal Commission on Sewage Disposal, but of arranging the results of their observations and drawing conclusions therefrom in such a useful and at the same time scientific manner. From Dr. Watson's remarks upon the cause of aerial nuisance from sewage works it appears that great care must be exercised in the future in selecting sites for sewerage works, and particularly in the case of large installations. On the other hand there is still some doubt in our minds whether the nuisance described by Mr. Watson is not confined to percolating filters. It would be interesting to learn what happened during the periods of high temperature mentioned at Manchester, Sheffield, Leicester, Chiswick, Twickenham, and other places where contact beds have been in operation for a considerable time.

The most important part of the address was that devoted to the sludge problem, in which Mr. Watson uttered strong warnings against the waste of the manurial value in sewage sludge. Similar warnings have been given in the past

in many quarters, but in no case has any practical suggestion been made towards preventing such waste. Mr. Watson, however, described a system of sludge treatment which he has investigated, with the result that he considers its merits sufficiently conspicuous to warrant him in saying that its discovery marks a decided advance in the treatment of sewage sludge, which no engineer can afford to ignore. The chief difficulty in sludge treatment is the separation of the liquid from the solid. The most usual method is to add chemicals, and force the liquid out by pressing. Some time ago Dr. Grossmann described in these pages a process in which the addition of a little acid caused the liquid to settle out at the bottom, leaving the solids at the top. In the method described by Mr. Watson a similar result is obtained by the addition of yeast to the sludge. He stated that "the introduction of yeast into the sludge evidently provides stimulating food for the putrefactive bacteria, as the rapidity with which the solid part of the sludge is separated from the liquid part is one of the extraordinary features of the process." We have always understood that "yeast" is the common name for the bacteria known to biologists as *Saccharomyces*, and in our opinion it will probably be found that it is these organisms, added in the form of yeast, which find stimulating food in the sludge and produce the result described.

Another point which arises in this connection is the necessity of adding phosphates and potash to the sludge in order to form a marketable manure. The manurial value of sewage sludge is not high, and, as Dr. Rideal pointed out in supporting the vote of thanks to Mr. Watson for his address, modern methods of fixing nitrogen have made it possible to produce an artificial manure which is cheaper than ordinary manure. We therefore appear to be reverting to methods similar to the A.B.C. process which was in operation at Kingston-on-Thames for a number of years, and to be recognising that in order to produce a marketable manure the sludge must first be enriched by the addition of phosphates, potash, or other suitable chemicals, and then dried to form a powder. The question of cost is important, and if the use of yeast reduces the cost of treatment it will be an important factor in the solution of the problem. It must also be borne in mind that the conversion of sewage sludge into a manure on the lines described is a real solution in the sense that the sludge is "got rid of" completely, and in a satisfactory manner from the sanitary point of view.

The Training of Highway Engineers.

In a short leading article, the *Automotor Journal* supports the proposal of Mr. H. Percy Boulnois that Chairs of Highway Engineering should be established for the purpose of training our future road engineers. Our contemporary considers that the present surveyors "are mostly doing their best with the knowledge and materials at their disposal," but expresses the opinion that "there is an enormous amount of waste going on simply because our road engineers have not received a proper training, and are bound by the traditional methods which were in vogue in the time of our grandfathers, when roads did not matter much to anyone." The use of the expression "the presence which comes of proper scientific training" in connection with a consideration of "future needs" will suggest to our readers that a high average in the matter of qualification is, in this connection, not so important as is the establishment of such an organisation of highway engineers as that which, in its main outlines, we have ourselves recommended. With or without a definite official organisation of a highway department, it ought to be possible that in case of need any stretch of road presenting difficult problems should come under the notice, successively, of persons corresponding to the executive, superintending, and chief engineer of an organised department of roads. Should this idea prove acceptable to those who may be considered responsible in the matter, it may be necessary to consider whether the training would not be more effective if the persons trained were divided into different ranks depending partly upon the length of time which their pecuniary resources would allow them to give to a college course, and partly upon their fitness to take up positions in the higher or lower ranks, which would be largely a matter dependent upon the level reached in the general education of each individual. If one kind of training would be suitable for all engaged in the reconstruction and maintenance of roads they could conveniently be trained at the different universities, each of which would turn out a relatively small number every year; if, however, the policy indicated above be accepted, it would obviously be more convenient to train the men at one or, at the most, three centres, in order that the instruction afforded might be given to classes containing each a reasonably large number of students.

It may also be pointed out that whereas it would be practically convenient for men at present engaged in highway work to attend short courses in special subjects at such a training college, it would not be so convenient to give instruction of this character to relatively senior men at an ordinary university. A training college such as we have in mind would stand to highway engineering in much the same relation as the colleges at Cirencester and Aspatria stand in relation to scientific and practical farming. In a number of countries men practically engaged in highway work are sometimes given opportunities of attending special courses in subjects relating to their profession, and it would seem to be sound policy to give, at any rate for the next five or six years, the fullest possible opportunities of this character to our own highway surveyors, as well as to assistants and those pupils and students who are just finishing courses of training which are in some respects unsatisfactory. One of the advantages of the policy which we have outlined would be the opportunity which would be afforded of developing a fully equipped training college from a nucleus which might consist of a very modest building and a staff, including two professors, one with special experience of highway engineer-

ing in the British Isles, and another with knowledge of Colonial or Indian conditions. The disappearance of Cooper's Hill College has left a gap which is by no means adequately filled by the present system of recruiting assistant engineers for India; and the great developments which are taking place or are about to take place in Canada and South Africa point to the probability that numbers of young highway engineers, properly trained in scientific and practical work and in surveying, will be wanted in those countries. It seems desirable, therefore, that a beginning should at once be made, in a suitable situation, with the idea of providing full courses in highway engineering suitable for the training of engineers for all parts of the Empire, and commanding, as a result of the relatively large number of students who would be attracted to it, a really adequate equipment and the services of a highly qualified technical and scientific staff.

County Councils and Rural Housing.

The activity which is now being displayed in many quarters in discussing the problem of rural housing and in making suggestions for the amelioration of the present admittedly deplorable state of affairs is a most excellent symptom, and we observe with pleasure that the latest proposals emanate from no less an authority than the County Councils' Association. In the current number of the official gazette of this body there appears a memorandum on "County Councils and Housing," which is of the greatest importance; and it is interesting to observe, in view of the opinion which has been expressed on more than one occasion that county councils have not hitherto done as much as they might in regard to housing matters, that the memorandum states that it cannot be denied that many county councils are not so ready as they might be to exercise their non-obligatory powers. Further, were the county councils, without exception, to act upon the principle that, so far as the law and other circumstances allowed them, they would see that the conditions of the population inhabiting the area over which they had control were as good as they should be, there is no doubt that a very vast benefit would accrue to the community as a whole. The policy advocated by the memorandum is based upon the conduct of a thorough independent investigation by the county medical officer of the housing conditions throughout each county. Having obtained reliable information in regard to the existing state of affairs in this way, it is next suggested that each county council should take action for the remedy of insanitary conditions, firstly, by bringing pressure to bear on the district councils, by making complaints to the Local Government Board, or otherwise, and secondly, if that fails, by undertaking the duty themselves. It is further proposed that similar action should be taken with regard to the provision of new houses for the working classes, both generally and for special classes of persons, such as small holders.

It appears that a survey for the purpose of obtaining complete and accurate information in regard to existing conditions is the proper point at which to begin any reform on broad lines. It has recently been indicated by the Chancellor of the Exchequer that an investigation of this kind may at some future time be undertaken on behalf of the Government with a view to the erection of a large number of cottages by the central authority; but it would appear to be very undesirable that county councils should abstain from taking any action which may do immediate good on the ground that other proposals are in the air. The memorandum, in conclusion, points

out that the policy outlined must involve some burden on the rates. It must be observed, however, that some of the work which is optional to county councils is obligatory on district councils, and that therefore, whichever authority undertakes it, the cost will fall on the ratepayers; further that the cost is likely to be less, rather than more, and that the burden will also be more widely spread if the work is done on the larger scale by the authority for the larger area. As regards expenditure which is not within this category, it is fully recognised on all sides that the housing conditions of the working classes are a crying evil, and that private enterprise cannot cope with it. It is, therefore, a matter which must be dealt with by means of public money, and it is a matter of such pre-eminently local concern that it should not be left completely in the hands of the central authority. If this is admitted, it necessarily follows that the whole cost cannot be expected to be paid out of the National Exchequer, but that some of it, at any rate, must be met out of the rates. There are few, if any, subjects upon which the contributions of the ratepayers are at present expended which are so likely to promote the health and prosperity of the community as a policy which will sweep out of existence the insanitary dwellings in towns and villages, improve those which are capable of improvement, and supply wherever needed a sufficiency of healthy cottages at a reasonable rent.

* * *

Law of Dilapidations.

The admirable paper on the "Law of Dilapidations" read by Mr. Graham Mould at last Monday's meeting of the Surveyors' Institution should certainly be perused by all surveyors who are concerned with the letting or management of private property, while as a brief summary of an important subject of examination study it should also be much appreciated by students. The subject, too, is not so far removed from the sphere of public health administration as might at first sight appear, for the implied obligation of a landlord in regard to the repair of premises demised by him is almost entirely the result of housing legislation. The rule of the common law that a landlord is under no implied obligation as to the condition of the premises (with the exception of furnished houses) which he lets, however ruinous or dilapidated such premises may be, still holds good, but this immunity of the landlord from liability has been considerably whittled away by the Legislature in recent years. The first step in this process was the passing of sec. 75 of the Housing of the Working Classes Act, 1890, which provided that where any house or part of a house is let for habitation at a rental not exceeding that specified there shall be an implied condition that the house is at the commencement of the holding in all respects reasonably fit for human habitation. Next came sec. 12 of the Housing of the Working Classes Act, 1903, which rendered nugatory any attempt to "contract out" of the provisions of sec. 75. Finally, by secs. 14 and 15 of the Housing, Town Planning, &c., Act, 1909, the rents specified in sec. 75 were considerably raised, and an implied undertaking was added that the landlord shall *during the holding keep* the premises reasonably fit for human habitation. The last-named provisions, however, are not applicable when the letting is for a period of not less than three years upon the terms that the premises are put by the lessee into a condition reasonably fit for occupation, and the lease is not determinable by either party before the expiration of that term.

Mr. Graham Mould, in discussing these provisions, expresses the opinion that "apparently there is nothing to prevent the landlord contract-

ing out of the Act of 1909, although he cannot contract out of the Act of 1890." While we are not prepared to disagree with this proposition—the space at our disposal would be insufficient to set forth the necessary arguments—we venture with respect to suggest that the statement should, at all events, not be put any higher than is implied by Mr. Graham Mould's "apparently." The point is one of difficulty, in regard to which much may be said on either side. It may here be pointed out that a landlord who commits a breach of this statutory undertaking is liable only to his tenant, and not to a stranger or even a member of the tenant's family in respect thereof. We have only discussed here that part of Mr. Graham Mould's paper which is most likely to interest our readers. The contribution further dealt exhaustively and ably with the respective obligations of landlord and tenant both in the absence and presence of an express contract to repair.

* * *

Housing in 1913.

The reports which have been published from time to time by the Local Government Board since the coming into operation of the Housing, Town Planning, &c., Act, 1909, show that the passing of that Act has produced considerable activity on the part of local authorities in regard to those matters with which that statute deals. The latest of these reports, issued last week, shows that this activity was considerably increased during 1913. In the first place, the powers conferred by sec. 15 of the Act, which relates to giving notice to landlords to make houses fit for habitation, have been utilised very extensively, and there has been a substantial increase in the number of local authorities who have exercised these powers. The total number of notices served during the year was 43,781, and they were issued at the instance of 865 authorities. In regard to the provision of new houses, too, the amount of sanctioned loans continues to increase at a larger rate. The loans sanctioned or under consideration at the end of 1913 exceeded £1,750,000, and the schemes provide for the erection of 7,700 new houses by local authorities. It is especially satisfactory to observe in this connection that improvement has been particularly noticeable in the case of rural districts. As regards town planning, it is stated that the regulations governing the procedure in regard to town planning schemes have now been in force some three and a-half years, and that, in view of the experience gained and representations made in favour of certain amendments, the board contemplate a revision of the regulations at an early date.

* * *

Road Models in the United States.

We are indebted to the courtesy of the officers of the United States Office of Public Roads for the opportunity of placing before our readers, in the present issue, some very good illustrations of different types of road crust taken from models which are used in the educative work of that office. The illustrations showing Roman and French road crusts give a much better idea of the actual method of construction than can be gained by a study of the sections only of such roads, and we have selected several other plates which convey useful information as regards bituminous and brick-paved roads, or serve to assist an engineer in explaining to his assistants and foremen how such work should be carried out. Our frank criticisms of certain passages in the text of the catalogue are by no means intended to apply solely to American practice, but form a part of our own propaganda of certain advanced ideas in matters of highway engineering.

Road Models in the United States.

[Notes and extracts from the descriptive catalogue of road models of the United States Office of Public Roads]

"The Office of Public Roads of the United States Department of Agriculture made an exhibit of road models for the first time at the Alaska-Yukon-Pacific Exposition. The aim was to put on view such striking examples in miniature of model roads that visitors would not only appreciate the beneficent effects of improved highways, but would, at the same time, be able to understand the methods of their construction."

The exhibit has since been displayed at a number of exhibitions, and the models have been shown on "road trains" at important places on several of the principal railways.

The models illustrate standard types of road construction, and represent the modern ideas of highway

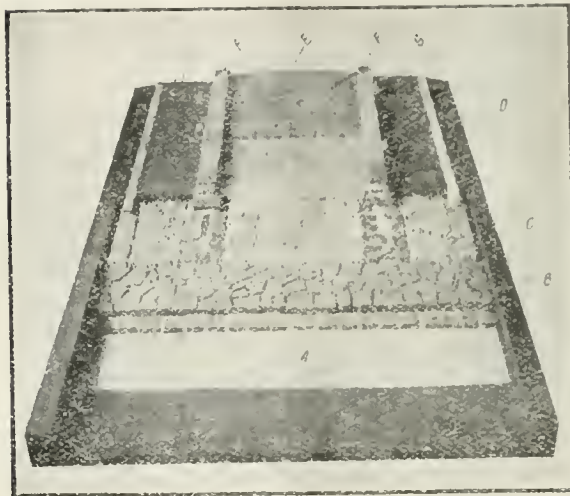


FIG. 1.—MODEL SHOWING THE APPIAN WAY (300 B.C.).

engineers. All of them are built on the scale of 1 in. to the foot, or one-twelfth of the full size. With the exception of the brick model, they represent roads with a hardened surface 16 ft. wide, and with earth shoulders on each side about 6 ft. wide. Owing to climatic conditions and the varying character of local materials, modifications in construction will be found necessary, and if application for expert advice concerning any special road problem is made, the Office of Public Roads is prepared to furnish it free of charge.

"The descriptions of the models are so arranged in this bulletin as to present the historic development of road building. The Roman road is described first, and then descriptions are given successively of the French roads, after the ideas of the Romans and of Trésaguet, the roads of MacAdam and Telford, and finally the various types of modern construction. Among the latter are models showing brick, concrete, asphalt block, macadam, sand-clay, gravel and earth roads. There are other models showing the process of maintenance, resurfacing, and bituminous macadam construction by the mixing, penetration and prepared-filler methods."

SOME OF THE ILLUSTRATIONS.

The following passages from the text of the catalogue relate to the illustrations selected for reproduction, to which consecutive numerals are here assigned.

"Fig. 1 shows a model of the Appian Way. This is the highest developed type of road constructed by the Romans.

"Section A shows the *contignatum pavementum*, composed of lime and sand, straw, rushes or reeds, and sometimes laid on sills or boards.

"Section B shows the *statumen*, or foundation, composed of two courses of flat stones laid dry or in lime mortar. The depth of this course was from 16 in. to 18 in.

"Section C shows the *rudus*, or rubble, composed of broken stone mixed with lime in the proportion of 1 part of lime to 3 parts of stone. Sometimes the material was taken from old buildings. This course was laid from 6 in. to 9 in. deep.

"Section D represents the *nucleus*, composed of coarse gravel and lime used hot, or bricks, potsherds

or broken tile mixed with lime and covered with a thin layer of lime mortar.

"Section E shows the *summa crusta* or *pavimentum*, consisting of polygonal block-joined with the greatest nicety. This course was about 6 in. deep, and about 16 ft. wide.

"Section F indicates the kerbs, which were 2 ft. wide and 18 in. high, with upping blocks as shown in the illustration. These blocks served as seats for travellers and as mounting blocks for riders.

"Section G shows a side road, the surface of which was composed of gravel flushed with mortar. The width was from 6 ft. to 8 ft.

"Fig. 2 illustrates the type of road constructed in France previous to 1775. This type was modelled on the Roman system.

"Section A shows the earth foundation, which was flat.

"Section B represents the stone foundation. This course was composed of flat stones laid by hand in two or more layers. The total width of this foundation was 18 ft., and the depth was from 9 in. to 10 in.

"Section C shows the layer of small stones, which were broken in place with hand hammers.

"Section D shows the finished surface. This course was composed of stones broken by hand into sizes smaller than the underlying material. It was left to be consolidated by traffic. The total thickness of the road in the centre was from 18 in. to 20 in., and at the sides from 12 in. to 14 in."

TRÉSAGUET METHOD.

"Fig. 3 illustrates the type of road constructed in France by Trésaguet from 1775 to 1830. After this period the MacAdam method was used almost exclusively.

"Section A shows the earth foundation parallel to the finished surface.

"Section B represents the stone foundation, which was composed of flat stones laid on edge, lengthwise across the road, and beaten to an even surface. The depth of this foundation was about 5 in.

"Section C shows the small stones laid and beaten by hand hammers. The finished layer was composed

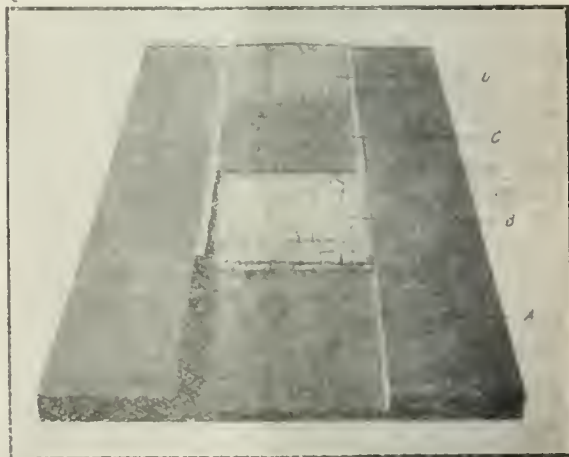


FIG. 2.—MODEL SHOWING A FRENCH ROAD BUILT BEFORE 1775 (ROMAN METHOD).

of broken stones about the size of walnuts, and was spread with a shovel.

"Section D represents the finished road as consolidated by travel. The crown was made 6 in., the width 18 ft., and the total thickness about 10 in.

"Section E shows the kerbs, which were composed of rough, flat stones, set on edge. The upper edge was made flush with the surface."

PENETRATION METHOD.

"Fig. 4 illustrates the construction of a bituminous macadam road built according to the penetration method.

"Section A represents the prepared subgrade 16 ft. wide, with the crown $\frac{1}{2}$ in. to the foot; section B, the first course of No. 1 stone, 4 in. compacted after

rolling; section C, the second course of No. 2 stone, 2 in. compacted after rolling; section D, the application of bitumen at the rate of about 1½ gallons to the square yard; section E, the application of stone chips, after being rolled; section F, a bitumen paint coat applied at the rate of about ½ gallon per square yard; and section G shows the completed surface, with clean stone chips lightly rolled, and the crown of the finished road, representing an average fall of about ¼ in. to the foot.

"The construction of this road, through the application of the No. 1 and No. 2 courses, is the same as

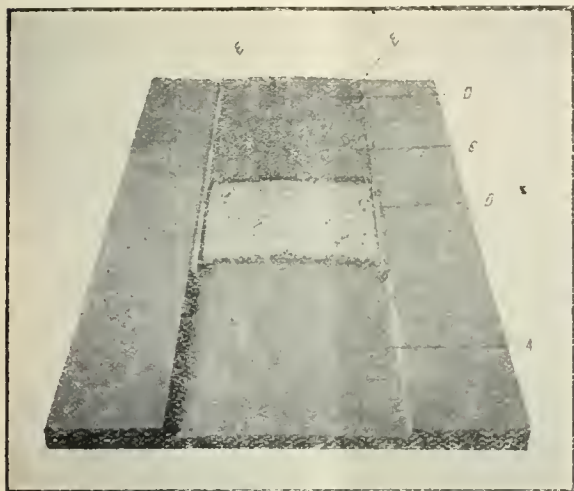


FIG. 3.—MODEL SHOWING A FRENCH ROAD OF TRÉSAGUET, BETWEEN 1775 AND 1830.

an ordinary macadam road. It varies from the method of construction of a macadam road in that hot tar or asphalt is flushed into the No. 2 course before the screenings are applied.

"After the application of hot tar or asphalt a light coat of clean stone chips is spread and rolled lightly into the surface."

MIXING METHOD.

"Fig. 5 illustrates the construction of a tar, oil, or asphalt macadam road, built according to the plan ordinarily referred to as the 'mixing method.'

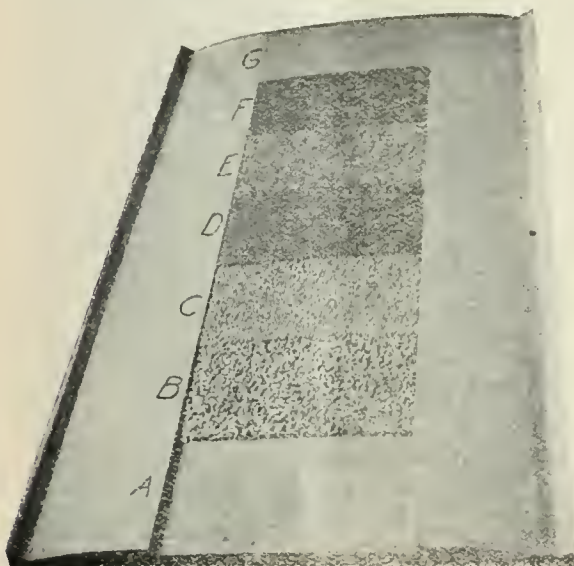


FIG. 4.—MODEL OF A BITUMINOUS MACADAM ROAD—PENETRATION METHOD.

"Section A illustrates the prepared subgrade 16 ft. wide, with the crown ¼ in. to the foot; section B, the first course of No. 1 stone compacted to a depth of about 4 in.; section C, the second course of bitumen-covered stone spread to a depth of about 2 in. when compacted; section D, the application of a layer, about ¼ in. thick, of bitumen-covered sand or stone chips, which, after being rolled firmly into the surface voids, should add nothing to the thickness of the road; and section E shows the completed surface and the clean chips or sand lightly

rolled, leaving the road with a sloping crown of about ¼ in. to the foot. The course of bitumen-covered stone is prepared by applying sufficient hot bitumen to cover a graded mineral aggregate when mixed. This graded aggregate is composed of No. 2 stone and stone ranging in size from ¾ in. to dust in proportions of 960 lb. to 350 lb.

"Before applying the bitumen-covered sand this course must be thoroughly rolled, and the sand then applied in such quantities that it will fill the surface voids and bring the surface to a smooth and even condition. The final coat of stone dust is applied merely for the purpose of taking up any excess of bitumen and of giving the road a pleasing appearance."

PREPARED-FILLER METHOD.

"Fig. 6 shows the construction of a bituminous macadam road built according to the prepared-filler method.

"Section A represents the prepared subgrade, which has a crown of ¼ in. to the foot and is well rolled.

"Section B shows the first course of No. 1 broken stone. The stone varies in size from 1½ in. to 3 in., and is placed to a depth of about 5½ in. loose, or 4 in. rolled.

"Section C represents the second layer of broken stone. The size of the stone in this layer varies from

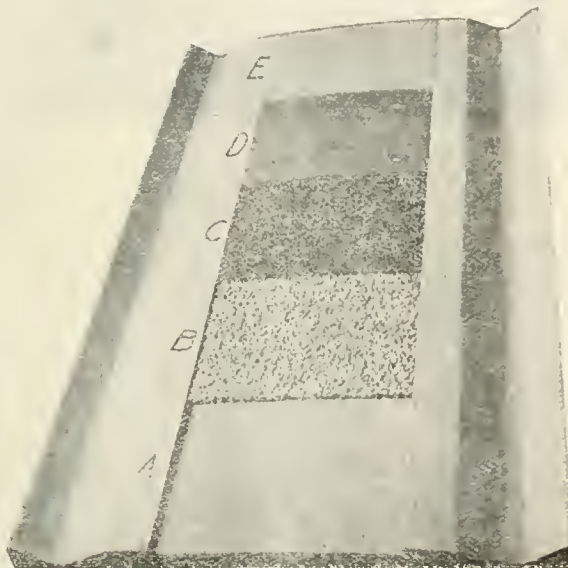


FIG. 5.—MODEL OF A BITUMINOUS MACADAM ROAD—MIXING METHOD.

¾ in. to 1½ in. The stone is spread to a depth of about 3 in. loose, or 2½ in. rolled.

"Section D illustrates the application of the bituminous prepared filler, spread to a depth of about 1½ in. The filler is made up as follows: Stone chips, from ½ in. to ¾ in., sand, and from 7 to 12 per cent bitumen, each heated separately and mixed. The mixture is applied hot.

"Section E represents the mixing of the prepared filler with the No. 2 stone by means of harrowing. The harrowing is continued until the No. 2 stone appears in the surface, after which the filler is thoroughly rolled with a steam roller.

"Section F represents the second layer of filler, which is spread to a depth of about ½ in. and thoroughly rolled.

"Section G shows the application of a light covering of screenings to take up the surplus bitumen, after which a thorough rolling completes the road."

BRICK ROADS.

"Fig. 7 illustrates the construction of a brick road where frost conditions are encountered, and differs from the other models in that the surface width is 14 ft., including the kerb. The crown of the completed roadway is ¼ in. to the foot.

"Section A illustrates the prepared subgrade for the foundation course; section B, the concrete kerbing placed along the edges of the road; section C, a stone foundation 6 in. deep; section D, a concrete foundation 6 in. deep, which is often used in place of the stone foundation; section E, the sand cushion, 2 in. deep, placed on top of the foundation previously described; section F, the surface before grouting; section G, the expansion joints, and section H illustrates

the grouted brick surface ready for travel. In addition, a properly constructed mixing box is shown, illustrating the manner in which the grouting is prepared."

SOME OTHER POINTS AND COMMENTS.

The text of the catalogue is not confined to descriptions of the models, but includes passages descriptive of the methods employed, and separate consideration is given to the subject of "foundations or subgrades-

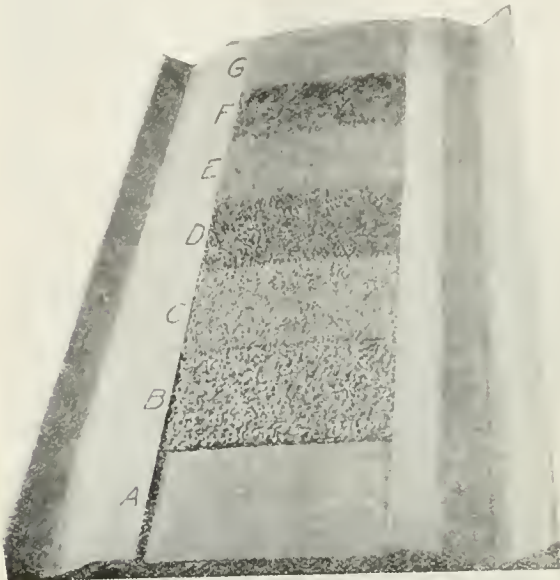


FIG. 6.—MODEL OF A BITUMINOUS MACADAM ROAD—PREPARED-FILLER METHOD.

and shoulders." The terms "foundation" and "sub-grade" seem to be used synonymously, and the opportunity may be taken to recommend THE SURVEYOR'S distinction between the road-bed and the foundation proper, or foundation course. A hard road-bed may be used, of course, as the only foundation for a single crust, and the terms "road-bed," "foundation," "foundation course," and "bottoming" or "bottoming course," have each a proper place in road terminology.

One of the chief weaknesses of American road construction is displayed in the statement that "the

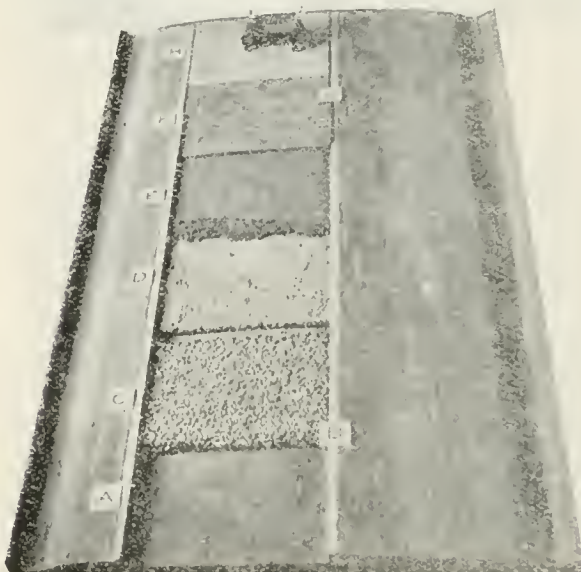


FIG. 7. MODEL OF A BRICK ROAD.

shoulders are usually finished with a sharper crown than is given the hardened surface." The models, it may be suggested, are lacking in adequate presentment of that important detail the junction of the edge of the main or wheelway crust with the shoulders or subsidiary crusts, and it would, perhaps, be supposed, from the illustrations of them at any rate, that the carriage-way crust has a vertical edge against plain earth, the latter being then sloped somewhat sharply to the ditch. The English nearly level turf border,

with grips for surface drainage, gives much better support.

Various methods of road drainage are briefly described, and it is pointed out that the V stone drain foundation "is cheaper than the Telford method, and in a section of country where rock abounds in ledges, it is also cheaper than the side drain construction." It might, however, have been pointed out that the V drain is, in many cases, much less efficient than Telford drainage, and tends to render the road crust wavy.

A passage relating to sand-clay roads, which suggests the experience of some of our overseas dominions, may be quoted in full as a good summary of main points:

"The mileage of roads in the United States is so vast, and the traffic on many of the country roads is so light that it is out of the question to improve more than a small percentage of these roads with a hard surface. This does not mean, however, that all other roads must be neglected. They should be improved just as far as their importance and the traffic will warrant. The common clay roads may be vastly improved by a little judicious grading and systematic maintenance. In many cases, especially in the vast regions of the South, most of the common roads may be improved, for all practical purposes, merely by the addition of sand or clay, as the case may require, and incorporating this with the surface soil of the road. Thousands of miles of sand-clay roads have already been built in the Southern States at an average cost of about \$750 per mile. These roads are almost without exception answering the purposes as well as a far more expensive form of construction would do."

As regards earth roads, it is pointed out that "such roads should be worked when they are damp and soft. The material can then be handled more economically, and the resulting road surface will be more satisfactory. After earth roads have once settled down in the spring or summer, they should not be disturbed. If work is then attempted the material will be brought upon the roads in clods, which make only a rough surface when dry and an excess of mud when wet."

This reflects the conditions of a climate with strongly marked and regular seasons, and would not apply to climates such as those of the British Isles.

Epsom Opposes New Road.—At a meeting of the Epsom Urban District Council last week it was decided to oppose the proposal to construct a new road, which would run through a portion of the Common Fields, recently given by Lord Rosebery to Epsom as a public place of resort, as the road would cut up the ground, interfere with the intention of the donor, and nullify the expenditure being incurred on the property by the council.

The Belfast Park Scheme.—At a special meeting of the joint Law and Tramways and Electricity Committee of the Belfast Corporation recently, a letter was read from the Local Government Board stating that on legal grounds they could not give their sanction to an application to a loan of £15,000 for the completion of the Bellevue Gardens as public recreation grounds in connection with the tramway department. The Board of Trade previously sent a similar reply to a like request made by the corporation. On Wednesday the corporation decided to promote a Bill in Parliament giving them power to spend the necessary sum.

Metropolitan Water Board.—At last Friday's meeting of the Metropolitan Water Board the General Purposes Committee—authorised by the board to select six architects to prepare competitive plans for the new central offices, and to appoint a professional assessor to advise on conditions of competition and on the design submitted—brought forward the following names: Mr. Burnett Brown, Mr. Edwin Cooper, Mr. H. O. Ellis, Mr. E. T. Hall, Mr. D. T. Hare and Messrs. Warwick & Hall. The committee stated that they had invited the president of the Royal Institute of British Architects to nominate an assessor. The report was adopted.—The tender of Messrs. R. McAlpine & Sons, at £37,404, was accepted for the construction of a tunnel under the Thames between Twickenham and Richmond. The various tenders received provided for construction in either one or two shafts, and both with and without compressed air, and that of Messrs. McAlpine was the lowest of those for work in a single shaft, using compressed air.

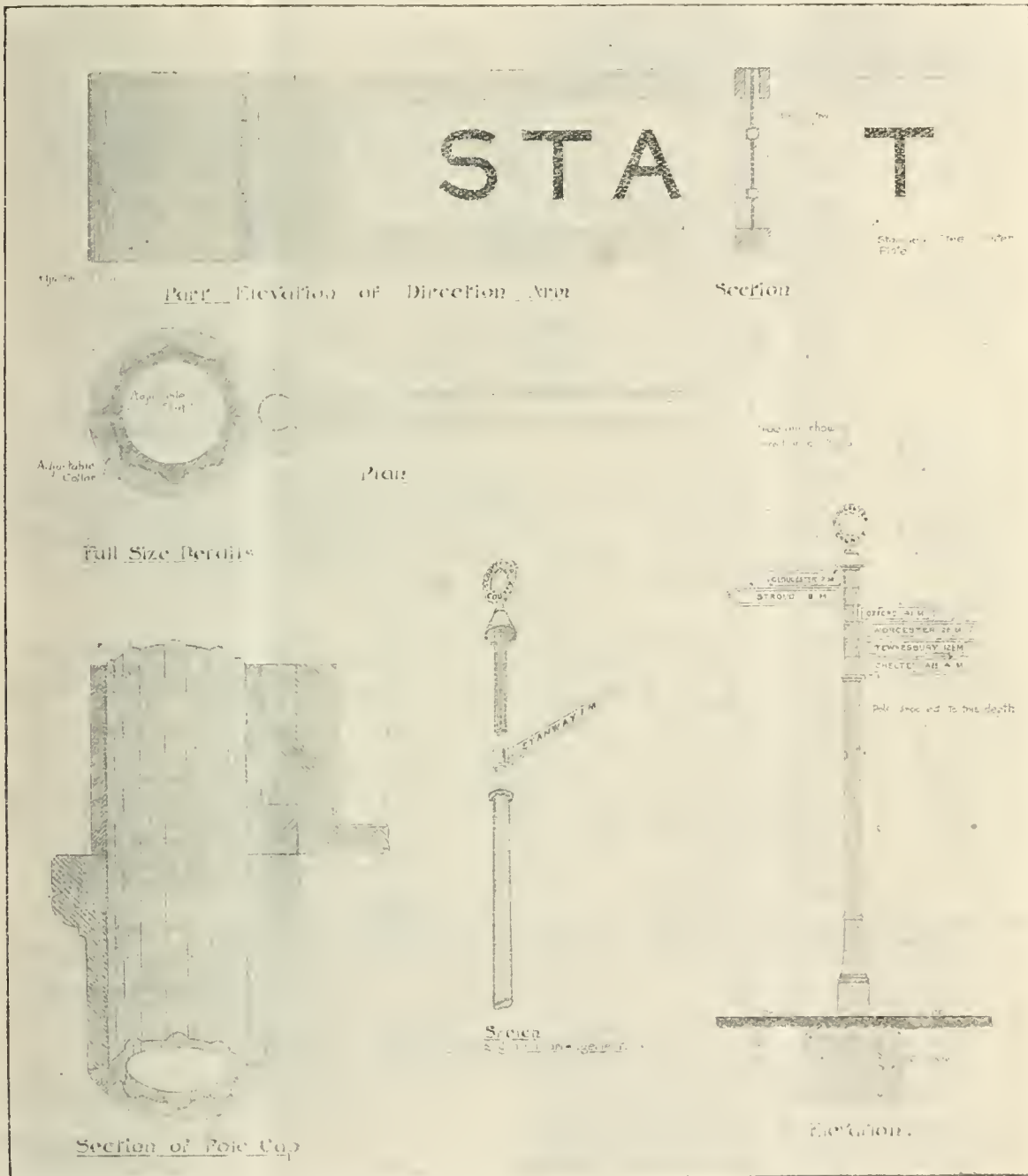
Direction Posts Competition.

GENERAL DESCRIPTIONS OF WINNING DESIGNS.

As we announced last week, Messrs. E. S. Sinnott, M.INST.C.E., county surveyor of Gloucester, W. & F. Wills, Limited, Perseverance Works, Bridgwater, and W. Weeks & Son, Limited, Perseverance Works, Maidstone, have been awarded the first, second and third prizes respectively in the competition for designs for direction posts and plates instituted in connection with the International Road Congress held in London in June last. The object of the competition was to secure a standard type of post suitable for general

sliding shaft, which can be moved vertically. This sliding shaft is shaped to correspond with the octagonal form in the post above referred to.

Adjustable collars are provided which can be placed in any one of the eight positions on the shaft at which it is desired to indicate direction. To these collars cast-iron direction arms are attachable after the collars have been fixed in position. The sliding shaft remains in position by its own weight, and the cap at the top forms a protection over the topmost collar.



GENERAL DESIGN FOR DIRECTION POSTS BY MR. E. S. SINNOTT, M.INST.C.E. (FIRST PRIZE).

adoption by highway authorities. Fifty-nine entries were received.

GLoucester COUNTY SURVEYOR'S DESIGN.

Accompanying the general description of the design submitted by Mr. E. S. Sinnott, county surveyor of Gloucester, are five illustrations. The drawing reproduced herewith gives particulars of the post, arm, letters, and so forth, and the others particulars for the four schemes set forth in the rules governing the competition.

The post is of cast iron, having on the inside, at the upper end, a special octagonal form to receive a

The top of the vertical shaft is in circular form, and bears the name of the county in which it is erected.

The lettering on the direction arms consists of steel stamped raised letters inserted in the arms, as shown upon the drawing, and appears on both sides. In the case of words which recur many times—such as Gloucester, Cheltenham, Tewkesbury, &c.—steel plates containing the whole word can be stamped complete. In the case of villages which occur but seldom—such as Stanway, the word can be made up by placing a series of independent letters in the necessary order. The same remark applies to the mileage, which is left blank for the insertion of the actual figures for each

particular arm. The letter M, indicating miles, is cast on both sides of the arm.

The design has the following objects:—

(a) To provide a post and arm that can be used in every possible situation.

(b) To avoid the use of all screwed attachments.

(c) To admit of all breakages being readily replaced, and to avoid the necessity for new castings, which is the drawback to the ordinary cast-iron arm.

(d) Adjustability of the direction arm upon the ground after the post is in position.

By the method set forth in the above description no expense in the way of special patterns for direction arms is needed. Any arm can be prepared in a few minutes by placing the necessary lettering and figures into the slot of the arm, as shown upon the drawing. Where it is necessary to place two or more arms pointing in the same direction—such as Cheltenham, Tewkesbury and Worcester (see drawing)—the lowest arm indicates the nearest town. As will be observed, no two arms are in the same horizontal plane, with the advantage that they are not obscured by the motorist when approaching from any direction.

The details required by clause 2 of the rules governing the competition are as follows:—

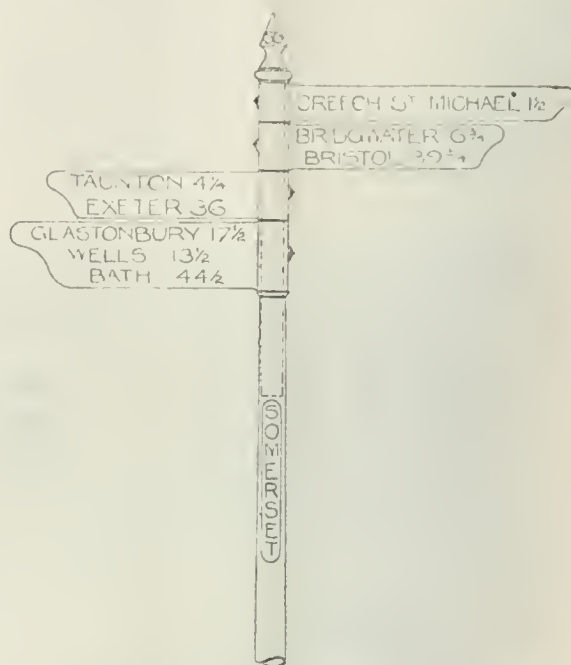
- | | |
|--|--|
| (i) POST. | Cast iron. |
| Shape. | Circular. |
| Size. | Diameter at ground line—9½ in.
Diameter at arm line—4½ in.
Height above ground for lowest arm—10 ft. |
| Colouring. | White, with black letters. |
| (ii) ARM. | Cast iron. |
| Shape. | As shown on drawing with slot from the top to admit of steel stamped letters and figures being inserted (see general description above). |
| Size. | Three feet long by 4½ in. deep. |
| Colouring. | White. |
| Attachment. | The arms are let into the adjustable collars as shown on Drawing A (see general description). |
| (iii) LETTERING. | Two inches in depth. |
| Shape. | Rectangular and raised one-eighth of an inch from surface of plate. |
| Colour. | Black. |
| Description. | To consist of stamped steel plates having single raised words such as Gloucester, Cheltenham, Tewkesbury, &c., or made up to form words from individual letters. The mileage also shown to same size, made up from individual figures to suit each particular case. The plate, or rather, series of plates, would give all the necessary direction, as shown in the typical instance taken (see drawing), which is on the top of Crickley Hill, on the road from Gloucester to Oxford. |
| (iv) COST.—Posts, with concrete foundation, including four arms with letters fixed and painted complete in quantities of 1,000, £4 10s. each. In quantities of 100, £4 18s. each (the cost of post with four arms is given as a fair average). | |
| (v) METHOD OF ERECTION | consists in the necessary excavation and concrete for foundation (see drawing). The subsequent fixing of the adjustable collars upon the sliding shaft can be arranged with ease by an unskilled man upon the ground. |
| (vi) ESTIMATED COST OF MAINTENANCE.—9d. each per annum. Owing to the lettering or the steel plates being raised, skilled workmanship is not required in repainting the lettering. | |

DESIGN OF MESSRS. W. & F. WILLS, LIMITED.

The post is of east iron in two castings, the lower part forming a socket for the upper part. The lower part has also a flanged base provided to make a satisfactory fixing in the ground, and it carries the name of the county in a vertical position, as shown on the model. The upper part is of circular section, and of the length required for the particular number of plates for any position.

A sufficient length of this part projects downwards beyond the plates into the lower part of the post which it fits. It is securely fastened therein by set screws, screwed against it through the lower part. The set screws are undercut at the correct length, so that after

screwing in tightly the heads may be twisted off flush with the post, and are thus proof against tampering. The upper part of the post is capped by a cast-iron finial cast solid with it, bearing the initial letters of the county or other authority. The plates are lettered on both sides. They are fixed by means of an undercut set screw in the back of each plate, which screws against the upper part of the post, and so holds the



GENERAL DESIGN FOR DIRECTION POSTS BY MESSRS. W. & F. WILLS, LIMITED (SECOND PRIZE).

plate in position. The head of the screw is twisted off so that the plate cannot be tampered with or altered in direction in any way.

The details required by clause 2 of the rules governing the competition are as follows:—

- | | |
|---|--|
| (i) POST. | Cast iron. |
| Shape. | Circular. |
| Size. | Diameter at ground line—9 in.
Diameter at arm line—4½ in.
Height above ground for lowest arm—9 ft. |
| Colouring. | White with black letters. |
| (ii) ARM. | Cast iron. |
| Shape. | As shown by model. |
| Size. | Length varying—not less than 2 ft. 6 in. from boss.
Depth for one name, 7 in.
Depth for two names, 8½ in.
Depth for three names, 12½ in. |
| Colouring. | White. |
| Attachment. | See general description. |
| (iii) LETTERING. | 3 in. deep by 2 in. wide by ⅜ in. line thickness.
Fractional figures 1¼ in. deep by 1 in. wide by ⅞ in. line thickness. |
| Shape. | Plain block, raised ⅞ in. |
| Colour. | Black. |
| Information. | Names of places and mileage from post and any other information required.
The number of names on one plate need by no means be confined to three. |
| (iv) COST.—One post (upper and lower parts to take up to four deep plates), 39s. One plain plate for one line, 5s. 6d., two lines, 7s., three lines, 8s. 3d. Letters, 1s. per dozen. These prices refer only to small quantities. | |
| (v) METHOD OF ERECTION.—See general description. The whole of the work can be done on the site with unskilled labour. | |
| (vi) ESTIMATED COST OF MAINTENANCE.—Occasional painting is all that is required. | |

DESIGN OF MESSRS. W. WEEKS & SON, LIMITED.

The post is a hollow cast-iron column in one piece, the upper portion being round and the base octagonal. The length below the ground flange for fixing in the

ground is 2ft. 9in. This part is octagonal, and has four long slots to allow the concrete to fill in and form a solid mass.

Short, single-flanged pieces or sockets are provided for fixing on top of the column for carrying the arms. The inside end of each arm is provided with a short, curved, projecting piece top and bottom, and a groove is formed round in the flange of each socket to take this projecting piece. A separate loose flange is provided also, having a groove round it for taking the other projection of the arm.

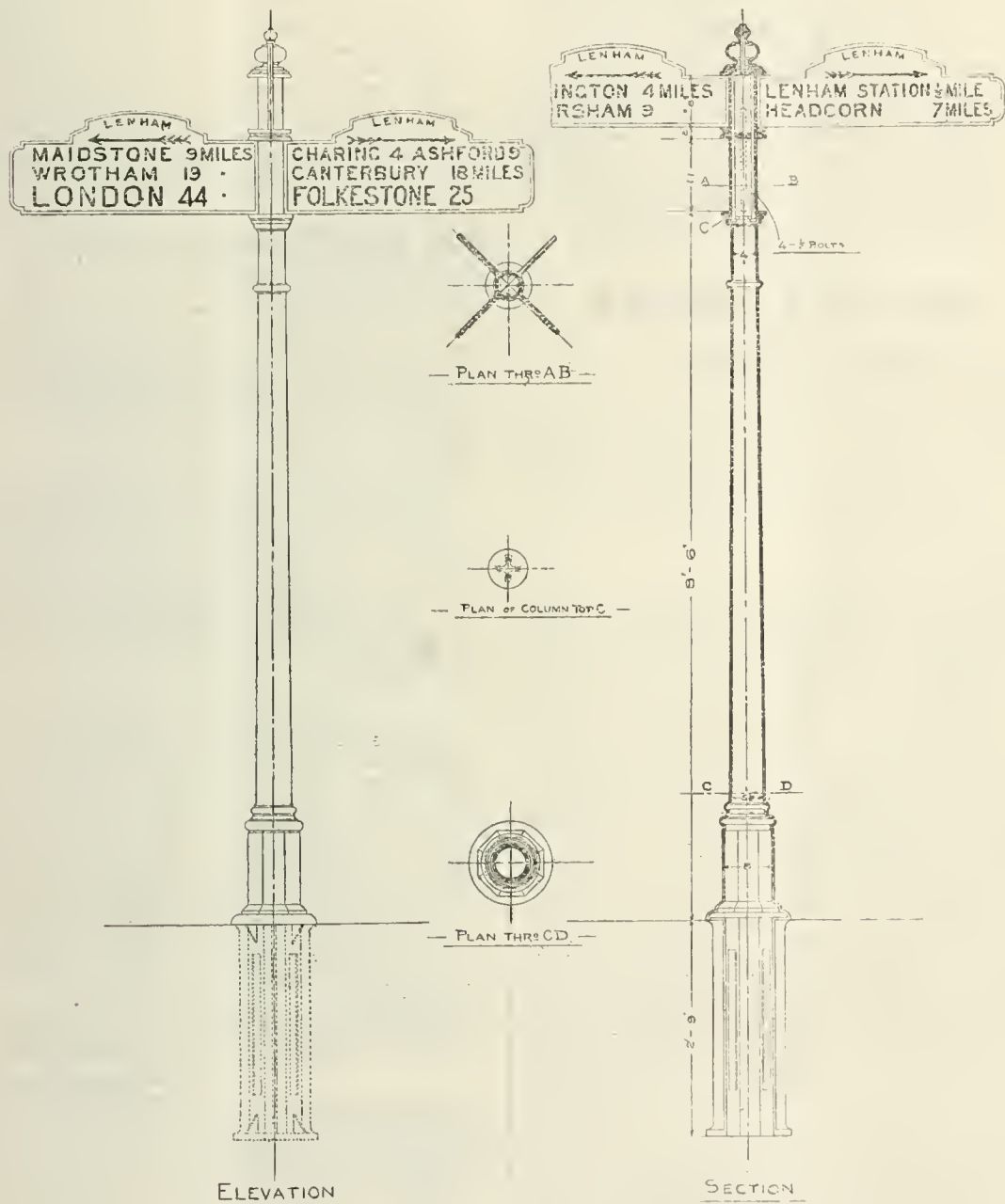
The top of the column is cast with tee-slots to take four long bolts, and the method of erecting is to put the four bolts in position, slip the socket over these, and also the top flange, and then screw the nuts on the bolts sufficiently tight to hold the parts together.

base of the finial is hollowed out inside, so that it can be screwed down over the four bolt ends and nuts to hide them from view.

A useful addition might be made to these posts by fixing a N. S. E. W. cross at the top to indicate the points of the compass.

The details required by clause 2 of the rules governing the competition are as follows:—

- | | |
|------------|---|
| (i) Post. | Cast iron. |
| Shape. | Circular. |
| Size. | Diameter at ground line, 6½ in.
Diameter at arm line, 5 in.
Height above ground for lowest arm, 8 ft. 6 in. |
| Colouring. | White. |



GENERAL DESIGN FOR DIRECTION POSTS BY MESSRS. W. WEEKS & SON, LIMITED (THIRD PRIZE).

By just undoing the nuts one side the flange can be raised sufficiently for the arm to be inserted, and its projecting pieces to come in their respective grooves, and they are securely held in position when the nuts are again tightened up. It will be seen that this system of fixing allows the arms to be erected so that they point in any particular direction required without any variation in construction.

At a cross-roads, such as has been selected, for example, it is much better to construct the post so that one pair of arms is above the other, and all four can be plainly seen from any position. To accomplish this an extra socket and flange are provided, and the tie bolts are made longer accordingly. The top flange is drilled and tapped in the centre to receive the stud, which is cast in the finial cap for securing it. The

- | | |
|------------------|--|
| (ii) ARM. | Cast iron. |
| Shape. | Rectangular, with plain end, rounded off with a small set-off at the corners. Middle portion raised 5 in. to form a panel for location name. |
| Size. | Varying according to information:
A plate 8 in. deep is 3 ft. 1 in. long.
" 11 in. " 3 ft. 3 in. " |
| Colouring. | White. |
| Attachment. | See general description. |
| (iii) LETTERING. | May be 6 in. or 4 in. with 3 in. deep and 2 in. wide as a minimum, except location letters, 1½ in. deep. |
| Shape. | Raised plain block. |
| Colour. | Letters black; figures red. |

- Information. Principal places near at hand in smaller letters.
Main town eventually reached in larger letters.
Location name in 1½ in. letters.
Arrow giving direction.
- (iv) Cost.
- | | |
|--|---------|
| Cast-iron post, complete with final top and bolts... | £ s. d. |
| One socket and flange to take two 11 in. arms ... | 0 4 6 |
| One socket and flange to take two 8 in. arms ... | 0 3 6 |
| Two 11 in. arms ready lettered and painted ... | 1 11 6 |
| Two 8 in. arms ready lettered and painted ... | 1 1 0 |
| Total ... | £5 0 6 |
- In quantities of 6 or more a 5 per cent reduction, and
In quantities of 12 or more a 10 per cent reduction.
- (v) METHOD OF ERECTION.—A hole about 18 in. or 24 in. square and 3 ft. deep is dug and the post put in plumb and fixed in with concrete. The arms are put up and erected after the post is in position.
- (vi) ESTIMATED COST OF MAINTENANCE.—Almost negligible, as, beyond repainting occasionally, with unskilled labour, nothing is required.

REGISTRATION OF ARCHITECTS.

PROPOSED LEGISLATION.

A Bill providing for the registration of architects has been prepared by the Society of Architects for presentation in the forthcoming Session of Parliament. It will provide that all architects in *bona-fide* practice at the passing of the measure shall be permitted to register, and that thereafter registration shall be limited to such as have been properly educated and have proved their qualifications by proper examinations.

The object of the Bill is to enable persons requiring professional aid to distinguish qualified from unqualified architects. It is proposed to establish a Council of Architectural Education and Registration of the United Kingdom. The council is to consist of (1) persons nominated by His Majesty with the advice of his Privy Council; (2) architects chosen by the council of the Royal Institute of British Architects, the council of the Society of Architects, founded 1834, and the council of the Royal Institute of Architects, Ireland; and (3) architects elected as direct representatives by registered practitioners.

Persons qualified to be registered comprise Fellows, Associates, and Licentiate of the Royal Institute of British Architects, members of the Society of Architects, founded 1834, or professional members of twenty-two specified provincial societies, as well as persons actually practising architecture in the United Kingdom, who were practising on January 1, 1914; also apprentices, assistants, or practitioners in architecture of a certain standing. Other applicants for admission after January 1, 1915, must be not less than twenty-one years of age, and must have been educated for architecture and pass an examination authorised by the council.

The Bill provides that after January 1, 1915, no person shall be entitled to take or use the name or title of architect unless he be registered; and any person who, not being registered, takes or uses any such name shall be liable to a fine not exceeding £20, and on repetition of the offence £50. No person shall be entitled, after January 1, 1915, to recover any charge in any Court of Law for any professional services rendered as architect unless he is registered under the Act. The right of members of the Institution of Civil Engineers and other bodies to recover charges "for work of any kind falling within the duties of their calling" is untouched.

Road Rollers in Victoria.—The Country Roads Board, Victoria—of which Mr. W. Calder is the chairman—has recently accepted tenders for road-making plant, including five steam road rollers, four of these being by the well-known English firm, Messrs. Aveling & Porter. Two of these will be 7-8 ton interchangeable rollers and tractors.

HOUSING AND TOWN PLANNING PROGRESS.

LOCAL GOVERNMENT BOARD MEMORANDUM.

The Local Government Board issued last week a memorandum giving particulars of the operation of the Housing and Town Planning Act. It appears from this that the activity of local authorities with regard to various phases of the housing question increased materially during 1913. The board are satisfied that considerable progress has been made in most districts with the work of inspecting dwellings, with the view of ascertaining whether any are in a dangerous or insanitary condition. In many districts where houses and areas regarded as most in need of inspection were dealt with first, some of the worst conditions have been remedied. In a large number of cases in which it does not appear that reasonable progress has been made, the board have impressed upon the local authorities the necessity of increased activity.

During 1912-13 a large number of houses, previously insanitary or in need of repair, were made fit for habitation. Below are set out the main results of the operations of local authorities in this direction, together with the corresponding figures for 1912:—

	1911-12.	1912-13.
Houses reported against	47,429	55,707
Houses made fit for habitation without closing orders	13,417	18,107
Closed or demolished voluntarily	1,935	2,167
Closing orders made	9,761	10,695
Demolished after issue of closing order	1,072	1,550
Demolition orders made	1,423	2,133

In the three years ending on March 31st last no fewer than 129,620 houses were made fit for habitation at the cost of the landlords or owners, and this in addition to the large number dealt with under the Public Health Acts.

During the five years ending on December 31st the board sanctioned to local authorities loans aggregating £1,403,869, on account of schemes providing for the erection of 6,355 houses, and at the date mentioned they had under consideration loans totalling £351,045, proposed to be spent on erecting 1,338 more. In addition, the Public Works Loan Commissioners advanced to societies for the provision of working-class dwellings £657,390 in the three years to March 31, 1913, compared with £660,504 for the previous twenty years.

TOWN PLANNING SCHEMES.

It is stated that the board have communicated with a large number of local authorities from time to time with a view to securing proper attention on their part to their statutory duties in relation to insanitary property, overcrowding, and the provision of further housing accommodation. "Much good has resulted from the board's action in regard to these matters, and the increased activity indicated in this memorandum, though due largely to the willingness and desire of local authorities to effect improvements in regard to housing conditions, may to a material extent be directly traced to the administrative pressure of the board."

With regard to town planning, the following table indicates the general position at December 31st:—

	No. of schemes.	Authorities concerned.	Acres affected.
Schemes finally approved by the board	2	1	3,762
Schemes prepared and submitted for approval	3	3	6,503
Schemes authorised to be prepared or adopted by local authorities	17	37	70,900
Applications for authority to prepare schemes under consideration	14	11	29,761
Totals	66	55	110,926

Many other schemes are under consideration by local authorities. It is added that, in view of the experience gained under the Act, and of representations made to the board in favour of amendment in certain respects, a revision of the regulations governing the procedure in regard to town planning schemes is contemplated at an early date.

"Pudlo."—The engineer to H.M. Board of Public Works in Ireland used "Pudlo" in an underground heating chamber recently constructed at the G.P.O., Dublin, and the result being entirely successful, he has now specified it for a large job at the Botanic Gardens, Dublin.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, II, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words, as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

PETROLEUM AND PETROL LICENCES.—"Ynys" writes: My council having decided to exercise their powers under the Petroleum Act, 1871, and that licences under sec. 7 of the said Act be granted for a period of twelve months, a fee being charged in respect of each licence, I have had placards posted up in the district giving notice to vendors and dealers of petroleum and petrol of the necessity of applying for licences, and I have also delivered copies thereof personally to such dealers and vendors. As a result I have received twenty-one applications from shopkeepers and others for licences for storing petroleum in quantities varying from 10 to 400 gallons, many storing the petroleum (paraffin oil) on the premises in iron tanks. The dealers referred to purchase their supply from a company who have a store in this town, and carry the oil to their customers in a large tank on wheels drawn by two horses. This company was also supplied with a copy of the placards referred to, and in reply they wrote "that none of the petroleum burning oil they sell gives off an inflammable vapour at a temperature of less than 73 deg. Fahr., and that therefore it does not come within the meaning of the Petroleum Acts, and no licence is necessary for its storage." Moreover, four of the dealers in petrol wrote that, as they do not store petroleum spirit in quantities exceeding 60 gallons, they are exempt under rule 5, and invite me to inspect their stores under rule 7. These dealers also obtain their supply of petrol from the company already referred to. I forward copy of placards and form of application, and shall be glad if you will kindly inform me: (a) Whether paraffin, benzoline and naphtha come within the meaning of petroleum? (b) Whether the council is justified in giving licences for storing petroleum on the premises providing it is not stored near an open fire, forge or other sources of danger, including explosive goods, and that all necessary precautions are taken for the prevention of accidents from fire? (c) Whether sec. 7 of the Act of 1871 applies, in the cases referred to in the query, for licences for petroleum providing that the oil does not give off an inflammable vapour at a temperature of less than 73 deg. Fahr.? (d) Whether a licence is required for petroleum spirit if the quantity is below 60 gallons, providing rule 7, as to storage, is observed (*vide* regulations enclosed)? (e) In order to prove whether the oil referred to is petroleum to which the Act refers, it will be necessary, of course, to get it tested; will you kindly supply me with names of makers of such apparatus, and of firms who would undertake the testing?

(a) By the Petroleum Act, 1871, sec. 3, as amended by the Petroleum Act, 1879, sec. 2, "petroleum" includes any rock oil, Rangoon oil, Burmah oil, oil made from petroleum, coal, schist, shale, peat, or other bituminous substances, and any products of petroleum, or any of the above-mentioned oils, which, when tested in manner set forth in the first schedule to the Act of 1879, gives off an inflammable vapour at less than 73 deg. Fahr. If paraffin, benzoline, and naphtha contain, or are the products of, any of the above oils or substances, and do not stand the above test, they are within this Act. (b) The Act of 1871 does not prescribe the conditions on which licences are to be granted, but leaves it to the discretion of the local authority to prescribe such conditions as they think fit (sec. 9), subject to an appeal to the Secretary of State (sec. 10). (c) No. See sec. 2 of the Act of 1879 (above referred to). The test must be made according to the Act. (d) By sec. 5 of the Locomotives on Highways Act, 1896, the keeping of petroleum for the purpose of light locomotives is to be subject to regulations made by a Secretary of State, which are to have effect notwithstanding anything in the Petroleum Acts. Petroleum spirit may therefore be kept for the purpose of light locomotives, in accordance with these regulations, without a licence. (e) I regret that this question is quite outside the scope of these notes, and I am unable to answer it. Perhaps some reader will kindly furnish names.

COMMON LODGING-HOUSE: REGISTRATION.—"Ynys" writes: A dwelling-house in this urban district is being used as a common lodging-house in contravention of sec. 86 of the Public Health Act, 1875. Secs. 76

to 89 of this Act are also embodied in the council's by-laws (Model series). The tenant has been notified of the provisions of secs. 77 and 86 of the Act of 1875, and the penalty she incurs by using an unregistered common lodging-house, and at the same time requested to apply to the council for registration. A reply has been received intimating that she is prepared to register the house, and I understand that a lady householder has been approached for a certificate of character, but the latter was informed by our clerk that as she is not a householder the certificate would not be in order; besides, sec. 76 of the Act provides that the certificate must be signed by three inhabitant householders. I have examined the house in accordance with the provisions of sec. 78 of the Act, and the sanitary defects then existing have all been made good by the owner excepting the provision of a supply of water to the water-closet and for domestic purposes. The water supply has been cut off by the waterworks company owing to non-payment of water-rate by the tenant; but I understand that arrangements are being made by the owner with the water company, and I learn that the water supply will be turned on as soon as the former signs the necessary arrangement in connection therewith. I may add that my council is not unanimous on the registry of the house, owing to its being situated only a short distance from the centre of the town, and many complaints have been made as to overcrowding, rowdyism, &c., while being used as a boarding-house by seafaring men and others, and it has since been used as a common lodging-house (unregistered). Will you kindly advise as follows: (a) whether the council is obliged to register a house as a common lodging-house if the applicant complies with the requirements of the by-laws, and produces a certificate of character signed by three inhabitant householders, or, (b) in the event of the council taking proceedings for using the house as a common lodging-house without being registered, what other steps should the inspector take in the matter before instituting proceedings as aforesaid?

(1) Yes, unless sec. 69 of the Public Health Acts Amendment Act, 1907, is in force in the district, in which case the council may refuse to register unless they are satisfied of the character of the applicant and of her fitness for the position. Where this section is in force the latter part of sec. 78 (from the words "and the local authority may") and sec. 88 of the Act of 1875 are repealed. (2) The reception of lodgers in a common lodging-house without its being registered entails the penalties mentioned in sec. 86 of the Act of 1875. In proceedings under this section it would appear to be sufficient to prove (a) that the house is a common lodging-house; (b) that it is not registered; and (c) that lodgers have been received there. "A common lodging-house is that class of lodging-house in which persons of the poorer classes are received for short periods, and although strangers to one another are allowed to inhabit one common room." (Lumley's "Public Health Acts," 7th edition, page 153.)

WATER SUPPLY: SEC. 62 OF THE PUBLIC HEALTH ACT, 1875.—"Chiefhunt" writes: In my district a new sanitary inspector has been appointed. The previous inspector was appointed under the above section as surveyor. The present inspector has not received that appointment, and the responsibility falls on me as surveyor. Would it be sufficient if I were to inspect and report certain premises without proper water supplies and leave the matter there for the sanitary inspector to take up, even for him to go as far as to execute works on default of owner and recover the costs in Court?

The council have to exercise a discretion, and to decide, upon the surveyor's report, whether the house is without a proper supply, and whether a supply can be furnished at the cost mentioned in the section; and the notice must be given by their direction. A notice given without their direction would be insufficient. See *Festry of St. Leonard's, Shoreditch v. Holmes* (50 J.P., 132). By 266 of the Act the signature of a notice by the clerk, surveyor, or inspector of nuisances is sufficient. In the note to this section in "Lumley's Public Health Acts" the opinion is expressed that a notice should be signed by such officer as can properly sign it by virtue of his office. As it is the surveyor who has to report under sec. 62 it would appear that he is the proper officer to sign a notice under that section (of course, by direction of the council, as already stated), and also to superintend the execution of the works. The proceedings for recovery of expenses would be taken in the name of the council.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

370. Temporary Building Design.—A temporary building is required, 50 ft. long, 30 ft. wide, and 10 ft. to eaves. Design a suitable structure, with steel trusses and stanchions, to be covered with corrugated iron on boards and felt, the bays to be filled in with 4-in. reinforced brickwork. (J. M. N., *Hitchin*.)

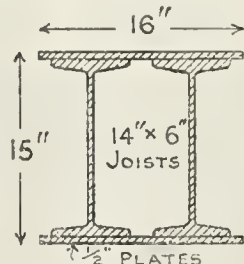
372. Cemetery Lay-out.—A new cemetery is to be provided in an urban district having a population of 17,000, increasing at the rate of 800 per annum. Flat meadow land, in a suitable position, having frontage to a district road (sewered), can be obtained at £350 per acre; subsoil, 5 ft. ballast overlying stiff clay. State area of land which should be acquired; give an approximate estimate of the cost of laying out the same, including buildings; state also principles governing the lay-out, and describe in detail method of drainage, arrangement of plots, disposition of buildings, &c. (Togun.)

373. Strength of Shaft.—What is the safe diameter of a wrought-iron shaft to transmit 60-h.p. at 120 revolutions per minute? (T. R.)

374. Magnetic North.—What is the difference in degrees between the magnetic and true north? (J. T. C., *Nottingham*.)

375. Working-class Dwellings.—Twenty working-class dwellings have been built at a cost of £3,500 for the buildings and £250 for the land. What must the rental be to ensure that the income will defray all loans, &c., charges? Give details as to how the allowances for empties, taxes, insurance, repairs, &c., are arrived at in the estimate. The money has been borrowed from the Public Works Loan Board at 3½ per cent for the usual periods. The poor and district rates are 6s. 8d. in the £ per annum. (Togun.)

376. Foundation for Stanchion.—A built-up steel stanchion, as shown in the diagram, transmits a load (including its own weight) of 250 tons. Design a suitable steel base and concrete and steel joist grillage foundation for the stanchion. The safe load on the earth may be taken as 2 tons per square foot. (I. W. S., *Clapham Junction*.)



[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

371. Testing Stoneware Pipes.—What is the maximum head of water which may safely be applied in the testing of stoneware pipes? Does the diameter of the pipe affect the safe head? If the head be excessive will failure occur first in the pipes themselves or at the joints—ordinary cement or Stanford and cement? Give references to publications, &c., where details of tests are set out. (Togun.)

After securely plugging the lower end of a drain, it is filled with water until the required head or pressure of water is brought to bear upon the interior of the pipes and joints. The necessary head or pressure of water may be obtained by temporarily fixing a bend with one or two lengths of pipe at the upper end, or a force pump and pressure gauge may be used.

Glazed stoneware pipe drains with ordinary cement joints should not be tested to a greater head

of water than 5 ft. or 6 ft., as it is not desirable to subject joints of this description to any greater pressure. Selected stoneware pipes with approved safety joints can, however, be tested to a greater head of water if required.

Now, 1 ft. head of water gives a pressure of 433 lb. per square inch at its base, so that a pressure of 1 lb. per square inch represents a column or head of water 2.31 ft. in height. A hydrostatic test of 5 ft. of water consequently causes an actual pressure of 2165 lb. per square inch upon the whole of the interior surfaces of the pipes and joints under test.

The majority of pipe manufacturers now produce specially selected and tested pipes, each pipe being examined, tested to a considerable head of water, and stamped with the word "tested" and the maker's name before leaving the works.

A little thought will quickly show that the diameter of the pipe has no effect whatever on the safe head, for from the principle of the transmission of hydrostatic pressure we see that the pressure per square inch will be the same for the same head of water, no matter what the diameter of pipe may be. This principle states that if a fluid at rest have any pressure applied to any part of its surface, that pressure is transmitted equally to all parts of the fluid. This is also the principle of the hydraulic press.

As to the mode of failure under excessive pressure, it will be better to consider the following first:—

Let D = internal diameter of pipe in inches.
 p = fluid pressure in pounds per square inch.
 t = thickness of the pipe in inches.
 P = total pressure on the end of the pipe.

$$\text{Then, } P = \frac{\pi D^2}{4} \times p.$$

Take any circumferential section—not too near the ends of the pipe—there will be tensile stress uniformly distributed over it, due to the pressure P . The area of this circumferential section of the pipe is given approximately by—

Sectional area = $\pi D \times t$, sq. in.

$$\begin{aligned} \therefore \text{Stress on section} &= \frac{P}{\pi D t} \\ &= \frac{\pi D^2}{4} \times p \\ &= \frac{p D}{4 t} \text{ lb. per sq. in.} \end{aligned}$$

Similarly, by considering the forces acting on a portion of the pipe between two cross-sections taken 1 in. apart, the stress on a longitudinal section of the pipe can be proved to be $\frac{p D}{2 t}$ lb. per square inch. That is: Stress on longitudinal section is just double that on a circumferential section.

Now, even the best joint employed in drain work is not so strong as the pipe itself, and, moreover, it is quite clear that, however tightly the drain is plugged, the stopper will be forced out before the pipes will burst, and from the above reasoning we see that the stress tending to burst the joints and to blow the stopper out is twice that which is tending to burst or break the pipe barrels themselves.

Hence, it is certain that if excessive pressure be applied, the joints, no matter how well they are made, will be the first to fail, provided that the stopper remains in position meanwhile.

As regards references giving details of how drains should be tested, the querist cannot do better than to consult "The Main Drainage of Towns," by F. Noel Taylor (Griffin & Co.), where the whole subject is most exhaustively treated in chapter ix., pp. 195, 196, 197.

Full details of testing, with the errors to look for, are also set out in "Practical Sanitation," by G. Reid (Griffin & Co.), in chapter vi., pp. 139, 140, 141. (T. W. P., *Beckhill-on-Sea*.)

The Surveyor

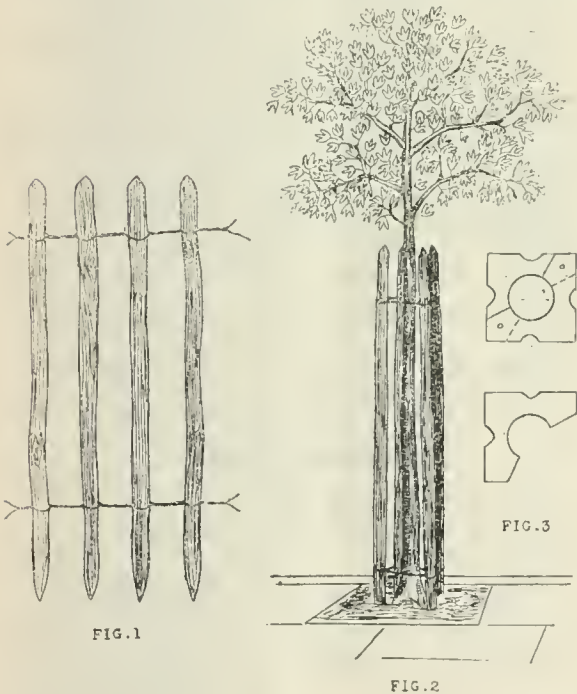
And Municipal and County Engineer.

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369. Tree Guards.—Give sketches of an economical and sightly tree guard, suitable for good-class residential roads, with details of cost. Ordinary iron guards are barred because of "stiff" appearance and high initial cost. (Togun.)

Chestnut pale fencing might easily be adapted to form a cheap tree guard of good appearance. This fencing consists of split pales held together at about 6-in. intervals by stout wire, as shown in Fig. 1. Four pales, arranged round the tree, as shown in Fig. 2, would provide quite sufficient protection.

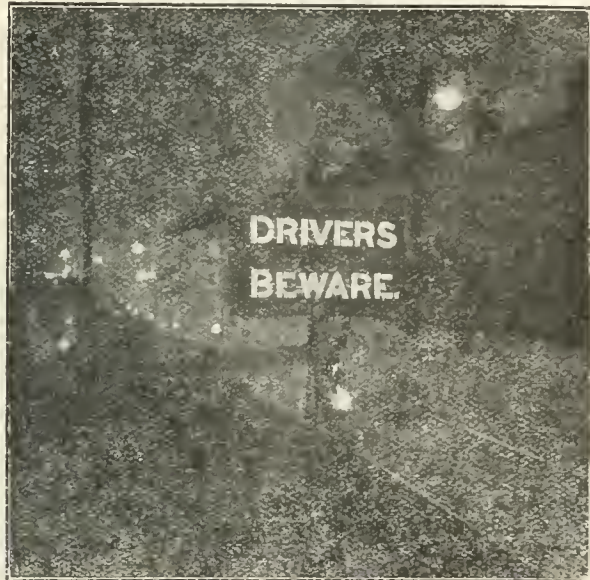


and if extra strength was required, a split collar could be made to encircle the tree near the top of the guard, and keep the pales in position. Such a collar, which could easily be cut out of board, is shown in Fig. 3. The cost of these tree guards should not exceed 1s. each, and they ought to last several years. (W. H. H., Southwark.)

Crematoria.—The Royal Institute of British Architects have set, as a final examination for architectural students, "Design for Mortuary Buildings in Connection with Cremation." In this connection we draw attention to the fact that the best text-book on the subject is "Crematoria in Great Britain and Abroad," by Albert C. Freeman, published, at 5s. nett, at the offices of THE SURVEYOR.

"DANGER" SIGNS TO PREVENT ACCIDENTS ON STREET WORKS.

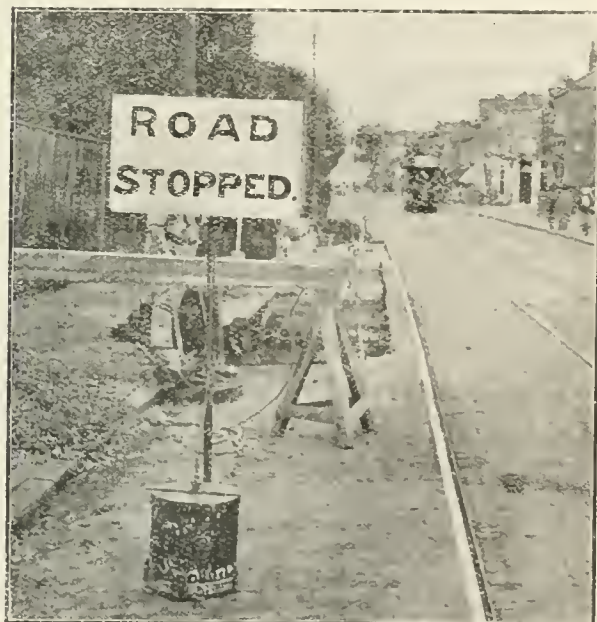
Local authorities and public works contractors are nowadays subjected to so many claims for compensation for accidents alleged to have been caused by some lapse or act on the part of their officials or employees, and are so often mulcted in heavy damages and costs, that we have little doubt they will welcome a device termed the "A-L" Reversible "Danger" Sign, which forms a valuable adjunct for facilitating road traffic, and, at the same time, marks a notable advance in protective measures for road works by



"A-L" DANGER SIGN, ILLUMINATED FOR NIGHT USE.

which the chances of accidents to the public are greatly lessened, and the possibility of claims for compensation minimised.

The mode of employing these "danger" signs is self-evident from the illustrations here given, which show their use and effect both at night and in the day time for warning drivers that works of road repair are in progress. The bold lettering of the signs when brightly illuminated at night is clearly visible at a distance of 100 yds., thus enabling those in charge of vehicles



"A-L" DANGER SIGN, REVERSED FOR DAY USE.

to slacken speed and take precautions to pass the obstacle without mishap. By simply reversing the sign an equally conspicuous warning sign suitable for day use is exhibited.

Signs are supplied with any desired wording. One should be employed at each end of all street works of magnitude.

These "danger" signs are constructed to withstand

rough usage, being of iron throughout. The acetylene light burns for sixteen hours without attention or re-charging; its cost is infinitesimal, and its generation simplicity itself, and quite easy to manage by an ordinary night watchman.

Illustrated circulars and particulars of the "A-I" "danger" signs may be obtained on application to Messrs. Wettern Brothers, Limited, 16 Water-lane, Great Tower-street, E.C.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Cardiff T.C. (January 5th. Mr. R. H. Bicknell).—£18,707 for the erection of a fire brigade station in Westgate-street.—The town clerk (Mr. J. L. Wheatley) said the intention was to erect the station upon land in Westgate-street, at the corner of Quay-street, which the corporation had received permission to appropriate for the purpose. Mr. E. V. Harris, architect, London, said there would be accommodation for sixteen married men, three single men, two engineers, and one superintendent.

Margate T.C. (December 29th. Mr. H. Shelford Bidwell).—£4,000 for the construction of a new road in extension of the front road known as the Royal Esplanade, £12,000 for the construction of a new sea wall promenade, and £1,700 for the purchase of No. 1 Fort-paragon, for the purpose of street improvements.—The town clerk, Mr. E. Brooke, stated that the applications in respect to the sums of £4,000 and £12,000 arose partly out of the work of the Town Planning Committee, and partly as a consequence of the recent extension of the borough boundaries. The proposals had been unanimously approved by the council. Practically the whole of the sea wall was outside the old limits of the borough. The borough engineer (Mr. E. A. Borg): Three-quarters of the esplanade will be within the added area. Mr. Borg proceeded to give evidence, explaining the plans in detail. The inspector asked for what period the corporation required the loans, and the town clerk suggested twenty-five years.

Richmond (Surrey) T.C. (January 7th. Major J. E. Stewart).—£1,000 for the erection of a public convenience in the Town Hall Gardens.—Mr. Brierley, the borough surveyor, said it was intended to provide accommodation for both sexes, and to have attendants in charge. The building would be properly screened. The only objection raised was as to the site, and this could, apparently, be met by the adoption of a site, at a cost of £100 further, on the opposite side of the gardens.

Southampton T.C. (December 19th. Mr. A. W. Brightmore).—£1,800 for the purpose of constructing storm-water drainage for the Northam and Bitterne Park districts.—The town clerk, Mr. R. R. Linthorne, said £1,500 was required for Northam, and £300 for Bitterne Park. The borough engineer, Mr. J. Crowther, stated that the district was below high water on exceptionally high tides, which depended largely upon the wind. There was some sort of bank along the river, which belonged to private owners. It was stated that the proposed drainage would only affect storm water, and would not be able to cope with floods caused by exceptionally high tides in addition to the storm water.

Southport T.C. (December 31st. Mr. F. H. Tulloch).—£4,500 for the construction of a bathing lake abutting on the Marine Drive, and £5,500 for the erection of a shelter on the children's playground.—It was stated that the proposed lake would be 400 ft. long, and 200 ft. wide, and would have a maximum depth of 6ft. Bathing would be done exclusively from a railed-in enclosure between the Marine Drive and the lake. It was calculated that in the summer months there would be an average of sixteen tides a month in the lake.

Spalding U.D.C. (December 7th. Mr. F. O. Stanford).—£29,550 for a sewerage scheme.—It was explained that the town is divided by the river Welland into the east and the north. It was proposed, in order to avoid going under the river, to have two distinct systems—one in each part. On the east side it was proposed to have a biological system, and on the north a broad irrigation system. The council had already conditionally purchased 17 acres of land on the east side, and 71 acres on the north. On the east

side the treated sewage would be let into the Exeter Drain to the Nene at Sutton Bridge, 18 miles further down to the north into the Welland. All the former, and 40 acres of the latter, would be immediately required, the remainder being used for allotments until needed. This would provide for 9,000 of the population, the remaining thousand odd being in rural districts where they were able to dispose of sewage on their own land.

APPLICATIONS FOR LOANS.

- Bootle T.C.**—£1,371 for a children's playground.
Bournemouth T.C.—£5,675 for school extension, and £3,250 for a woodwork and cookery centre.
Cardiff T.C.—£21,869 for the western sewer.
Dawlish U.D.C.—£5,250 for the purchase of land in connection with the water undertaking.
Devonport T.C.—£3,061 for works of road improvement.
Houghton U.D.C.—£11,718 for the erection of fifty-two houses.
Luton T.C.—£350 for a foul-water sewer.
Nuneaton T.C.—£5,000 for electricity plant.
Rotherham T.C.—£15,956 for extensions at the electricity generating station.
Torquay T.C.—£500 for lighting Princess Gardens.
West Bromwich T.C.—£16,518 for new schools.
Wigan T.C.—£50,638 for the Hoscarr and Pemberton sewage disposal scheme, and £7,890, supplemental expenditure on the Hoscarr outfall sewage works.
Wigton U.D.C.—£160 for water mains extension.

LOANS SANCTIONED.

- Barnet U.D.C.**—£350 for paving works.
Beeston U.D.C.—£1,958 for paving works.
Bognor U.D.C.—£2,400 for the provision of dwellings.
Carlisle T.C.—£7,970 for extensions to plant and buildings, and for £4,300 for the installation of a high-tension electricity plant.
Chard T.C.—£1,200 for the purchase of land in Old Town for working-class dwellings.
Chesterfield T.C.—£1,950 for road widening.
Dartford U.D.C.—£1,950 for road improvements.
Hendon U.D.C.—£23,769 for the reconstruction of Golder's Green-road.
Llanelli T.C.—£16,971 for a new council school.
Loughborough T.C.—£11,000 for buildings and additional electricity plant, and £3,000 for mains and services.
Marsden U.D.C.—£350 for an ambulance shed.
Monaghan U.D.C.—£4,000 for artisans' dwellings, repayment to be spread over sixty years.
Newport (Mon.) T.C.—£1,100 for school building extension.
Pembroke (Co. Dublin) U.D.C.—£80,218 for housing schemes.
Swansea R.D.C.—£1,000 for street improvements, and £550 for sewerage works.
Uttoxeter U.D.C.—£550 for alterations to the town hall.

FORTHCOMING INQUIRIES.

JANUARY.		£
19.—Walton-on-the-Naze.	For the purchase of the municipal buildings (Mr. R. H. Bicknell)	1,450
20.—Barnes.	For the provision of a tennis court and bowling green (Major J. Stewart)	800
20.—Chorley.	For the purchase of property for municipal offices (Mr. H. Shelford Bidwell)	3,300
20.—Heston.	For works of paving and road widening (Mr. F. H. Tulloch)	17,176
20.—Hursley.	For sewage disposal purposes (Mr. A. G. Drury)	10,000
21.—Cheshunt.	For street improvement purposes (Mr. M. K. North)	255
21.—Stoke Newington.	For the erection of public wash-houses (Mr. R. H. Bicknell)	1,900
22.—Grange.	For works of water supply (Mr. F. O. Stanford)	280
22.—Guilden Norden.	For the provision of a recreation ground (Mr. M. K. North)	260
27.—Christchurch.	For hospital extension (Dr. F. St. George Mivart)	700
FEBRUARY.		
11.—Hebburn.	For hospital extension (Dr. R. A. Farrar)	170

Some Notes on Water Supply in the Rural District of Atherstone.*

By H. J. COLEBY, Engineer and Surveyor to the District Council, Atherstone.

In submitting these notes for your consideration the author does so, not with the idea of reading a paper on the subject of water supply, but rather to bring before your notice some features of general interest in his own district, and to give prominence to certain works which have not been altogether successful, in the hope that others may profit by the mistakes that have been made in the past.

The rural district of Atherstone is, roughly, 25,000 acres in area, and has a population of about 18,000. It is divided into eleven parishes (of which the town of Atherstone forms one), which, for purposes of water supply, are grouped into four areas.

No. 1 area is supplied from a well which was sunk in the year 1882, in what was then called the "Permian" formation, but which is now said to be part of the "Carboniferous." The well is 9 ft. in diameter, 70 ft. deep, and for the first 30 ft. from the surface is lined with brickwork in cement, in order to exclude all surface water. Below this point the well has been excavated in the red sandstone, which here is very hard and calcareous. At the bottom of the well a 12-in. diameter borehole was sunk, but as this was found to have been filled up with clay, presumably no benefit by way of increased yield was derived therefrom.

The machinery consists of two sets of double-barrelled, single-acting bucket pumps of the standpipe pattern, fixed in the well, and driven by horizontal steam engines, steam being supplied by two Cornish boilers.

When first sunk this well yielded 300,000 gallons per day on the test pumping, and for some years a constant supply of about 100,000 gallons per day was obtained therefrom. The yield, however, gradually decreased, until, at the present time, the average quantity obtained is only 55,000 gallons per day, while it has sunk so low as 25,000 gallons per day.

The author regards this as an indication that the underground reservoir of water has been exhausted by continuous pumping, and that the amount which can now be obtained is governed entirely by the rainfall and the area of outcrop. This latter is very difficult to determine, the site being near to the eastern boundary of the Warwickshire coalfield, and the ground being very much faulted. The recent investigations of the Geological Survey Department tend to show that, so far from there being a large and continuous area of water-bearing rocks, these are so divided by beds of impervious marl and broken by faults that the actual watershed drained by this well is very limited in extent, and is probably confined to the immediate vicinity of the well itself.

This source of supply must, therefore, be regarded as a failure, and the author mentions it in order to point out the very capricious character of this formation from a water supply point of view.

As a further instance of this, but of a more fortunate character: In 1887 a boring only 5 in. in diameter was made to a depth of 60 ft. in the so-called "Permian," at another part of the district, for the supply of No. 2 area, and this has yielded an average of 50,000 gallons per day ever since. In 1906 the author made a test of this boring by pumping day and night for a week with all the power then at his command, and was able to obtain 104,000 gallons per twenty-four hours without materially lowering the water level. This level, when pumping, is about 15 ft. below the surface, and in this case two sets of horizontal, treble-plunger pumps, driven by belts from Hornsby oil engines of 16 and 22 h.p. respectively, are used.

One of the difficulties experienced in the working of these oil engines is that arising from the variable quality of the petroleum, and it has been found that a difference of .001 in the specific gravity of the oil will have a very appreciable effect on the working of the engines. The author has found it necessary, when inviting tenders for petroleum, to define strictly the limits of specific gravity between .820 and .815 at a temperature of 60 deg. Fahr. The use of oil of a greater density than .820 leads to imperfect vaporisa-

tion and consequent waste of oil, while if the density be less than .815 the heat generated is sufficient to burn both the petroleum and the lubricating oil, with the result that after the engines have been stopped and have cooled down, they can only be restarted with great difficulty, owing to the pistons being set fast in the cylinders with partially carbonised oil. In point of fuel costs, there does not seem to be much difference between oil and steam engines, the balance being slightly in favour of oil up to a certain point, when oil reaches 6d. per gallon; but with oil at 7½d., which is the present price, the steam plant becomes cheaper. In large installations, however, the cost of labour would undoubtedly be heavier with steam than with oil, and it is probable that a Diesel engine, burning residual petroleum, would compare very favourably with steam plant.

The water for supplying No. 3 area is purchased from a colliery company, under an agreement, by which the company agreed to sink a well in the coal measures sandstone, to put down the necessary machinery, build a service reservoir, and deliver water into the council's mains at a cost of 6d. per 1,000 gallons, the council undertaking to pay for a minimum quantity of 60,000 gallons per day. The distributing mains were laid by the council, and the scheme came into operation shortly after the author's appointment in 1902. After a short time, considerable trouble was experienced by reason of a large amount of reddish-yellow deposit which was found to be taking place in the mains. Complaints were also received from consumers that the water, which was quite clear when first drawn, could not be used for drinking, owing to its foul smell and astringent flavour, and that potatoes boiled therein rapidly turned black, while it was quite unfit for laundry purposes.

Upon investigation the water was found to contain iron, held in solution by carbonic acid. In its passage through the service reservoir and mains it became sufficiently aerated to oxidise the iron, which was then precipitated as iron oxide in the mains, more particularly in those parts of the system where very little flow took place, and where the whole of the water was not changed very frequently. To remedy this state of affairs the author, in conjunction with Mr. H. J. Clarson, of Tamworth, advised the adoption of Candy's filters, and two of these of the "pressure" type were fixed upon the pumping main. These have proved effectual in oxidising and removing the whole of the iron.

The author is, however, of opinion that permanent injury has been done to the mains by passing water charged with iron through them, since an examination of sections cut from different mains shows that the bituminous coating has been almost entirely removed from the inside, leaving the metal bare.

It has been suggested that this may be due to the action of the iron bacterium (*crenothrix*), but as analyses of the water show it to contain very little or no organic matter, the author is inclined to think that it is due to the action of the liberated CO₂, and he would like to hear the opinion of any member who has had a similar experience.

Since the above was first written, the author has had the pleasure of reading the very excellent paper on the "Corrosion of Water Mains,"* by Mr. Wm. Ransom, the assistant city engineer of Worcester, and he finds the phenomena mentioned in that paper almost identical with those given above. It remains to be seen whether the destructive action on the bituminous coating will cease now that the iron has been removed, or whether, in oxidising the iron, CO₂ has been liberated in sufficient quantity to render the water acid enough to attack the metal of the mains. If this latter be the case, then it would appear that the treatment of the water at its source is incomplete, and, in addition to oxidisation and filtration, some means must be found for removing the liberated CO₂.

No. 4 area is supplied from a boring 170 ft. deep, in the Cambrian rocks. The yield, however, is very

* Paper read yesterday at a meeting of the West Midland District of the Institution of Municipal and County Engineers at Birmingham.

* See THE SURVEYOR, November 21, 1913.—ED.

small, and it is proposed to augment this from another source in the near future.

DISTRIBUTION.

Water is distributed over the greater part of this district from three service reservoirs, through over 45 miles of mains. The reservoirs are placed so as to command the whole of the areas in which they are situate, and are conveniently near the chief centres of population. The mains have been carried through nearly every road in the areas supplied, and out of the eleven parishes which comprise the rural district, nine have water mains in almost every road or street, and the remaining two are partially supplied. So that, as a whole, the district is well served so far as the leading mains are concerned. In some of the country parishes, indeed, long lengths of mains have been laid which only supply a few scattered farm-houses and cottages, from which very little revenue is derived by way of water rate, and in those parishes the repayment of the loans must be a heavy burden on the rates for years to come, while the mains, radiating as they do from the reservoir to the extreme boundaries of the parishes, cannot be made to form circuits, and so come to objectionable "dead ends."

The author would submit this point as one for discussion this evening—viz., whether, in designing a scheme for a country district, it is good policy to provide for mains reaching to every part of every parish for supplying a few scattered houses, where there is already, or where there can be obtained, a good supply from wells on the premises.

In such a case it seems to the author that the only excuse for burdening a parish with a thirty years' loan is that the water mains afford protection in case of fire; but it is also his experience that these country parishes have no means for making use of a fire hydrant, and would have to await the arrival of a fire brigade from the nearest town, by which time the house might be burnt to the ground.

FAULTS IN DISTRIBUTION SYSTEMS.

In one part of the district a service reservoir is supplied from another reservoir about 1½ miles distant, with only a small difference in level. The main connecting the two reservoirs was laid to follow the contour of the ground, and although it just comes below the hydraulic gradient, considerable trouble is experienced from "air locking" at the highest points.

The author has reason to believe that when this main was designed, the head taken for discharge was that due to difference between top water level in the upper reservoir and floor level in the lower reservoir. The result is that if the water level in the upper reservoir falls, and the lower reservoir is nearly full, the head is so reduced that the main only discharges about 50 per cent of the amount for which it was designed, while the high points in the main rise above the hydraulic gradient, and the air locking eventually becomes bad enough to almost stop the flow.

Of course, air valves were fixed at all the high points, but under the peculiar circumstances they were found to be of very little use, in fact, under certain conditions, they were the means of admitting air to the main. Further than this, it was found, by tapping the main at short intervals, that the air did not accumulate at the highest points only, but also in those portions of the main which are comparatively flat and well below the hydraulic gradient. The air appeared to lie in the top part of the main in the shape of an elongated bubble, similar to the bubble of a spirit level, and did not move forward at the same rate as the water. The charging of this main and getting rid of the air is a long and tedious process, and on more than one occasion recourse has been had to pumping through it while keeping several fire hydrants open.

As a remedy, the author has advised his council to either relay the main to proper gradients, or, since the upper reservoir is fed direct from the pumps, to erect a standpipe on the pumping main and to place the main in question under the standpipe head. The matter is now under consideration, but probably the second suggestion will be adopted.

This is perhaps an extreme case, but the author is of opinion, firstly, that when calculating the discharge of such a main as this no account should be taken of the height of water in the upper reservoir, but that the head should be the difference in level between the floor of the upper and the top water level

of the lower reservoir. If this be done, then any alterations in the respective water levels would give an increasing rather than a diminishing discharge through the main. Secondly, that mains under a small head should not rise above nor approach near to the hydraulic gradient, and that it is better to lay such mains to proper gradients, even if it necessitates deep excavations, as the extra cost involved would be amply repaid by the increased efficiency of the main.

SIZES OF DISTRIBUTING MAINS.

Owing to mistaken ideas of economy in the past, the distributing mains in several parts of the district are much too small, and although the static head in some parts reaches 300 ft., yet the loss of head is such that very little more than 20 lb. per square inch working pressure is available, and when any extra demand is made upon the larger supply mains, little or no water can be obtained from the small service mains.

As an instance: The author tested some fire hydrants fixed on a 2-in. main, 230 yds. long, and found that although the static head was 220 ft. the working head, when discharging 40 gallons per minute, was reduced to 40 ft., or a loss of 180 ft. head.

In another case, with a static head of 140 ft., no pressure at all could be obtained, and the fire hydrant was useless. A 3-in. main was substituted for the 2-in. in this case, with the result that the loss of head was reduced to 40 ft., leaving 100 ft. available for working.

It is the author's intention to carry out a series of tests of the capacities of all the fire hydrants in his district, and he would be glad to learn whether any member has used Prentice's hydrant flow gauge for this purpose, and whether this has been found a reliable means of testing the discharge from hydrants.

NEW BORING.

It has been stated earlier in these notes that the Atherstone district is fairly well served, in that the mains penetrate to nearly every part of the district; but, unfortunately, the supply of water in some parts is very variable, and during the recent dry years 1911 and 1913 there has been a considerable shortage.

As the population of the district has increased and is still increasing rapidly, it has become necessary to seek for a further supply of water to meet both present and future needs.

On the advice of Dr. Herbert Lapworth it was decided to make a boring in the "Bunter beds," which outcrop over a fairly large area in the northern part of the district. This boring was completed in May last, to a depth of 300 ft., and on being tested yielded 240,000 gallons per twenty-four hours for fourteen days.

This, however, must not be taken as the maximum yield, but was the limit of the capacity of the pump employed.

The rest level of the water is 41 ft. below the surface, and the working level did not fall more than 63 ft. below the surface when pumping at the rate of 10,000 gallons per hour. Upon the cessation of pumping at the end of the fourteen days' test the water rose 18 ft. in the borehole in twenty-five minutes, and regained its normal level within twenty-four hours.

At a depth of 160 ft. a bed of soft, white sandstone, coarse grained, and containing some small pebbles, was met with. This gave some trouble during the test pumping, and it was decided to line the portion of the borehole between 160 ft. and 240 ft. with steel tubes. The boring is 20 in. in diameter, and the lining tubes will be 18 in. internal diameter, with ordinary screwed and socketed joints. The author hoped to have been able to give an account of the inserting of these tubes, but owing to the strike in the tube trade they have only just been delivered, and have not yet been inserted.

If any trouble is experienced from sand washing in after these tubes have been fixed, it has been suggested that an air lift should be used for raising the water to the surface, instead of the ordinary bore-hole pump. The author would be glad to hear the experiences of any member who has made use of an air-lift plant under similar circumstances.

The Society of Architects.—The annual report of the council, presented at a meeting last night, states that the membership of this body was, at the end of October last, 1,185, of which number 960 are corporate members.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2.

MR. BOULNOIS' "GLOSSARY OF ROAD TERMS": PROF. FEARNSIDE ON "THE PART PLAYED BY WATER IN MACADAM ROAD CONSTRUCTION."

To the Editor of THE SURVEYOR.

SIR,—Will you permit me, as an interested reader of THE SURVEYOR for a number of years, to offer you my hearty congratulations on two articles published in your columns during the past year of 1913?

It seems to me, as a highway engineer, that a long step in the right direction has been made through your assistance in the compilation and publication of a glossary of road terms, and that Mr. Boulnois, as well as yourself, deserves the sincere thanks of highway engineers generally for his efforts in preparing this glossary. Having been interested in the subject for some time, and having attempted more or less work under it, the writer fully appreciates the amount of effort necessary for results, and wishes to compliment Mr. Boulnois for the excellence of the results, as well as to thank him for his efforts.

While, naturally, criticism is to be expected, and, indeed, is most desirable, in order that the most general concordance may finally be had, perhaps it will not be officious for the writer to suggest that the greatest good will come from constructive rather than destructive or captious criticism. Personally, the writer feels that, if anything, Mr. Boulnois has too thoroughly covered the field, and that there may be little, if any, need for inclusion in the list of some of the terms set down. However, for the final draft of the glossary, elimination of such terms as shall be proved unnecessary will be easily accomplished, and quite possibly additional emphasis thereby be had of the value of the other definitions agreed upon.

It would be, the writer thinks, unfortunate if, in view of the amount of road work now being done on this side of the water, British engineers should accept and finally establish such a glossary as referred to without proper consideration of the terms and their meanings used here, but probably no apprehension may be warranted on this score, because it is understood that the Engineering Standards Committee of Great Britain already has this matter in charge, and will arrange for proper consideration of American terms in this connection.

The second article to which the writer referred in his opening sentence was that of Prof. Fearnside on "The Part Played by Water in Macadam Road Construction." This, in the opinion of the writer, is one of the most scientific articles concerning highway work which has yet appeared in print, and the profession is certainly greatly indebted to Prof. Fearnside, not only for the highly scientific way in which he has treated this subject, but also for the happy expression of the treatment in language intelligible to both lay and scientific minds. It is just such treatment of many of the problems of highway work which, in the opinion of the writer, is most necessary for the advancement of the profession, and the establishment of its art upon its proper foundation of science. Unless such advancement and establishment are pursued and won, the right of highway engineering to be called a profession may be questioned, and a highway engineer as such will be overwhelmed and exterminated by an artisan.

Accept my best wishes for a happy and prosperous New Year, and believe me, yours &c.,

W. W. CROSBY.

Baltimore,
Maryland, U.S.A.
December 29, 1913.

[We are much gratified to receive so encouraging a letter from such an eminent authority on road engineering matters as Major Crosby, M.A.M.SOC.C.E., whose good wishes we cordially reciprocate.—Ed. SURVEYOR.]

To the Editor of THE SURVEYOR.

SIR,—In your reply to the correspondence on this subject, appearing in THE SURVEYOR of the 2nd inst., it is interesting to learn you are of the opinion that "well-established usage must certainly be taken into account" in drawing up definitions of the terms

"bitumen" and "asphalt," and that you "are fully alive to the necessity for preventing interested or badly informed parties from exerting an influence likely to be prejudicial to those who have used these terms for many years."

I quite agree with your views, although it is not likely, as your correspondent remarks, that old-established merchants and manufacturers would agree to be dictated to, or be willing to attach to their goods terms that might be incorrect and opposed to old-established trade definitions.

The terms "asphalt" and "bitumen" are not of modern origin or invention, and I cannot see the object of departing from old-established definitions and usage except for the purpose of gain.

On referring to past correspondence on this subject, I notice Mr. Bastian, in one of his letters as far back as July last, writes:—

"Colonel Crompton states that it is his intention, and that of those associated with him, to confer with certain American engineers, and, as a result of their united action, and, presumably, the co-operation of the Engineering Standards Committee, to obtain the classification of petroleum pitch as 'bitumen.'"

My view of this is that it would be quite as absurd for, say, bitumen and asphalt makers to advise electrical engineers that in future the terms "volts" and "amperes" were to be altered and revised as it is for Colonel Crompton or other electrical engineers to say that it is proposed to alter the established definitions of bitumen and asphalt, and "obtain the classification of petroleum pitch as bitumen."

Your correspondent in last week's issue very rightly points out that the definition given of asphalt—viz., limestone naturally impregnated with bitumen—is incorrect, as this clearly describes rock asphalt, "a very different thing to those materials that come under the classification of asphalt." The prefix of the word rock alters the case entirely, and denotes a totally different material to the asphalts of Cuba, Venezuela, Trinidad, Turkey, Nigeria, &c. The latter are also correctly termed "natural bitumens"—natural asphalts and bitumens always being known as one and the same thing—and the term "rock asphalt" refers only, of course, to the limestone or sandstone which is found naturally impregnated with a small percentage of bitumen in France, Germany, Switzerland, Sicily, &c.

It is only necessary, therefore, to consider what materials come under the classification of—

- (1) Rock asphalt.
- (2) Natural bitumens and asphalts.
- (3) Pitches.

There are many of the last named, such as coal, petroleum, Swedish, wood, bone, wax, reed, Burgundy, British pitch, &c., and if petroleum pitch is to be called "bitumen," then the same thing applies to Swedish, Burgundy, and all other pitches.

I contend that they are either all "bitumens" or none, and although the term "artificial bitumen" has been introduced—any one pitch is as much entitled to this term as the others—it is very misleading, inasmuch as the word "bitumen" has all along been understood to refer to a natural product.

I notice Colonel Crompton, in his paper "Commercial Motor Road Transport"—the abstract you give, however, in your issue of December 26th last, principally deals with the experiments Colonel Crompton has carried out in his laboratory—refers to the work that has been done in America, but I fail to understand why American practice is considered of so much importance, as in no country in the world have the words asphalt and bitumen been used in such a loose manner as they have in America.

In the construction of bituminous roads America is also far behind France, Germany and other European countries, which are the home of asphalt for paving purposes, and if anything is to be learnt it is to France, Germany, &c., that we should look. Proof of this is, I think, to be found in the remarks of Colonel W. D. Sohler, whose article "Lessons from the International Road Congress" you referred to in your last issue.

If it is thought necessary to copy foreign practice, and someone abroad must be consulted, by all means let those on the Continent be consulted who have had the experience, as no reliance is to be placed on American terms, these, apparently, having only been adopted to suit their own convenience.—Yours, &c.,

ENGINEER.

January 12, 1914.

[We have omitted from our correspondent's letter some phrases which, in our opinion, are too personal

for publication in THE SURVEYOR, and do not really affect the problem with which we are concerned—viz., to attach to "bitumen," "asphalt," and other road-engineering terms definite meanings which shall be generally accepted.—Ed. SURVEYOR.]

To the Editor of THE SURVEYOR.

SIR,—I am exceedingly obliged to Dr. F. Judd Lewis for his able criticism of some of the definitions I attempted in my glossary, and I wish that others of your readers would have taken the trouble to do so.

I have, however, one fault to find with Dr. Lewis, and this is that, although he objects to some of my definitions he does not suggest others that should take their place.

I should therefore be greatly obliged to him if he would give me a correct, scientific, and short definition of the words to which he takes exception—viz.: "Ammoniacal liquor," "Anthracene," "Artificial asphalt," "Asphaltenes," "Bitumen," "Resin," "Calcium chloride," "Carbon," "Creosote," and "Deliquescent." I can assure Dr. Lewis that, before embarking on the glossary I consulted all the books and other sources of information I had at my disposal, in order, if possible, that my definitions should approximately describe, to the lay mind, the meaning of the word.

That is the sole object of the glossary, which was not compiled for the purpose of "fathoming the depths of this area of the ocean of philology"—a task which would be far beyond my powers.

I quite realise the difficulty of defining chemical terms, as even chemists themselves are not always in agreement as to the true meanings of words that they use.

If Dr. Lewis will help me in my difficulty by replying to this letter in your next issue, and will suggest some better definitions than I have given, I need not say how grateful I shall be to him for his valuable assistance.—Yours, &c.,

H. PERCY BOURNOIS.

7 Victoria-street, S.W.
January 10, 1914.

MUNICIPAL AUTHORITIES AND THE SANCTITY OF LIFE.

To the Editor of THE SURVEYOR.

SIR,—In a recent issue of the *Referee* I read some comments on authorities, with reference to the outbreak of winter influenza, from the pen of Mr. George R. Sims. The writer asked: "Why should there be an epidemic of influenza every year?" and commented strongly on the authorities for its occurrence; but the remedies he suggests are of little use. We must get at the origin of the disease.

Previous to the year 1901, Members of the House of Commons were stricken with influenza in numbers out of all proportion to other communities or assemblies. A Select Committee was appointed, and expert evidence called. The correct conclusion arrived at was that it was due to the impure saturation of the air, the major portion of the impurities coming from the adjoining sewers of the London County Council and the Westminster Council. A pure saturation of the air supplied to the House was provided, and resulted in no epidemic having been reported since. Other cases could be cited where an improved air saturation has prevented any recurrence of the disease.

Without going into details as to why influenza is epidemic, it only occurs when we have a late autumn or mild winter. When a cold snap sets in the output of impurities which give an impure air saturation is very great.

The prevention of such epidemics is the work of the engineer rather than that of the medical officer or bacteriologist, by taking efficient means to make it impossible for an impure air saturation to come from sewers or drains.

During the past year no less than seven men have been killed in the sewers of London and the Provinces through contact with gaseous compounds from sewage. Some are non-smelling, and are heavier than the air, and the men have great difficulty to locate their existence.

Sewer men are not killed unless there are gases which asphyxiate them. Influenza is not prevalent except where heavy volumes of sewer emanations pollute the air saturations.—Yours, &c.,

R. H. REEVES.

Walton-on-Naze.
January 5, 1914.

THE ROAD BOARD.

GRANTS TO HIGHWAY AUTHORITIES: THIRTEENTH LIST.

During the months of October, November and December, 1913, the Road Board indicated additional advances to county councils and other highway authorities amounting, in the aggregate, to £396,985, of which £677,452 was by way of grant and £228,633 by way of loan.

The total advances made and promised up to December 31st from the constitution of the board amounted to £4,528,872.

The grants formally made, with the approval of the Treasury, during the last quarter amounted to £95,063, and were applied as follows:—

	£
To road crust improvements	77,302
To road widenings and improvement of curves and corners	9,465
To road diversions	6,727
To reconstruction and improvement of bridges	1,569

During the same period advances by way of loan have been arranged to the sum of £298,786.

The total grants formally made up to December 31, 1913, were applied as follows:—

	£
To road crust improvements	1,439,563
To road widenings and improvement of curves and corners	143,312
To road diversions	40,655
To reconstruction and improvement of bridges	60,996
To construction of new roads and bridges ...	83,498

The total sum arranged to be advanced on loan up to December 31st amounted to £564,896.

County or County Borough.	Amount of grant for			
	Improvement of road-crusts.	Widening, corners and diversions.	New roads and bridges and reconstruction of bridges	Total.
ENGLAND.				
	£	£	£	£
Berkshire	188	—	—	188
Blackburn (C.B.)	5,000	—	—	5,000
Rucks	6,262	500	—	6,762
Cambridge	266	—	—	266
Canterbury (C.B.)	1,000	—	—	1,000
Cornwall	—	150	—	150
Cumberland	6,050	400	—	6,450
Dorset	843	—	—	843
Halifax (C.B.)	643	3,157	—	4,000
Huntingdon	5,550	85	425	6,010
Kent	320	—	—	320
Lines (Kesteven)	—	—	60	60
London (Area of the Metropolitan Police District) ...	12,550	—	—	*12,550
Newport (C.B.)	1,700	—	—	1,700
Nottingham	2,110	—	—	2,110
Peterborough (Soke of)	7,185	—	—	7,185
Rutland	—	177	—	177
Southampton	6,475	25	—	6,500
Southport (C.B.)	1,906	—	94	2,000
Staffs	1,720	—	—	1,720
Surrey	—	50	—	50
Yorks (W. Riding)	—	100	—	100
WALES.				
Anglesey	—	100	—	100
Brecon	766	50	—	796
Carmarvon	1,400	—	—	1,400
Denbigh	1,504	264	—	1,768
Glamorgan	—	9,440	1,000	10,440
SCOTLAND.				
Argyll	—	1,000	—	1,000
Ayrshire	1,883	—	—	1,883
Bute	—	500	—	500
Dumbarton	—	1,200	—	1,200
Fife	500	—	—	500
Haddington	861	—	—	861
Inverness	2,000	—	—	2,000
Kinross	133	—	—	133
Lanark	438	—	—	438
Linlithgow	435	—	—	435
Peelies	100	—	—	100
Perth	1,050	—	—	1,050
Renfrew	1,704	—	—	1,704
IRELAND.				
Armagh	360	—	—	360
Longford	600	—	—	600
Mayo	3,600	—	—	3,600

* NOTE.—This amount of £12,550 is part of a total sum of £280,000 now in course of distribution in Greater London and is made up as follows:—Hammersmith, £4,000; Hendon, £1,500; Paddington, £1,200; Stepney, £4,750; Richmond, £1,100.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Bexhill £6,000, Bournemouth £60,000, Rhyd £19,000, Sheffield, Worcester £9,970; housing and town planning—Cardiff, Greenock; roads and materials—Holland, Ramsbottom £14,153, Teddington £6,577; sewerage and sewage disposal—Carlisle; water, gas and electricity—Leigh, Rotherham, Warrington.—Particulars of other projected works will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Acton U.D.C.—It is proposed to erect a park-keeper's lodge at the North Acton playing fields at an estimated cost of £600.

Barnsley T.C.—The council on Tuesday adopted the proposals of the Treatment of Tuberculosis Committee for the establishment of a sanatorium at Mount Vernon. A revised scheme, providing for forty beds and the purchase of additional land, was presented. It was calculated that ten of the beds would be available for letting to adjoining authorities, and an estimated income of £900 from this source was included in the estimate, which left a deficit of £1,420 to be met, half of which would be paid by the State.

Belfast T.C.—A new shelter is to be constructed in the Botanic Gardens Park.

Bexhill T.C.—A scheme is being promoted for the erection of a permanent isolation hospital at an estimated cost of £6,000.

Bournemouth T.C.—It has been agreed to erect a pavilion on the Belle Vue site at an estimated cost of £60,000.

Bradford T.C.—Plans and estimates have been approved for a number of cottage baths in various parts of the town.

Brighton T.C.—The Education Committee propose to enlarge the Coombe-road school by the provision, at an estimated cost of £6,750, of a third department for the accommodation of about 370 infants and junior scholars.

Clacton T.C.—A large bathing pavilion is to be erected in the East Cliff at an estimated cost of £850.

Falmouth T.C.—An enlargement scheme is to be carried out at the Princess Pavilion at an estimated cost of £600.

Galashiels T.C.—The council have agreed to proceed with the necessary alterations on and additions to the municipal buildings.

Inverness T.C.—The burgh surveyor has received instruction to prepare estimates for the erection of a public wash-house and swimming bath.

Penrith R.D.C.—The plans of the surveyor, Mr. W. S. Lythgoe, for the proposed new bridge at Ivegill have been adopted, and the county council is to be asked for a grant towards the estimated cost of £550.

Rhyd U.D.C.—It has at length been agreed to proceed with a scheme for rebuilding the pier. This scheme will cost about £16,000, and, with new works proposed in connection with the extension of the promenade to join the pier, will entail an expenditure of about £19,000. The new scheme provides for the removal of the old Bijou Theatre, the widening of the pier to its site, reconstruction of the pier head, and the erection of a handsome amphitheatre at the entrance. The work will be taken in hand as soon as sanction to the necessary loans can be obtained.

Sheffield T.C.—It has been agreed to build two sanatoria for consumptives, one with 100 beds for women, and another with 150 beds for men.

Southwold T.C.—Subject to the Local Government Board granting a loan, it has been agreed to erect a groyne to the north of No. 1 groyne.

Torquay T.C.—A tramway shelter is to be erected near the railway station at an estimated cost of £100.

Walsall T.C.—The Electricity Committee recommend that plans and estimates be prepared of a new generating station.

Worcester T.C.—Plans have been approved for the provision of a new council school at an estimated cost of £9,970.

HOUSING AND TOWN PLANNING.

Blaenavon U.D.C.—As a result of the recent Local Government Board inquiry into the housing conditions at Blaenavon, the council have received a formal letter from the Local Government Board requesting them to submit a scheme for the provision of not less than fifty houses before February 26th next, and that the whole of such cottages be ready for occupation before November 26th next.

Blaydon U.D.C.—Ten houses are to be erected by the council at Chopwell, the rents to be 7s. per week each.

Buckfastleigh U.D.C.—The surveyor, Mr. A. Warren, has received instructions to prepare plans for a housing scheme.

Cardiff T.C.—The city engineer, Mr. W. Harpur, has submitted to the Housing Committee schemes of housing for the 6 acres of land near Portmannoor-road, which the Bute estate has offered the committee on a ninety-nine years' lease at £30 per acre per annum. Scheme A submitted provided for the erection of 144 houses, with an open square in the centre, at a total cost, including street and private improvement works, of £24,748. The total ground rent would be £193 2s. 6d. per annum, or £1 6s. 10d. per house. Scheme B provided for 180 houses, reserving no open space, at a total cost of £30,148, ground rent per house £1 1s. 6d. per annum. The houses proposed were four-roomed dwellings, with a 14-ft. frontage. The city engineer was instructed to prepare a plan of houses of four and five rooms, and submit it to the committee.

Clones U.D.C.—The council have decided to support the petition of Irish municipal authorities to Parliament for better facilities for acquiring loans to carry out housing schemes in cities and towns.

Coventry T.C.—The Housing Committee will shortly present to the council, for adoption, a comprehensive scheme of housing. The proposals will not be confined to the building of houses on one site, but will embrace several sites, and the scheme can be proceeded with in sections. The total cost will reach a very large figure, but the experience of the council with regard to the Narrow-lane scheme is that municipal houses pay without any charge upon the rates.

Denbigh R.D.C.—Detailed estimates are to be prepared for a housing scheme at Llandulas estimated to cost £2,281.

Greenock T.C.—Competitive plans for a housing scheme are being invited. Eighteen tenements, to contain 162 two-roomed houses, are to be erected at an estimated cost of about £40,000.

Lostwithiel T.C.—A housing scheme is to be carried out at a cost of £1,250.

Stewartry C.C.—The Northern District Committee have appointed a sub-committee to inquire into the advisability of erecting working-men's houses in Dalry.

Winchcombe R.D.C.—Plans and estimates are to be prepared for twenty cottages under the Housing and Town Planning Act, to be erected on land near Winchcombe Railway Station.

PARKS AND OPEN SPACES.

Bradford T.C.—The council are recommended by the Parks Committee to construct bowling greens at Horton Park, Victoria Park, and the Wyke recreation ground.

REFUSE COLLECTION AND DISPOSAL.

Pontypool U.D.C.—The work in connection with the new refuse destructor has been completed. The installation contains two cells, each capable of dealing with about 15 cwt. of refuse per hour, and an emergency cell. The cost of the destructor was £2,140.

ROADS AND MATERIALS.

Ayrshire C.C.—A plan for a proposed new road between Irvine and Stevenston has been prepared by Mr. John B. Brodie, Glasgow. The proposed new roadway will reduce the distance between the two towns for road users by 1½ miles, and in addition to this will relieve them of the trouble of negotiating ten or eleven corners. A liberal grant from the Road Board is expected for the project.

Ballycastle R.D.C.—Consideration is being given to a proposal to provide for improving the surface of main roads from Larne to Ballycastle, for about 2 miles, from the district boundary at Waterford through Cushendall by giving a steam-rolled coating with a tar-sprayed surface, in such manner as should be approved by the Road Board, at a cost of £1,250.

Banffshire C.C.—The Road Board have decided upon the construction of a new road over the Corsemaul from Bakebrae to Glenmarkie. The road will be wholly in the parish of Mortlach, and the estimated cost is £300.

Brighton T.C.—The Improvements and Buildings Committee recommend the purchase of property for the sum of £1,800 for the widening of Market-street. —It is proposed to renew the tramway track in Richmond-terrace at an estimated cost of £3,500.

Derbyshire C.C.—The Highways Committee have decided to recommend a grant of £200 to the Chesterfield Corporation towards the proposed improvement and widening of the Newbold main road.

Essex C.C.—The council have adopted a report prepared by the county surveyor, Mr. P. J. Sheldon, on the reorganisation of the main road inspectors' districts, rendered necessary by the large capital expenditure to be incurred by the county council during the next few years, under the Road Board scheme. Motor cycles are to be provided for eight inspectors, together with an allowance of 10s. per week for upkeep. It was stated that the expenditure upon upkeep of the main roads and bridges in the county had now reached an annual sum of £210,000, excluding all expenditure upon Road Board schemes.

Fifeshire C.C.—The Road Board have sanctioned a grant of £500 to the St. Andrews District Committee for road improvement purposes.

Frome U.D.C.—The surveyor, Mr. F. W. Jones, has submitted to the Highways Committee a scheme for the improvement of Christchurch-street West, at an estimated cost of £1,218.

Haddingtonshire C.C.—The District Committees of the council have practically completed an extensive scheme of proposed improvement of the coast and post road routes through the county. The scheme has been informally submitted to the chairman of the Road Board, and there is reason to believe that a grant of money will be voted. The scheme will cover a period of five years. The committees have definitely adopted the tar-macadam system of treatment.

Holland (Lincs) C.C.—A deputation from the Roads and Bridges Committee has had an interview with the Road Board with reference to a grant for the improvement of the main roads of the county. The roads proposed to be dealt with included the Boston and Lynn roads, the Wrangle road, and the Wainfleet road, and the expenditure on strengthening and widening was put at £9,680. The chairman of the Road Board intimated that they would make a grant of half the estimated expenditure, and it is proposed that the work should be carried out.

Newport (Mon.) T.C.—It is announced that the Road Board have made a grant of £1,700 towards the improvement of the Cardiff-road as far as the railway bridge.

Perthshire C.C.—The Road Board have agreed to make a grant to the West Perthshire District Committee of three-fourths of the cost of reconstructing 27 miles of the main roads in the district. The cost to the District Committee will be about £1,000.

Ramshotbottom U.D.C.—The council have adopted the scheme of the surveyor, Mr. T. H. Bell, for the reconstruction of $1\frac{1}{2}$ miles of the Manchester-road with granite setts on a concrete foundation. The estimated cost is £14,153. The plans are to be submitted to the county council with a view to getting them to do the work on a 90 per cent basis, leaving Ramshotbottom to pay 10 per cent.

Roxburgh C.C.—The Jedburgh District Council have agreed to accept a grant from the Road Board of £6,000 for the construction of bridges and the repair of roads in the district on the condition that the local authority put on an extra 1d. in the £ on the road rate for ten years. A sum of £2,061 will be allocated to surface improvements, and £3,870 for bridges.

Swansea T.C.—The Highways Committee have given instructions for the planting of certain streets with trees, and Mr. Bliss, parks superintendent, reports

it will not be many years before the Parks Committee will be able to supply from their own nursery all the trees that will be wanted for the streets.

Teddington U.D.C.—Mr. M. Hainsworth, the surveyor, is to furnish the Middlesex County Council with particulars as to paving Kingston-road with creosoted deal at an estimated cost of £6,577.

Twickenham U.D.C.—It has been agreed that the Middlesex County Council shall make an annual charge for laying asphaltic macadam in Cross Deep and Waldegrave roads; that the offer of the Road Board to grant £500 be accepted; and that application be made to the Local Government Board for sanction to a loan of £5,300 for resurfacing these roads.

Willenhall U.D.C.—The council have adopted the plans of the surveyor, Mr. T. E. Fellows, for the widening of Morfital-lane, Walsall-street, and Lone-lane, at an estimated cost of £4,500, subject to grants being received from the Staffordshire County Council and the Road Board.

Worcester T.C.—Upon the advice of the city engineer, Mr. T. Calk, it has been agreed to treat certain roads with tar-macadam, at an estimated cost of £2,314, and to apply to the Road Board for a grant towards the cost of the work.

SEWERAGE AND SEWAGE DISPOSAL.

Beverley R.D.C.—Opposition was again manifested recently to the Elloughton and Brough drainage scheme, which the Local Government Board, after an inquiry on the spot, had insisted should be carried out. A letter was read from the Board ordering that the sewerage must be commenced within six months, and completed in eighteen months. Mr. J. Jackson, the chairman, moved that the council proceed to carry out the scheme in accordance with plans prepared by Messrs. Fairbank, and that application be made for sanction to a loan of £9,583 for the purpose. This, he said, was the fourth time he had made a similar proposition, and he hoped that on this occasion it would be finally settled. The vice-chairman, Mr. W. W. Forge, seconded, but the proposition was defeated, eight voting for and nine against.

Carlisle T.C.—At the meeting of the Health Committee, the city surveyor, Mr. H. C. Marks, stated that the Local Government Board had intimated that they were prepared to issue their sanction to borrow what was needed for the sewerage of Botcherby, Harraby and Durran Hill. The estimate for the work had been increased from £6,500 to £7,200 since it was first made in 1909, chiefly owing to the increases in the price of materials and the cost of the labour. The work would be commenced at once, and the Cumberland and Westmorland lunatic asylums would be included in the scheme.

Chelmsford T.C.—The Joint Sewerage Committee's account for the past year showed a profit on the working of the farm (no charge being made in respect of instalments of loans and interest) of £82, against £63 the year before, and a debit balance (representing the cost and disposal of the sewage of the constituent authorities, excluding instalments of loans and interest) of £394 in 1911. The sale of stock, produce, &c., during the year came to £1,045, and the total receipts were £1,970.

Glasgow T.C.—Sir William H. Lindley, engineer-in-chief of Warsaw, having written requesting information in connection with the Glasgow sewage purification scheme, and stating that a deputation from that town would visit Glasgow in the spring of this year to get acquainted with the scheme, the Sewage Committee recommend that arrangements be made for receiving the deputation, and that the town clerk supply in the meantime the information desired.

Haywards Heath U.D.C.—The surveyor, Mr. G. Plummer, has been instructed to prepare plans for the sewerage of a part of Eastern-road.

Macclesfield T.C.—The Highway Committee, having considered replies from other towns in the county as to the procedure adopted with respect to cleaning out intercepting traps, have passed a resolution that the owners of property be charged a fixed sum of 1s. 6d. for cleaning out the interceptors on their private drains, and in cases where it is necessary to open the ground to clear the interceptor they be charged the actual cost of the work.

St. Austell R.D.C.—Plans are to be prepared of drainage schemes for St. Dennis and Pentewan, and a committee has been asked to report on the drainage of St. Blazey.

WATER, GAS, AND ELECTRICITY.

Chelmsford T.C.—It has been agreed, in the event of the Local Government Board sanctioning the purchase, for £1,000, of the field adjoining the Admiral's Park water tower, to sink a borehole there to provide a new supply in substitution for the surface springs should they become polluted.

Coleraine U.D.C.—A scheme is under consideration for the extension and improvement of the gasworks at an estimated cost of £3,000.

Leigh T.C.—It was agreed on Tuesday last to spend £11,919 on extending the electricity undertaking, and it was also decided to apply for permission to borrow £11,420 for improvements at the gasworks.

Rotherham T.C.—Extensions to the electricity undertaking, estimated to cost £68,500, are recommended by the Electricity Committee.

St. Austell R.D.C.—The council have ordered a report to be prepared on the water supply of Pentewan.

Todmorden T.C.—The Local Government Board have sanctioned the loan which the council applied for for the extension of the electricity works.

Warrington T.C.—A scheme is being considered for taking a water supply from the upper reaches of the Mersey at an estimated cost of £35,000.

MISCELLANEOUS.

Brierley Hill U.D.C.—A new steam fire engine is to be purchased at an estimated cost of £400, the whole of which has been subscribed voluntarily.

Wimbledon T.C.—The tender of Messrs. Dennis Brothers, Limited, of Guildford, to supply and deliver a motor ambulance for £670, has been accepted, and application for sanction to borrow that sum is to be made to the Local Government Board.

Queen's County Surveyorship.—The Queen's County Council (Leinster) are inviting applications for the position of county surveyor at a salary of £250 a year.

School Ventilation.—The new council schools, Oldham, are being supplied with Shorland's patent exhaust roof ventilators by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

German Town Plans and Housing.—A lantern lecture entitled "German Town Plans and Housing" will be given by Mr. Charles C. Reade at the Royal Institute of British Architects (9 Conduit-street, W.) on Tuesday, February 3rd, at 8.30 p.m., when Mr. Raymond Unwin, F.R.I.B.A., will preside. Mr. Reade (who is assistant secretary of the Garden Cities and Town Planning Association) lately spent two months in Germany investigating housing and town planning conditions in many of the principal towns and cities in Germany, and has marshalled much illustrated material, and many plans showing not only recent developments in modern German town planning, but the effect of many of these plans on the housing of the people. Those desirous of attending should apply for an invitation to the Secretary, Royal Institute of British Architects, 9 Conduit-street, W., or to the Garden Cities and Town Planning Association, 3 Gray's Inn-place, W.C.

Tar-painting Main and Subsidised Roads.—The Highways Committee of the Middlesex County Council have issued a circular letter stating that they are prepared to recommend the county council to allow local authorities to include in their account for the maintenance of main, light railway, or subsidised roads, in respect of tar-painting operations, charges on the following scale: If carried out by hand labour, 2½d. per yard super.; if carried out by horse machine, 1½d.; if carried out by mechanical spreaders, 1d. Where these charges are made, watering, where necessary, will be allowed on the road at a rate not exceeding ½d. per square yard per annum for the area watered, and charges on this scale may also be included in the accounts. It is added that the county council will only bear a moiety of the above charges in respect of subsidised roads "A," and one-fourth part in the case of subsidised roads "B," and the contribution of the county council in respect of all roads will only be paid in circumstances where the county engineer and surveyor certifies that the tar-painting operations were commenced during the months of March, April, May or June, and completed not later than June 30th. The above scale will come into effect on March 1, 1914.

PERSONAL.

Mr. John Breeze, surveyor to the Wellington Rural District Council, has resigned after forty-five years' service.

Mr. G. W. Lambert, Rathmines, has been appointed assistant surveyor to the Rathmines Urban District Council.

Mr. S. W. Harman, assistant surveyor to the Twickenham Urban District Council, was on Monday awarded an increase of salary.

Mr. G. V. Roberts has been appointed second assistant (main roads) in the county surveyor's offices, Hereford. Mr. Roberts served his articles with Mr. G. H. Jack, county surveyor of Hereford.

Mr. G. Edgar Fryer, who has for the past two years held the position of deputy surveyor and inspector to the Ripley (Derbyshire) Urban District Council, has been appointed surveyor and inspector to the Melton Mowbray Rural District Council.

Mr. Donald M'Coll has resigned his position as superintendent of cleansing to the corporation of Glasgow, which he has occupied since 1894. Mr. M'Coll has been connected with the cleansing department since it was formed in 1868.

Mr. S. E. Burgess, M.INST.C.E., the borough engineer and surveyor of Middlesbrough, has, in consideration of extra and special work undertaken by him in connection with the borough extension, been voted an honorarium of £100 by the corporation.

Mr. Sam Owen, formerly of Birmingham, passed away on Sunday, at his residence at Aberdovey, at the age of sixty-four. Many years ago Mr. Owen was the surveyor to the old Balsall Heath Local Board, and when the district was annexed to Birmingham, in 1891, he was compensated for the loss of his position by a superannuation allowance. On ceasing to hold his official appointment, he practised for a number of years as a surveyor in Birmingham.

Messrs. E. Potts, borough engineer's office, Rotherham, J. A. Rodwell, waterworks office, Belfast, and P. G. Smales, borough engineer's office, Southend-on-Sea, have been elected associate members of the Institution of Civil Engineers; and Messrs. F. J. Dixon, water engineer, Ashton-under-Lyne, L. Mitchell, Bolton, H. J. T. Smith, Bombay, and J. P. Wakeford, city engineer of Wakefield, have been transferred from the class of associate member to that of member.

Mr. S. Barlow Bennett, the city engineer of Nanaimo, British Columbia, was born (says the *Contract Record* of Toronto) at Burslem, and educated at Newcastle. After serving an apprenticeship to sanitary engineering, he took a three years' course at the Municipal School of Technology, Manchester, where he became a silver medallist. Later he entered the Armstrong College at Newcastle, and spent several years in the chemical laboratory, chiefly with a view to studying chemistry as applied to engineering and the analysis of water supplies, and then took the civil engineering course leading up to Intermediate Science. For several years he practised drainage engineering in Manchester, and acquired considerable experience in the reconstruction of slum areas, town planning, sewerage and other municipal work. Next he obtained an appointment as sanitary expert to the Durham County Council, which was followed, in 1911, by his acceptance of his present position. Mr. Bennett is a member of the Royal Sanitary Institute and the Institute of Sanitary Engineers, is a frequent contributor to the technical Press, and devotes much of his leisure time to research on dangerous occupations. Foremost among his hobbies is the making of geological specimens.

Institution of Municipal and County Engineers.—The next examination of the Institution of Municipal and County Engineers will be held on the 2nd, 3rd and 4th of April, 1914, at the Examination Hall, 8 Bloomsbury-square, London, W.C. The use of slide rules in connection with the examination is no longer prohibited.

Tarmac Ponies.—An advertiser in the *Daily Mail* offers for sale a "cheap, smart, fast, reliable, Tarmac handsome black pony gelding." It is well known that the county surveyor of Notts has done wonders with furnace slag, but this ingenious use of it is novel. Mr. Boulnois must extend his "Glossary" to cover this latest application of "Tarmac."

INSTITUTION OF MUNICIPAL ENGINEERS.

NORTHERN DISTRICT ANNUAL DINNER.

The annual dinner of the Northern District of the Institution of Municipal Engineers was held at Newcastle on Saturday last, and a large gathering, some ninety all told (most of whom were members of the institution), was present. The chair was taken by Mr. W. Finch, county surveyor of Cumberland and chairman of the Northern District, and among those present were the Lord Mayor of Newcastle (Councillor Johnstone Wallace), the Sheriff (Councillor Herbert Shaw), Aldermen Dixon (Cumberland), Dalton (Carlisle), and Gilbertson (Southwick-on-Wear), Councillors T. A. Yelder (Cumberland), R. H. Humphrey (Darlington), F. J. Mathews (Gosforth), Swinney (Morpeth), A. L. Scott-Owen (Houghton-le-Spring), Bertram (Whitley Bay), Parkin (Felling), Captain H. W. Taylor (Newcastle), Captain F. P. Mill (Newcastle), Mr. John Robinson (honorary secretary of the district), and Mr. B. Wyand (secretary of the institution). A letter from the president, Mr. Horace Boot, regretting his absence through indisposition, was read.

The toast list was a long one, and following the loyal toasts were "Army, Navy, and Imperial Forces," proposed by Mr. J. T. Pegge (Durham), and responded to by Captain Harry W. Taylor (Newcastle); "Local Government Board, Road Board, and Administrative Bodies," proposed by Mr. J. W. Moncur (Sunderland), responded to by Alderman W. Dixon (Cumberland); "The Institution of Municipal Engineers," proposed by Sheriff Herbert Shaw, responded to by Mr. W. Wallin (Newcastle); "The City and County of Newcastle-upon-Tyne, and Northern Municipalities," proposed by Mr. C. W. Hall (Felling), responded to by the Lord Mayor of Newcastle-upon-Tyne; "Our Guests and Visitors," proposed by Mr. J. W. Holbrook (Houghton-le-Spring), responded to by Alderman Dalton (Carlisle); "The Chairman," proposed by Mr. J. W. Hulstead (Harrogate). Mr. Holbrook made a most efficient toast-master, and an excellent musical programme was interspersed among the various speeches.

A full report of the proceedings will appear in our next issue.

A Middlesex Conference.—A conference of Middlesex highway authorities will be held at Caxton Hall, Westminster, on Tuesday, February 3rd.

FOR OTHER ADVERTISEMENTS

See End of Paper.

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

APPOINTMENT OF MAIN ROAD INSPECTORS.

The above Council are prepared to receive applications for the appointment of three District Inspectors of Main Roads in the County, under the superintendence and direction of the County Surveyor.

Applicants must not exceed the age of 35 years, have had previous experience in the repair and maintenance of roads, and be conversant with modern forms of construction; they must also devote their whole time to the duties of their office.

Salary, £175 per annum, rising by annual increments of £5 to a maximum of £220 per annum.

Applicants must be competent to ride the motor cycle provided by the Council, for the upkeep of which an allowance will be made additional to the salary stated above.

Applications, on the form to be supplied, accompanied by copies of three testimonials of recent date, are to be delivered to the undersigned not later than the first post on Friday, January 30th, 1914.

PERCY J. SHIELDON, M.INST.C.E.,

County Surveyor of Essex.

County Surveyor's Office,
Chelmsford.

January 16, 1914.

(1,160)

TEMPORARY ASSISTANT required. Must be good draughtsman, experienced in preparing Specifications and Bills of Quantities. State experience, and salary required, to H. Hind, Surveyor, Urban District Council, Erith.

(1,157)

OFFICE ASSISTANT and **PROVINCIAL ENGINEER** required by the Gold Coast Government for the Public Works Department for two years of twelve months, with possible extension.

Office Assistant £500, with duty allowance of £100.

Provincial Engineer £400-£20-500, with duty allowance of £80. Furnish bed quarters or allowance. Free first-class passage. Liberal leave on full salary. Age 28-40.

Candidates for the post of Provincial Engineer should have had experience in charge of works such as would be met with in Town or District Surveyor's Office, and in both appointments Corporate Membership of the Institute of Civil Engineers is essential.

Application should be made at once to the Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

(1,170)

EALING TOWN COUNCIL.—Wanted, in the Drawing Office of the Borough Surveyor, a Junior, age between 18 and 21. Preference will be given to one who has occupied a similar position, and is a neat and accurate tracer, and used to helping in the making of Surveys, &c. Salary £50 per annum. Applications, in Candidate's own handwriting (endorsed "Junior"), enclosing copies of three recent testimonials, to be addressed to the Borough Surveyor, Town Hall, Ealing, W., not later than Wednesday, 28th January, 1914.

(1,165)

BATH RURAL DISTRICT COUNCIL. MONKTON COMBE AND AVON VALLEY SEWERAGE SCHEME.

The Rural District Council of Bath invite Tenders for the following work in connection with the Sewerage of Monkton Combe, Combe Down, Claverton, Bathford, Bathampton, Batheaston, and Swainswick:—

Twelve miles of 15, 12, 9 and 6 in. Stoneware Pipe Sewers, and about 1 mile of 12, 10, 7 and 6 in. Cast-iron Sewers, including Railway, Canal and River Crossings, together with Manholes, Lampholes and Flushing Chambers, and other works.

Also for the Erection of Engine-house and Construction of Pump-well at Batheaston.

Plans and Specifications may be seen at the Offices of the Engineers, Messrs. Willcox & Raikes, Union Chambers, 63 Temple-row, Birmingham, from whom copies of the Bills of Quantities and Form of Tender may be obtained (after the 19th day of January) on payment of a deposit of Five Guineas, which will be refunded on receipt of a *bonâ-fide* Tender and the return of all documents to the Engineers.

Sealed Tenders, in envelopes supplied, and endorsed "Monkton Combe Sewerage—Contract No. 2," to be delivered at my Office not later than 12 o'clock noon on the 14th day of February, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

R. H. WHITTINGTON,
Clerk to the Council.

1 Queen-square, Bath.

Dated January 14, 1914.

(1,164)

COUNTY BOROUGH OF SOUTHPORT. BIRKDALE AND AINSDALE MAIN SEWERAGE—CONTRACT No. 3.

The Corporation of Southport invite Tenders for the Construction of Storm-overflow Sewer, Concrete Storm Tank to hold 500,000 gallons, and other works appertaining thereto.

Plans may be seen, and Specification and Form of Tender obtained, at the Borough Engineer and Surveyor's Office, Town Hall, Southport, upon the receipt of a cheque for £3 3s. (made payable to the "Southport Corporation"), which will be returned upon the receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Birkdale and Ainsdale Main Sewerage—Contract No. 3," and addressed to the Town Clerk, must be delivered at the Town Hall, Southport, not later than 10 a.m. on Thursday, the 5th day of February, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender, and all who Tender must do so at their own cost.

J. ERNEST JARRATT,

Town Clerk.

Town Hall,
Southport.

January 14, 1914

(1,155)

**COUNTY BOROUGH OF WEST HAM.
TENDERS FOR SUPPLIES, &c.**

The Council hereby invite Tenders for the Supply of

- Paving Materials,
- Broken Granite and Chippings,
- Road Flints,
- Sand for Tramways,
- Tar and Pitch,
- Ironmongery, &c.,
- Iron Castings,
- Lime, Plaster, &c.,
- Portland Cement,
- Rope and Tarpaulins, &c.,
- Hardwood,
- Lead, Zinc and Solder,
- Oils and Colours, &c.,
- Stoneware Pipes, &c.,
- Brooms and Brushes,
- Boots,
- Sanitary Articles and Disinfectants,
- Domestic Articles,
- Clothing,
- Soaps.

Forms of Tender and further particulars may be obtained at the Borough Engineer's Office, Town Hall, West Ham, E. (where the Standard Samples may also be seen).

For the Supply of—

- Newspapers and Periodicals,
- New Books, and for
- Bookbinding

for the Public Libraries and Technical Institute.

Forms of Tender and further particulars may be obtained at the Central Public Library, Water-lane, Stratford, or at the Central Public Library, Barking-road, Canning Town, E.

For the Supply of—

- Meat,
- Fish,
- Ice,
- Bread and Flour,
- Druggist's Sundries,
- Groceries,
- Tea and Coffee,
- Linen,
- Drapery, Boots and Slippers.

for use in the Council's Hospitals.

For the Supply of—

- Bread and Flour,
- Meat,

to the Council's Convalescent Home, The Grange, Harold Wood, Essex.

Forms of Tender and further particulars may be obtained of the Physician Superintendent, at the Hospital, Samson-street, Plaistow.

For the Supply of—

- Engine Room Stores,
- House Service A.C. Wattmeters,
- Electrical Fittings and Accessories,
- I R. Covered Wires and Cables.

Forms of Tender and further particulars may be obtained of the Electrical Engineer, 84 Romford-road, Stratford, E.

A deposit of £1 will be required in respect of each Form of Tender, which will be returned on receipt of a *bonâ-fide* Tender.

NOTE.—No Tender will be considered unless the same is delivered at the Office of the Town Clerk, Town Hall, West Ham, E., in the envelope supplied, by registered post, not later than 12 o'clock noon on Friday, 6th February, 1914.

The Tenders will be opened at the Town Hall, West Ham, at 6.30 p.m. on Friday, 6th February, 1914, and persons tendering may be present if they so desire, but no guarantee is given that any information, beyond the names of persons tendering, will be read out.

The Council do not bind themselves to accept the lowest or any Tender. The contractor will be required to enter into a Bond, with sureties, for the due performance of the contract, and no goods, materials, &c., will be ordered under the contract until such Bond has been duly executed.

The contractor whose Tender is accepted, and with whom a contract is entered into, will be required to pay to the whole of his workmen such rate of wages, and observe such hours of labour as are recognised by the Workmen's Trade Unions, and in force at the time of signing the contract. In the event of any breach

of such agreement the Council will enforce the penalty clauses in their entirety.

(By order of the Council)

H. W. GREAVES,
Town Clerk.

Town Hall,
West Ham, E.
January, 1914.

(1,169)

**CITY OF SHEFFIELD.
STEVENSON ROAD TIPPING DOCK AND SIDING.**

The Health Committee of the City Council are prepared to receive Tenders for the Construction of Weighbridge Office, Steel Roof to Tipping Dock, 75 ft. by 34 ft., Entrance Gates, Dock Walls, Fences, and other contingent works, at Stevenson-road, Sheffield.

Particulars and Forms of Tender, together with "Conditions of Contract," may be obtained, and Drawings inspected, at the Office of the City Engineer, Town Hall, Sheffield, on payment of the sum of 10s., which will be returned on receipt of a *bonâ-fide* Tender. Applications to be endorsed "Stevenson-road Tipping Dock."

Tenders, enclosed in official envelope provided, to be delivered at the City Engineer's Office not later than 10 o'clock a.m. on Thursday, the 29th day of January, 1914.

The Committee do not bind themselves to accept the lowest or any Tender.

Any person or firm sending in a Tender will be required to add a Schedule to such Tender, stating the names of the various classes of labour which he or they intends or intend to employ, together with the places where such labour will be employed, and the rates of wages, hours of labour, and conditions of employment to be paid and observed in respect to each class of labour, all of which, as shown in such Schedule, shall comply with the City Council's form of clauses respecting wages, hours, and conditions of labour, and prohibition against assigning or sub-letting, a copy of which will appear in the "Conditions of Contract."

(By order)

WILLIAM E. HART,
Town Clerk.

Town Hall,
Sheffield.

January 11, 1914. (1,168)

**WILLESDEN DISTRICT COUNCIL.
ANNUAL CONTRACTS.**

The Willesden District Council are prepared to receive Tenders from persons willing to enter into Annual Contracts, commencing April 1st, 1914, to execute the following works or to supply the following materials—viz.:—

1. Jobbing Works in construction of Sewers, &c.
2. Jobbing Works, Mason and Pavior.
3. Supply of Artificial Slab Paving.
4. Supply of Tar Paving, and execution of Tar-paving Works.
5. Supply of Gravel, Flints, Burnt Ballast, &c., for repair of roads, &c.
6. Supply of Broken Granite for repair of roads, &c.
7. Supply of Lime, Cement, Stoneware Pipes, &c.
8. Supply of Lamp Columns and Fittings complete.
9. Supply of Oil and Chandlery.
10. Supply of Coal and Coke.
11. Barging of Road Slop, &c., from Fermev Wharf.
12. Supply of Horse Provender.
13. Supply of Ironmongery and Tools.
14. Supply of Timber.
15. Wood Paving Works.

Specifications and Forms of Tender may be obtained upon receipt of 5s. for each Tender Form, on and after Monday, January 19, 1914, upon application to Mr. O. Claude Robson, M.INST.C.E., Engineer to the Council, Municipal Offices, Dyne-road, Kilburn, N.W. The deposit for Tender Form will be returned upon receipt of *bonâ-fide* Tender.

Tenders to be delivered to the undersigned not later than 4 p.m. on Tuesday, January 27, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

STANLEY W. BALL,
Clerk of the Council.

Municipal Offices,
Dyne-road, Kilburn, N.W.
January 13, 1914.

(1,162)

PORHCRAWL URBAN DISTRICT COUNCIL. DRAINAGE.

TO CONTRACTORS.

The Urban District Council of Porthcawl invite Tenders for the Construction of certain lengths of Stoneware and Iron Sewers of 9, 12 and 24 in. diameter, and Concrete Tube Sewers of 30 in. in diameter, with the necessary Manholes, Flushing Tanks, and other appurtenances. The Contract also includes the Construction of a Sea Outfall, formed of 24-in. Cast-iron Pipes, to be laid through the rock foreshore, in accordance with Plans and Specification prepared by Messrs. John Taylor & Sons, Civil Engineers.

Contractors desirous of tendering may obtain copies of the Specification and the Bill of Quantities with Form of Tender from the Offices of the Engineers, Caxton House, Westminster, S.W., upon payment of 5s (cheque only), which will be returned upon receipt of a bona-fide Tender. The Drawings may be inspected either at the Offices of the Engineers, or at the Office of the Surveyor to the Council, Porthcawl.

Tenders, endorsed "Porthcawl Drainage, Contract No. 1," must be delivered in a sealed package, addressed to the Clerk to the Council, before 10 a.m. on the 5th February, 1914.

The acceptance of a Tender will in any case be provisional upon sanction being granted by the Local Government Board for a loan to defray the cost of the works, for which application has already been made, and the Council do not bind themselves to accept the lowest or any Tender.

(By order)

WM. CHORLEY,

Clerk to the Council.

(1,161)

EAST HAM CORPORATION.

CHURCH-ROAD RECREATION GROUND.

SUPPLYING AND ERECTING WROUGHT-IRON UNCLIMBABLE FENCING AND GATES.

The East Ham Corporation invite Tenders for the above.

Particulars, Drawings, Specification and Form of Tender may be obtained on application to Mr. J. Birch, Borough Engineer, Town Hall, East Ham.

Tenders to be sent in, addressed to "The Worshipful the Mayor, Town Hall, East Ham," endorsed "Tender for Iron Fencing," not later than 12 o'clock noon of Monday, the 26th January, 1914.

The firm whose Tender is accepted will be required to observe and fulfil the obligations upon contractors specified in the Fair Wages resolution adopted by the House of Commons on the 10th March, 1909, which is fully set forth in the Specification and particulars of Tender, and to enter into a contract with a Bond for the due performance thereof.

The Corporation does not bind itself to accept the lowest or any Tender.

(By order)

C. EUSTACE WILSON,

Town Clerk.

Town Hall,

East Ham, E.

January 14, 1914.

(1,171)

THE FROME URBAN DISTRICT COUNCIL. TENDERS FOR STORES.

The above-named Council invite Tenders for the Supply of the following Materials for the year ending March 31st, 1915:—

Scavenging Brushes, Portland Cement, Broken Limestone, Broken Granite, Tarred Material, Tools, Kerbing, Channelling, Pennant and Concrete Flagging, and Coal.

Particulars and Forms of Tender may be obtained from Mr. F. W. Jones, ASSOC. M. INST. C.E., the Public Offices, Frome.

Tenders must in all cases be made on the prescribed Forms, and delivered at my Office, addressed to the Chairman of the Council, not later than 12 noon, January 26th, 1914.

The Council does not bind itself to accept the lowest or any Tender.

(By order)

H. E. AMES,

Clerk.

The Public Offices, Frome,

January 14, 1914.

(1,166)

HILL'S MOTOR VACUUM ROAD CLEANSER AT BRADFORD.

Mr. J. Hill's Patent Motor Vacuum Road Cleanser, Limited, 4 Broad-street-place, London, E.C., have had their patent motor vacuum road cleansing machine at work in Blackburn during the strike of the scavengers. They loaned a machine to the Blackburn Corporation, and it has been doing excellent work. The street, owing to the lockout, have been in a very dirty condition through the frost and their unsympathetic condition, and the firm's representative on the spot informs them that in a few hours on Thursday of last week their machine swept and collected over 12 tons of refuse.

Northwich Water Supply.—A town's meeting at Northwich last week approved the promotion by the urban council of a Parliamentary Bill empowering the council to provide, at a cost not exceeding £20,000, a supplementary water supply for Northwich.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1045) subject to later confirmation by letter.

CITY ENGINEER.—January 17th. City of Cape Town. £1,500 per annum. Messrs. Davis & Soper, agents for the corporation, 54 St. Mary-axe, London, E.C.

ASSISTANT ENGINEER.—January 20th.—Singapore Municipal Commissioners. \$300—\$400 per month.—Mr. C. C. Lindsay, 150 Hope-street, Glasgow.

TEMPORARY ASSISTANT.—January 20th.—Corporation of Warrington. £3 3s. per week.—Mr. Andrew M. Ker, borough engineer and surveyor.

CLERK OF WORKS.—January 21st.—Chorley Town Council. £2 10s. per week. Borough Surveyor.

ASSISTANT IN ENGINEER'S DEPARTMENT.—January 22nd.—Willesden Urban District Council. £150 per annum.—Mr. O. Claude Robson, engineer.

TEMPORARY ENGINEERING ASSISTANT.—January 23rd.—Buxton Urban District Council. £2 per week.—Mr. F. Laigley, engineer and surveyor.

SURVEYOR'S ASSISTANT.—January 26th.—Corporation of Harrigate. £160 per annum.—Mr. C. E. Rivers, borough engineer and surveyor.

CLERK OF WORKS.—January 26th.—Finchley Urban District Council. £3 3s. per week.—Mr. E. H. Lister, clerk.

SURVEYOR'S ASSISTANT.—January 27th.—Corporation of Newark. £90—£120.—Mr. Godfrey Tallents, town clerk.

BOROUGH SURVEYOR'S ASSISTANT.—January 26th.—Islington Borough Council. £90—£120 per annum.—Mr. W. F. Dewey, town clerk.

SURVEYOR'S CLERK.—January 30th.—Canmore Urban District Council. 25s. a week.—Mr. C. A. Loxton, clerk.

MECHANICAL ENGINEER AND FOREMAN.—January 30th.—Corporation of Bedford. £2 10s.—£3 per week, with house, coal, and light.—Mr. N. Greenshields, borough engineer and surveyor.

ENGINEER AND SURVEYOR.—January 31st.—Rhondda Urban District Council. £500—£750.—Mr. W. P. Nicholas, clerk, Pentre, Rhondda.

BOROUGH SURVEYOR AND WATER ENGINEER.—January 31st.—Borough of Godalming. £250—£350.—Mr. T. Percival Whitley, town clerk.

ASSISTANT HIGHWAY SURVEYOR.—January 31st.—Bowland Rural District Council. £60 per annum. Mr. Thomas Eastham, clerk, 21 Church-street, Clitheroe.

INSPECTOR OF NUISANCES.—February 1st.—Faversham Rural District Council. £145 per annum.—Mr. G. Tassell, clerk.

BRIDGE AND MAIN ROAD SURVEYOR.—February 9th.—Devon County Council. £400 a year, with £200 a year for expenses.—Mr. F. Bailey, clerk, The Castle, Exeter.

SUPERINTENDENT OF FIRE BRIGADE.—February 28th.—Municipality of Karachi. 200 rupees per month, with free quarters.—Mr. Measham Lea chief officer and chief engineer.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

ASSISTANT ENGINEERS AND DRAUGHTSMEN.—Public Works Department of Sierra Leone. Engineers, £300—£400; draughtsmen, £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

COVENTRY.—February 1st.—Sketch plans for a technical institute, for the corporation.—Education Offices, 44 Bayley-lane.

HENDON.—March 2nd.—Designs for public baths, for the urban district council. Premiums £100, £75, and £50.—The Clerk.

TWRCELYN.—March 9th.—Plans and specifications for a water supply and drainage scheme for Cemaes.—Mr. T. H. Hughes, clerk, Pir-grove, Menai Bridge.

BELFAST.—March 20th.—Designs for an art gallery and museum, for the corporation.—Mr. R. Meyer, town clerk.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

BLACKPOOL.—January 20th.—For the erection of a branch reading-room, for the corporation.—Mr. J. S. Brodie borough engineer.

CHELMSFORD.—January 20th.—For the provision and laying of 2,500 lin.-yds. of 3-in. water mains and fittings, for the rural district council.—Mr. W. Almond, surveyor.

KETTERING.—January 21st.—For the erection of public baths, for the urban district council.—Mr. T. R. Smith, surveyor.

MIDDLESBROUGH.—January 22nd.—For the erection of a laundry at the sanatorium, for the corporation.—Mr. S. E. Burgess, borough engineer.

CROYDON.—January 22nd.—For the execution of ferro-concrete construction on the Hennibique system for the removal of the present Hack Bridge over the Wandie, and the provision of a new ferro-concrete bridge, for the rural district council.—Mr. Robt. Chart, junr., surveyor.

HULL.—January 22nd.—For alterations and additions to a school, for the Education Committee.—Mr. J. H. Hirst, city architect.

MARGAM.—January 24th.—For the erection of a Carnegie public library, for the urban district council.—Mr. J. Cox, surveyor, Port Talbot.

MANCHESTER.—January 26th.—For the culverting of the Gore Brook, for the Paving Committee.—City Surveyor.

BOOTLE.—January 26th.—For the erection of a cemetery chapel, for the corporation.—Town Clerk.

MANCHESTER.—January 27th.—For extensions and alterations at the electric car shed, for the Tramways Committee.—Mr. J. McElroy, tramways manager, 55 Piccadilly, Manchester.

WOOD GREEN.—January 28th.—For the erection of a pavilion in the recreation ground, for the urban district council.—Mr. C. H. Croxford, engineer and surveyor.

WIDNES.—January 29th.—For alterations and additions to the accident hospital, for the corporation.—Mr. J. Sinclair, borough surveyor.

HERTFORD.—January 29th.—For the erection of a public school, for the Education Committee.—County Surveyor, Hatfield.

DORSET.—January 30th.—For the erection of a school, for the Education Committee.—Messrs. Fletcher & Bratt, Wimborne.

WHARFEDALE.—January 30th.—For the erection of a diphtheria pavilion, and additions to administration block at isolation hospital, for the Joint Hospital Committee.—Mr. Phil. S. Wade, clerk, Union Offices, Otley.

EGREMONT.—January 30th.—For the erection of seventy-six houses, for the urban district council.—Mr. J. S. Stout, architect, 36 Lowther-street, Whitehaven.

YORK.—February 2nd.—For piling and laying out the west bank of the river Ouse, between Lendal Bridge and Scarborough Bridge, for the corporation.—Mr. F. W. Spurr, city engineer.

LONDON.—February 3rd.—For the supply of building materials and tools, for the Prison Commissioners.—Prison Commission, Home Office, Whitehall, London, S.W.

SCUNTHORPE.—February 4th.—For the sinking of a pump well, 12 ft. clear internal diameter by about 60 ft. deep, driving adits and sinking boreholes, for the urban district council.—Mr. C. Curtis Gray, engineer and surveyor.

Iron and Steel.

RANGOON.—February 25th.—For the supply of lap-welded steel mains, lap-welded pipes, bends, branches and other special pipes, for the municipality.—Messrs. Ogilvy, Gillanders & Co., agents, 67 Cornhill, London, E.C.

CLEETHORPES.—January 26th.—For the supply of cast-iron turned and bored pipes, sluice valves and sewer penstocks, for the urban district council.—Mr. J. McKie, engineer.

MANCHESTER.—January 26th.—For the supply of ventilating grids and other castings, for the corporation.—Mr. H. Prescott, manager, Drainage Department.

Roads.

PLYMOUTH.—January 19th.—For making-up work, for the corporation.—Mr. J. Paton, borough surveyor.

WIGTON.—January 19th.—For road maintenance, for the rural district council.—Mr. T. B. Simmons, surveyor.

BLACKBURN.—January 19th.—For making up certain streets, for the corporation.—Mr. W. Stubbs, borough engineer.

ACTON.—January 20th.—For making up certain roads, for the urban district council.—Mr. W. Hodson, clerk.

SURREY.—January 20th.—For the supply of high-class granites, basalts, limestone, slag, tar-macadam, bitumen, pitch, tar, and tar oils, for the county council.—Mr. A. Dryland, county surveyor, Kingston-on-Thames.

LEIGH.—January 23rd.—For the supply of 2,000 tons of granite setts, for the corporation.—Mr. Tom Hunter, borough engineer.

NEWMARKET.—January 23rd.—For the supply of Leicestershire granite, tarviated granite chips, and granite chips, for the urban district council.—Mr. W. H. Eley, surveyor.

ESSEX.—January 24th.—For the supply of team labour, stoneware pipes, Norwegian granite kerb and setts, York kerb, and distilled tar, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

BIRMINGHAM.—January 24th.—For the supply of granite kerbs, setts, crossing stones, chippings, flags, paving bricks, wood paving blocks, ragstone, limestone, tarred limestone, gravel, sand, and slag, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

WORKSOP.—January 26th.—For the supply of slag, for the urban district council.—Mr. G. Featherstone, clerk.

WANGFORD.—January 26th.—For the supply of granite, red broken gravel and fine marl, for the rural district council.—Mr. S. W. Rix, clerk, Beccles.

CUCKFIELD.—January 26th.—For the supply of about 6,500 tons of broken granite, tarred material, and flints, for the rural district council.—Mr. A. Macarthur, surveyor, Haywards Heath.

DEVON.—January 26th.—For steam rolling and scarifying on the main roads in the Bideford Rural District, for the county council.—Mr. Edward Stead, county surveyor, No. 1 Division, Barnstaple.

EPSOM.—January 26th.—For the supply of about 100,000 gallons of coal tar, for the rural district council.—Mr. T. E. Ware, surveyor.

PLOMESGATE.—January 26th.—For the supply of broken granite, and flint, broken or unbroken, for the rural district council.—Mr. David R. Read, clerk.

BURGESS HULL.—January 26th.—For the supply of 12,000 gallons of coal tar, for the urban district council.—Mr. A. F. Hardwick, clerk.

TORQUAY.—January 26th.—For road widening works, for the corporation.—Mr. H. A. Garrett, borough engineer.

MERIDEN.—January 26th.—For the supply of granite or other similar stone, for the rural district council.—Mr. A. W. Liggins, clerk, 11 Priory-street, Coventry.

WIMBLEDON.—January 27th.—For making up both or either of the following streets—viz., Wilton-grove and section 2 of Compton-road, for the corporation.—Borough Engineer and Surveyor.

ISLINGTON.—January 27th.—For the supply of Jarrah or other hard wood and creosoted deal paving blocks, for the borough council.—Mr. J. Patten Barber, borough engineer.

BIRMINGHAM.—January 28th.—For the supply of about 1,500 tons of coal-gas tar, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

THIRSK.—January 26th.—For the supply of whinstone, unbroken limestone, slag, tar, and carting, for the rural district council.—Mr. C. A. Lake, highway surveyor.

SOUTHALL-NORWOOD.—January 27th.—For work of making-up, for the urban district council.—Mr. R. Brown, engineer and surveyor.

RAMSGATE.—January 28th.—For the supply of granite chippings, for the corporation.—Mr. T. G. Taylor, borough engineer.

WOODBIDGE.—January 29th.—For the supply of granite or basalt, flint, and other materials, for the rural district council.—Mr. G. Cook, district surveyor, Ipswich-road, Woodbridge.

BRACKLEY.—January 30th.—For the supply of granite, for the corporation.—Mr. A. A. Green, borough surveyor.

GRIMSBY.—January 30th.—For the sale, by the corporation, of a steam road roller, with Morrison scari-lier, made by Messrs. Aveling & Porter.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

SEVENOAKS.—January 30th.—For the supply of chert, flints, ragstone, granite, quartz, basalt, steam rolling, team labour, cartage, and haulage from stations, for the rural district council.—Mr. F. H. Vibert, clerk.

SOMERSET.—January 31st.—For the supply of broken granite or basalt, for the county council.—Mr. H. T. Chapman, county surveyor.

SOMERSET.—January 31st.—For steam rolling and scarifying on the main roads, for the county council.—Mr. H. T. Chapman, county surveyor.

WITNEY.—January 31st.—For the supply of granite, for the rural district council.—Mr. H. T. Ravenor, clerk.

WITNEY.—January 31st.—For the supply of the best 2-in. clean, broken Cleve Hill, Hartshill, Mendip, Pyx, and Rowley Regis granites, for the rural district council.—Mr. G. Wallis, district surveyor, Bampton, Oxon. and Mr. D. H. W. Powell, Brize-norton, Oxon.

WORCESTERSHIRE.—January 31st.—For the supply of granite, for the Highways and Bridges Committee.—Mr. G. F. Gettings, county surveyor.

BRIDGWATER.—January 31st.—For the supply of stone for the roads, for the rural district council.—Mr. W. A. Collins, 56a Eastover, Bridgwater.

EARBY.—January 31st.—For making up certain streets, for the urban district council.—Mr. J. E. Aldersley, surveyor.

BROMLEY (Kent).—February 2nd.—For the execution of sewerage, levelling, paving, metalling, channelling and making good portion of a road, for the rural district council.—The Surveyor, Maulden House, Sideup-hill, Sideup.

BLYTH AND CUCKNEY.—February 2nd.—For road widening, for the rural district council.—Mr. F. Hopkinson, surveyor, Worksop.

EAST GRINSTEAD.—February 2nd.—For the supply of 400 cub. yds. of fine compo sand, flint grit, or other material for the surface-tarring of roads, for the rural district council.—Mr. Francis S. White, clerk.

LEWISHAM.—February 3rd.—For making up Grove Park-road, for the borough council.—Borough Surveyor.

ROTHERHAM.—February 4th.—For the supply of granite, slag, and team labour, for the rural district council.—Mr. R. Bradbury, district surveyor.

MIDDLESEX.—February 4th.—For the supply of about 12,000 tons of 2-in. and 1½-in. hand-broken basalt for road construction, and 2,000 tons of ½-in. chippings, for the county council.—Mr. H. T. Wake-lam, Middlesex Guildhall, Westminster, S.W.

HERTFORDSHIRE.—February 5th.—For the supply of broken granite, slag and tar-macadam required for the main roads during the year ending March 31, 1915, for the county council.—Mr. Urban A. Smith, county surveyor, Hatfield.

ARDSLEY.—No date.—For the supply of granite, whinstone, limestone, slag, and tar, for the urban district council.—Mr. J. Morley, engineer and surveyor, Stairfoot, near Barnsley.

Sanitary.

PONTEFRAC.—January 17th.—For scavenging work, for the rural district council.—The Clerk.

WIMBLEDON.—January 17th.—For scavenging work, for the rural district council.—Mr. F. Small-piece, clerk, 138 High-street, Guildford.

HALIFAX.—January 17th.—For the extension of sewage disposal works, for the corporation.—Mr. J. Lord, borough engineer.

CROYDON.—January 19th.—For the supply of stoneware drain pipes, for the corporation.—Borough Engineer.

MIRFIELD.—January 19th.—For the extension of sewage disposal works, for the urban district council.—Mr. E. Gill, engineer and surveyor.

BRANDON AND BYSHOTTLES.—January 20th.—For work of sewerage, for the urban district council.—Mr. G. G. Donkin, surveyor, Langley Moor.

WALTHAMSTOW.—January 22nd.—For drainage and other works, for the parochial charities.—Mr. W. Houghton, surveyor, 58 Old Broad-street, E.C.

MANCHESTER.—January 26th.—For the execution of general drainage work, for the corporation.—Mr. H. Prescott, manager, Drainage Department.

GODSTONE.—January 26th.—For the construction of sewage works, for the rural district council.—Mr. G. H. Widger, sanitary inspector.

EPSOM.—January 27th.—For the removal of house refuse, for the rural district council.—Mr. F. A. Prat-ley, surveyor.

WESTHAMNETT.—January 29th.—For laying sewers, building manholes and lampholes, and all necessary work connected with the main drainage of Felpham, for the rural district council.—Mr. H. Howard Humphreys, 28 Victoria-street, Westminster, S.W.

MALDENS AND COOMBE.—February 2nd.—For additions to the sewage disposal works, comprising raising walls of existing sedimentation tanks, constructing detritus tanks, No. 5 percolating filters, high and low level humus tanks, ejector chamber, ejectors, carriers, sludge pipes, forming sludge beds, and preparing storm-water filtration area, for the urban district council.—Mr. R. H. Jeffes, engineer and surveyor.

Stores.

NORTHAMPTON.—January 19th.—February 14th.—For the supply of broken granite, granite kerb, setts, artificial stone paving, stoneware pipes, gullies, Portland cement, lime, ironmongery, wrought iron, steel, tar paving, tar-macadam, blue bricks, local lime, gravel, sand, brooms, brushes, coal, coke, iron castings, timber, and team labour, for the corporation.—Mr. Alfred Fidler, borough engineer.

MIDDLESBROUGH.—January 19th.—For the supply of annealed scoria blocks, bricks, castings, concrete flags and kerbs, Portland cement, pitch and tar, sanitary pipes, gullies, junctions, broken slag, domestic coal, timber, whinstone and granite (broken),

whinstone and granite setts and kerbs, brushes, bolts, nuts, disinfectants, general stores, glass, hardware, indiarubber goods, iron, steel, leather belting, oils, paints, varnishes, packings, picks, shovels, shafts, polishes, cleaning materials, and ropes, for the corporation.—Mr. S. E. Burgess, borough engineer.

CHELSEA.—January 21st.—For the supply of water-proof goods, broken granite from the Channel Islands, wood blocks, hoggins and ballast, removal of trade refuse, scavengers' tools, dust baskets, tools, and carbolic disinfectants, for the borough council.—Mr. T. W. E. Higgins, borough surveyor.

ACTON.—January 23rd.—For the execution of works and supply of Portland cement, ground blue lias lime, stoneware pipes, granite, flints, household coal, shoeing horses, manhole covers, granite kerb and channel, artificial stone paving, York stone, cycle repairs and accessories, paints, oils, team labour, horsing fire brigade, brooms, disinfectants, wood blocks, and tarpaving materials, for the urban district council.—Mr. W. Hodson, clerk.

BIRMINGHAM.—January 24th.—For the supply of lias lime, Portland cement, drain pipes, gullies, gully pans, brown bricks, timber, drysaltery, malleable-iron castings, iron castings, galvanised goods, iron and steel ware, lamps, glass, enamelling, brooms, hose pipes, hose coupling, rubber goods, incandescent mantles, and miscellaneous stores, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

SHEFFIELD.—January 26th.—For the supply of asphalt or tar-paving (labour and materials), bricks, castings for sewer and other work (manhole covers), cement, earthenware pipes, blocks, traps, free-stone and gritstone kerb and setts, flags, quarry sand, granite setts, kerb, ringsmall, gravel and chips, limestone, slag shingle, pitch, tar and creosote oil, timber, iron, steel, tools and sundries, oils, paints and brushes, for the corporation.—Mr. W. J. Hadfield, surveyor of highways.

GRIMSBY.—January 30th.—For the supply of chalk, whinstone, or columnar basalt macadam, slag, artificial flags, Yorkshire flags, Yorkshire kerbs, granite setts, kerbs, channel, pitch, coal-gas tar, lime, Portland cement, drainage pipes, miscellaneous brushes, scavenging brushes, drysalteries, lubricating oils, oils, paints, disinfectant fluid, disinfectant powder, formalin, formalin tablets, and SO₂ tubes, for the corporation.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

CHELTENHAM.—January 31st.—For the supply of Portland cement, forage, stoneware pipes, broken stone, kerbs, setts, disinfectants, oils, colours, ironmongery, timber, indiarubber goods, lead, brass fittings, tools for highways, wrought iron, steel, files, electric light fittings, road brooms, lias lime, bricks, clothing, and cast-iron pipes, for the corporation.—Mr. J. S. Pickering, borough engineer.

STEPNEY.—February 10th.—For the supply of bricks, lime, fireclay, brooms, cast-iron work, colours, varnishes, painters' brushes, drainage materials, oilman's goods, Portland cement, pitch, tar, green oil, bitumen, timber, tools, implements, ironmongery, wheelwrights' materials, ballast, shingle, sand, hoggins, flints, uniform clothing, boots, disinfectants, paving materials, horse hire, and squaring and re-dressing old paving materials, for the borough council.—Mr. M. W. Jameson, borough engineer.

HASTINGS.—December 29th.—For the supply of manhole covers, gullies, brooms, and brushes, for the corporation.—Mr. P. H. Palmer, borough engineer.

Miscellaneous.

CHESTERFIELD.—January 19th.—For sinking a trial borehole, for the Gas and Water Board.—Mr. J. Middleton, clerk.

TREDEGAR.—January 20th.—For the supply of a 5-ton steam tractor and two side-tipping wagons or trailers to carry 4 tons each, and the immediate hire of a similar tractor, with driver, or two similar wagons or trailers, for the urban district council.—Mr. H. J. C. Shepard, clerk.

BIRMINGHAM.—January 24th.—For the supply of uniform clothing, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

MANCHESTER.—January 26th.—For fencing at Knutsford-road, for the corporation.—City Surveyor.

RAMSGATE.—January 28th.—For fixing a hydraulic flag-making plant, and revolving mixer and grinding mill, for the corporation.—Mr. T. G. Taylor, borough engineer.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance. ‡ Provisionally accepted.

CHEESHAM.—For kerbing, channelling and paving works, for the urban district council.—Mr. Percy C. Dormer, engineer:—
W. Wright, Chesham £1,469
Engineer's estimate, £1,522.

DEVONPORT.—For the erection of ward pavilion and other works at the hospital, for the corporation.—Mr. J. F. Burns, borough surveyor:—
G. B. Turpin, Plymouth £3,672
J. Crockerell, Devonport 3,566
A. R. Debnam, Plymouth 3,166
S. Roberts, Limited, Plymouth 3,460
F. I. Stanbury, Devonport 3,263

HOVE. For paving and other works, for the corporation.—Mr. H. H. Scott, borough surveyor:—
H. Farrow, Barrington-road, Brixton, £686.

LONG MARSTON.—For laying water pipes, and extensions to Evesham and Pebworth joint scheme.—Messrs. Willcox & Raikes, engineers:—
Johnson Brothers, Gloucester £1,673
A. Holloway, Wolverhampton 1,121
T. Broad, Limited, Great Malvern 1,039
Curral, Lewis & Martin, Birmingham 999
Childs & Withers, Worcester 954
Firth & Co., Derby 920
W. Thorpe, Birmingham 899
J. Riley, Cheltenham 895
W. Ellis, Birmingham 881
F. Earke & Son, Stoke-on-Trent 860
G. Law, Kidderminster 840
Staveley Coal and Iron Company, Limited, Chesterfield 831
Rowell & Sons, Chipping Norton 818

LUDLOW. For putting down additional borehole in connection with Craven Arms water supply.—Messrs. Willcox & Raikes, engineers:—
C. Chapman & Sons, Manchester £600
T. Wilson & Sons, Edinburgh 541
New England Boring Company, Peterborough 519
T. Tilley & Co., Limited, London 411
E. Timmins & Sons, Runcorn 351

NEATH.—For the construction of new waterworks, for the corporation.—Mr. D. M. Jenkins, water engineer:—

CONTRACT No. 1.
A. G. Collins & Co., Barry £3,404
Barnes, Chaplin & Co., Cardiff 3,284
Brebner & Co., Edinburgh 3,095
B. Jones, Neath 3,084
Thomas Brothers, Pontardawe (Amended) 3,004
J. W. Thompson, Neath 2,971

CONTRACT No. 2.
J. W. Thompson, Neath £671
A. G. Collins & Co., Barry 669
Barnes, Chaplin & Co., Cardiff 632
B. Jones, Neath 549
Hannev Brothers, Swansea 545
Thomas Brothers, Pontardawe 524
Brebner & Co., Edinburgh 522

PONTYPRIDD.—For the construction of a new highway, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor:—

G. L. Morgan, Pontypridd £5,663
A. G. Collins, Barry 5,574
F. Hayes, Liverpool 5,380
R. C. Brebner & Co., Edinburgh 5,362
J. Sutherland, Abercynon 5,242
H. Murray, Pontypridd 5,240
W. J. Davies, Pontypridd 5,057
W. Jones, Llanbradach 4,952
Surveyor's estimate, £5,250.

PONTYPRIDD.—For works of kerbing, flagging, and pitching in two streets, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor:—

G. L. Morgan, Pontypridd £312
H. Murray, Pontypridd 269
W. Jones, Llanbradach 237
F. Hayes, Liverpool 212
Surveyor's estimate, £270.

SWANSEA.—For the construction of a bridge, for the rural district council.—Mr. G. Powell Thomas, highway surveyor, Forestfach:—

T. Riley, Cheltenham £8,180
A. Farley, Pontardulais 8,108
Hill Brothers, Sketty 7,526
R. J. Jones, Clydach 6,920
B. Jones, Neath 6,528
T. Walker, Swansea 6,512
Thomas Brothers, Pontardawe 6,009

SWANSEA. For the supply of material, and reforming, ballasting, and metalling, for the rural district council.—Mr. G. P. Thomas, surveyor, Forestfach:—

W. Jones, Gorseinon £290
T. Walker, Swansea 265
Thomas Brothers, Pontardawe 279
R. J. Jones, Swansea 239
A. Farley, Pontardulais 224

CHANGE OF TELEPHONE NUMBER.—Readers are requested to note that "The Surveyor" telephone number is now City 1046.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JANUARY.

- 17.—Institution of Municipal and County Engineers: South-Eastern District Meeting at Institution Offices.
- 19.—Surveyors' Institution (Junior Meeting): Mr. H. J. Smith on "The Housing and Town Planning Act in Working." 7 p.m.
- 19.—Institute of Sanitary Engineers: Baibe W. B. Smith, Chairman of the Glasgow Corporation Committee on Air Purification, on "The Need for Purer Air." Caxton Hall, Westminster. 8 p.m.
- 23.—Institution of Civil Engineers (Students' Meeting): Mr. E. W. Monkhouse, M.A., M.INST.C.E., on "The Testing of Materials for Use in Engineering Construction." 8 p.m.
- 26.—Surveyors' Institution: Mr. George Corderoy on "Measuring and Quantity Surveying."
- 29.—Concrete Institute: Discussion on Joint Report of the Reinforced Concrete Practice Committee and the Quantity Surveyors' Association, on "Standard Methods of Measurement for Reinforced Concrete Work." 7.30 p.m.
- 30.—Institution of Civil Engineers (Students' Meeting): Mr. E. W. Monkhouse, M.A., M.INST.C.E., on "The Testing of Materials for Use in Engineering Construction." 8 p.m.
- 31.—Institution of Municipal Engineers: North-Western District Meeting, Mitre Hotel, Manchester. 1.30 p.m.

FEBRUARY.

- 4.—Institute of Sanitary Engineers: Annual Dinner, Holborn Restaurant.
- 16.—Institute of Sanitary Engineers: Mr. F. R. O'Shaughnessy, F.I.C., on "The Significance of Colloidal Matter in the Problem of Sewage Disposal." Caxton Hall, Westminster. 8 p.m.
- 20-21.—Institution of Municipal and County Engineers: Meeting at Manchester.
- 23.—Surveyors' Institution: Annual Dinner, Whitehall Rooms. 7 p.m.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

BOROUGH OF BEDFORD.

APPOINTMENT OF MECHANICAL ENGINEER AND FOREMAN.

Applications are invited for the appointment of Mechanical Engineer and Foreman to take charge (under the direction of the Borough Engineer) of the Sewage Pumping Stations and the Refuse Destructor.

Applicants should not be under 30 or over 40 years of age.

Candidates should be able to execute small repairs, and preference will be given to those who have had experience in similar work.

Wages will commence at £2 10s. per week, rising by four annual increments to a maximum of £3 per week, together with house, coal, rates, and light free.

Applications, in candidate's own handwriting, stating age, previous experience, together with copies of not more than three recent testimonials, to be sent to the undersigned not later than 12 noon on Friday, January 30th, 1914.

Canvassing is strictly prohibited, and will be deemed a disqualification.

N. GREENSHIELDS, ASSOC. M.INST.C.E.,
Borough Engineer and Surveyor.

Town Hall, Bedford.

January 9, 1914.

(1,137)

BOROUGH OF NEWARK.

SURVEYOR'S ASSISTANT.

The Council invite applications for the appointment of an Assistant to the Borough Surveyor, at a commencing salary of £90 per annum, rising by annual increments of £10 to £120 per annum.

Candidates should be neat draughtsmen, accurate Surveyors and Levellers, and should have had experience in Building Construction and Sewerage Works.

Applications, endorsed "Surveyor's Assistant," stating age and experience, accompanied by copies of not more than three recent testimonials, must reach the undersigned not later than Tuesday, the 27th January.

GODFREY TALLENTS,

Town Clerk.

Town Clerk's Office,
Newark.

January 10, 1914.

(1,141)

SINGAPORE, STRAITS SETTLEMENTS.

MUNICIPAL ENGINEER'S DEPARTMENT.

The Municipal Commissioners of the Town of Singapore require an Assistant Engineer, between 25 and 30 years of age, of sound constitution. He must have had a good technical education, a regular training as a Civil Engineer, and have a practical knowledge of Surveying, Levelling and Estimating, and experience in ordinary Municipal work, including the collection, filtration, pumping and distribution of water, and in Sewerage Works, both in the design and in the construction of new works and in ordinary maintenance. Preference will be given to an Assistant connected with the Institution of Civil Engineers.

The engagement will be for three years, and the applicant is to state the earliest date upon which he could be free to leave for Singapore. The selected candidate must pass a medical examination.

A second-class passage will be provided by mail steamer, or a first-class passage by other steamer, with half-pay during the voyage out.

The salary will be 300 dollars per month for the first, 320 dollars per month for the second, and 340 dollars per month for the third year, paid monthly in dollars, the currency of the Colony, the value of the dollar being two shillings and fourpence sterling. Local transport duty allowance of 60 dollars per month will be paid.

Applications, stating age and place of birth, and giving details of education, training and experience generally, and in Waterworks, Sewerage and Municipal Engineering, and referring to the above requirements seriatim, accompanied by copies (only) of testimonials, and also personal references, to be lodged with C. C. Lindsay, Esq., M.INST.C.E., 180 Hope-street, Glasgow (who will give further particulars if requested), not later than Tuesday, 20th January, 1914. (1,130)

COUNTY BOROUGH OF WARRINGTON.

The Street Improvement Committee of the Council of the County Borough of Warrington invite applications for the appointment of a Temporary Assistant for a period of not less than 6 months, with experience in Town Planning. Salary £3 3s. per week.

Applications, in candidate's own handwriting, stating age, and giving full particulars of experience and present employment, and accompanied by copies of not more than three recent testimonials, to be sent to the undersigned, endorsed "Application for Town Planning Assistant," not later than Tuesday, the 20th day of January, 1914.

Canvassing, either directly or indirectly, will be a disqualification.

ANDREW M. KER,

Borough Engineer and Surveyor.

Town Hall, Warrington.

January 6, 1914.

(1,116)

KARACHI MUNICIPALITY.

APPOINTMENT OF SUPERINTENDENT OF FIRE BRIGADE.

Applications are invited for the post of Superintendent of the Municipal Fire Brigade. Salary Rs.200/- per mensem. with Free Quarters, unfurnished.

The Superintendent will be a full-time Officer, and, in addition to taking charge of a Motor Fire Engine at fires, will be required to organise the Brigade, to conduct fire drills regularly, and to see that all fire appliances are always in good working order, and generally to act under the orders of the Chief Engineer of the Municipality.

Preference will be given to a young, active man, with experience in a properly organised Brigade, used to obeying and enforcing discipline.

The selected candidate will be subject to all the Municipal Rules, including Leave and Provident Fund Rules, and the appointment may be terminated at any time by three months' notice on either side.

Single second-class fare will be paid to enable the candidate to join his appointment.

Applications, stating age, nationality, qualifications and experience, will be received up to 28th February, 1914.

MEASHAM LEA, ASSOC. M.INST.C.E.,
Chief Officer and Chief Engineer,
Karachi Municipality.

(1,138)

BOROUGH OF GODALMING.

Applications are invited for the position of Borough Surveyor and Water Engineer. Salary £250 per annum, rising by annual increments to £350. Age limit 28 to 45. Canvassing, directly or indirectly, will disqualify.

Particulars and conditions of appointment, and Form of application showing the information which must be furnished, may be obtained at the Town Clerk's Office.

Applications, endorsed "Borough Surveyor," must be delivered at the Town Clerk's Office, Godalming, on or before Saturday, the 31st day of January, 1914.

T. PERCIVAL WHATELY,
Town Clerk.

Town Clerk's Office,
Godalming, Surrey.
January 12, 1914. (1,151)

**BUXTON URBAN DISTRICT COUNCIL.
TEMPORARY ENGINEERING ASSISTANT.**

The above Council require the services of a Temporary Engineering Assistant in their Engineer and Surveyor's Department, at a salary of £2 per week.

The appointment will be made for a period not exceeding 12 months.

Candidates must be competent Levellers and Surveyors, and good Draughtsmen, and must have had general experience in a Municipal Engineer's Office.

Preference will be given to those who have passed the examination of the Institution of Municipal and County Engineers.

Applications, endorsed "Temporary Assistant," stating age, qualifications and experience, and accompanied by copies of three recent testimonials, must be delivered to the undersigned not later than 12 o'clock (noon) on Friday, the 23rd January, 1914.

Canvassing, either directly or indirectly, will be deemed a disqualification.

F. LANGLEY,
Engineer and Surveyor.

Town Hall, Buxton.
January 10, 1914. (1,148)

**BOWLAND RURAL DISTRICT COUNCIL.
APPOINTMENT OF ASSISTANT HIGHWAY
SURVEYOR.**

The above Council invite applications for the Office of Assistant Surveyor of Highways, at a salary of £60 per annum, inclusive of travelling expenses, for the above district, which comprises 19 Townships and about 147 miles of Highways, of which 16 miles are Main Roads.

The person to be appointed will be required to reside at some place within the District approved by the Council, and to devote the whole of his time to the service of the Council.

Applicants must have had previous experience, and the appointment is subject to termination by either party by a month's notice.

Applications, marked "Assistant Surveyor," with copies of two testimonials, to be sent to me on or before the 31st day of January instant.

(By order of the Council)
THOMAS EASTHAM,
Clerk.

21 Church-street,
Clitheroe.
January 12, 1914. (1,154)

**CANNOCK URBAN DISTRICT COUNCIL.
APPOINTMENT OF SURVEYOR'S CLERK.**

The Council invite applications for the above appointment. Applicants must have had experience in a Municipal Surveyor's Office, including the keeping of all the various books, and be an efficient short-hand-typist.

The salary will be 25s. per week.

Applications, in candidate's own handwriting, stating age and qualifications, to be addressed and delivered to the undersigned, accompanied by copies of three testimonials, not later than 10 a.m. on Friday, the 30th inst., endorsed "Surveyor's Clerk." Canvassing will be deemed a disqualification.

C. A. LOXTON,
Clerk to the Council.

Council Offices,
Cannock.
January 7, 1914. (1,157)

COUNTY COUNCIL OF DEVON.

The Council invite applications for the Office of Bridge and Main Road Surveyor for the Northern Division of the County.

Applicants must not be more than 45 years of age, and must have had not less than seven years' experience in the maintenance of Main Roads and County Bridges under a County, Borough or District Council.

Applicants must be either Members or Associate Members of the Institution of Civil Engineers.

Salary £400 a year, with £200 a year for expenses. Office stationery and postages are provided by the Council.

The Officer must devote the whole of his time to the duties of his office, and will be required to provide and use a motor car in the discharge of his duties.

Particulars of the conditions and duties of the office, together with the prescribed Form of application, can be obtained from the undersigned.

Applications, on the prescribed Form, must be endorsed "Application for Surveyorship," and must be received at the Offices of the Council, The Castle, Exeter, on or before the 9th February next.

Canvassing, directly or indirectly, will be regarded as a disqualification, but candidates are at liberty to send copies of their applications and testimonials to members of the County Council.

F. BAILEY,
Clerk of the County Council.

Castle of Exeter.
January 8, 1914. (1,153)

**BOROUGH OF HARROGATE.
SURVEYOR'S ASSISTANT.**

The Harrogate Corporation invite applications for the appointment of an Assistant in the Borough Engineer and Surveyor's Department at a salary of £100 per annum.

Applicants must be neat and expeditious Draughtsmen and accurate Surveyors and Levellers, and must have had previous experience in the preparation of plans, estimates and apportionments, and the carrying out of Private Street Works.

Applications, in candidate's own handwriting, stating age, qualifications and experience, accompanied by copies of not more than three recent testimonials, to be addressed to the undersigned on or before Monday, the 26th January, endorsed "Assistant."

Canvassing, directly or indirectly, is prohibited, and will be deemed a disqualification.

C. E. RIVERS, ASSOC. M. INST. C.E.,
Borough Engineer and Surveyor.

Municipal Offices,
Harrogate.
January 13, 1914. (1,155)

TENDERS WANTED.

**ARDSLEY URBAN DISTRICT COUNCIL.
ROAD MATERIAL.**

The Council invite Tenders for the supply of Granite, Whinstone, Limestone, Slag and Tar for Tarmacadam, and Surface Tarring Work.

Specification and Forms of Tender may be obtained from the undersigned.

J. MORLEY,
Engineer and Surveyor.

Council Office,
Stairfoot,
Nr. Barnsley.
January, 1914. (1,158)

**METROPOLITAN BOROUGH OF
ISLINGTON.**

Tenders are invited for the supply and delivery of Jarrah, or other hard wood, and creosoted deal Paving Blocks.

Form of Tender and particulars can be obtained upon application to the Borough Engineer, Mr. J. Patten Barber, at the Town Hall, Upper-street, Islington, N.

Sealed Tenders, endorsed "Tender for Wood Blocks," must be received by the undersigned not later than 4 p.m. on Tuesday, the 27th January, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

WM. F. DEWEY,
Town Clerk.

Town Hall, Upper-street, N.
January, 1914. (1,159)

SOMERSET COUNTY COUNCIL. TENDERS FOR ROAD MATERIALS.

Tenders are invited for the Supply of Broken Granite or Basalt required for the Main Roads in the Long Ashton Rural District, delivered to the various Stations and Docks in the neighbourhood of Bristol during the year ending 31st March, 1915.

Forms of Tender and Specifications may be obtained from the undersigned, and they must be delivered at the County Surveyor's Office, Wells, endorsed "Tenders for Road Materials," not later than the 31st January, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

H. T. CHAPMAN,
County Surveyor.

County Surveyor's Office,
Wells, Somerset.
January 12, 1914. (1,147)

SOMERSET COUNTY COUNCIL. STEAM ROLLING.

Tenders are invited for Steam Rolling and Searifying required on Main Roads in the Long Ashton Rural District Council during the year ending 31st March, 1915.

Specifications and Form of Tender may be obtained from the undersigned, to whom Tenders, endorsed "Steam Rolling," must be delivered not later than 31st January, 1914.

The lowest or any Tender will not necessarily be accepted.

H. T. CHAPMAN,
County Surveyor.

County Surveyor's Office,
Wells, Somerset.
January 12, 1914. (1,146)

WORCESTERSHIRE COUNTY COUNCIL. MAIN ROADS.

TENDERS FOR MATERIALS.

The Highways and Bridges Committee are prepared to receive Tenders for the Supply of Granite delivered to Railway Stations and Canal Wharves in the County during the year ending 31st March, 1915.

Conditions of Contract and Forms of Tender can be obtained from the undersigned.

Tenders to be delivered at my Office not later than 31st January, 1914.

The Committee do not bind themselves to accept the lowest or any Tender.

(Signed) C. F. GETTINGS,
County Surveyor.

Shirehall, Worcester.
January 12, 1914. (1,149)

CITY OF BIRMINGHAM. COAL-GAS TAR.

The Public Works Committee are prepared to receive Tenders for the Supply of about 1,500 tons of Coal-gas Tar to be delivered during the coming Spring and Summer to various Corporation Depots within the City, by boat, rail, or road, as circumstances permit. Tenders may be given for the whole quantity of 1,500 tons, or any less quantity.

Specification and Form of Tender may be obtained at the Office of the undersigned, where Tenders, endorsed "Tenders for Tar," are to be delivered by Wednesday, the 28th instant.

The Corporation do not bind themselves to accept the lowest or any Tender.

HENRY E. STEIGOE, M.A.S.T.C.E.E.,
City Engineer and Surveyor.

The Council House,
Birmingham.
January 12, 1914. (1,148)

THE MALDEN AND COOMBE URBAN DISTRICT COUNCIL.

ADDITIONS TO SEWAGE DISPOSAL WORKS.

The Council invite Tenders for additions to the Sewage Disposal Works, comprising raising walls to existing Sedimentation Tanks, constructing Detritus Tanks, No. 5 Percolating Filters (80 ft. diameter), high and low level Humus Tanks, Ejector Chamber and Ejectors, Carriers, and Sludge Pipes, forming

Sludge Beds, preparing Storm-water Filtration Area, and other appurtenant works.

The Plans can be inspected, and copies of the General Conditions, Specification, Bill of Quantities, and Form of Tender obtained, after the 20th instant, on application to the Engineer and Surveyor (Mr. R. H. Jeffes, M.A.S.T.C.E.E.) at the Municipal Offices, New Malden, upon payment of a deposit of £3 3s., which shall be by cheque made payable to the Council.

The deposit will only be returned on receipt of a bona-fide Tender, and in the case of the accepted Tender the deposit will be retained until a contract and bond have been entered into with the Council, and in the event of a withdrawal such sum will be forfeited.

Sealed Tenders, in official envelopes, must be received by the undersigned not later than 4 p.m. on Monday, 2nd February, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

JAMES WM. JOHNSON,
Clerk of the Council.

Municipal Offices,
New Malden, Surrey.
January 12, 1914. (1,145)

COUNTY COUNCIL OF MIDDLESEX. TO QUARRY OWNERS, GRANITE MERCHANTS AND OTHERS.

Tenders are invited for the supply of about 12,000 tons (more or less) of 2-in. and 1½-in. Hand-broken Basalt for Road Construction, and 2,000 tons (more or less) of ½-in. Chippings, to be delivered free to various Stations in Middlesex.

Particulars, with Specification and Form of Tender, may be obtained at my offices after Monday, the 19th instant.

Tenders must be sent to the Clerk of the County Council, Middlesex Guildhall, Westminster, S.W., by 12 o'clock (noon) on Wednesday, the 4th day of February, 1914.

The lowest or any Tender will not necessarily be accepted.

H. T. WAKELAM,
County Engineer.

County Engineer's Office,
Middlesex Guildhall,
Westminster, S.W.
January 12, 1914. (1,152)

SEVENOAKS RURAL DISTRICT COUNCIL.

TENDER FOR MATERIALS. STEAM ROLLING, TEAM LABOUR, &c., IN CONNECTION WITH THE REPAIR OF HIGHWAYS.

YEAR ENDING 31st MARCH, 1915.

The Rural District Council of Sevenoaks invite Tenders for—

(1) The Supply of Chert, Flints and Ragstone on to the various Roads in the district. (2) The Supply of Granite, Quartz, &c., Basalt, or other approved Hardstone to various Stations in the district. (3) Steam Rolling. (4) Team Labour and Cartage. (5) Haulage from Stations and Quarries for the year ending 31st March, 1915.

Specifications, Conditions of Contract, Schedule of Quantities, with Form of Tender, may be obtained on application at my Office, or from Mr. R. Bailey, Sundridge, Sevenoaks, and Mr. J. Randerson, Leigh, Kent, Surveyors to the Council. Persons applying for Form should state which they require.

The Council do not bind themselves to accept the lowest or any Tender, and they reserve to themselves the right to accept such part of any Tender as they may deem proper.

Samples of Material to be delivered, carriage paid, at this Office, Sevenoaks, and sealed Tenders, marked "Tenders" on the outside of the envelope, to be returned with the conditions intact to me on or before Friday, the 30th day of January.

(By order of the Council)

F. H. VIBERT,
Clerk of the Council.

Bank Chambers,
82 High-street, Sevenoaks.
January 8, 1914. (1,136)

SCUNTHORPE (LINCOLNSHIRE) URBAN DISTRICT COUNCIL.
WATERWORKS EXTENSIONS.

Tenders are invited for the Sinking of a Pump Well, 12 ft. clear internal diameter by about 60 ft. deep, the driving of Adits, and the sinking of Boreholes.

Specification and Bill of Quantities, &c., may be obtained from the undersigned on payment of a deposit of £2 2s., which will be refunded on receipt of a *bona-fide* Tender made out on the form supplied, and accompanied by the Specification and Bill of Quantities.

Drawings may be seen at the Engineer's Office by appointment.

Sealed Tenders, endorsed "Tender for Well, Adits, &c.," must reach Mr. H. M. Hett, Clerk to the Council, High-street, Scunthorpe, on or before the 4th day of February next.

The Council do not bind themselves to accept the lowest or any Tender.

C. CURTIS GRAY,
 Engineer and Surveyor.

Council Offices,
 High-street,
 Scunthorpe, Lincs.
 January 10, 1914.

(1,139)

COUNTY BOROUGH OF GRIMSBY.
TEN-TON ROAD ROLLER, WITH SCARIFIER, FOR SALE.

The Corporation of Grimsby invite offers for a Steam Road Roller, with Morrison Scarifier (weighing, loaded, 13 tons 5 cwts.), made by Messrs. Aveling & Porter in 1900. The Roller is in excellent condition.

Further particulars, including dates when it may be seen working, and also opened out for inspection, may be obtained from the undersigned on receipt of an addressed foolscap envelope (unstamped).

Sealed Tenders, addressed to the Chairman of the Highways Committee, to be delivered at my Office not later than noon on Friday, January 30th instant.

H. GILBERT WHYATT, M.INST.C.E.,
 Borough Engineer and Surveyor.

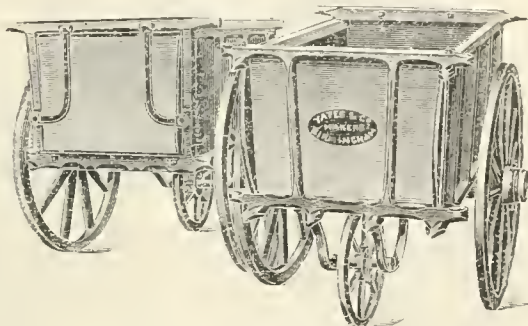
Municipal Buildings,
 170 Victoria-street,
 Grimsby.
 January 13, 1914.

(1,156)

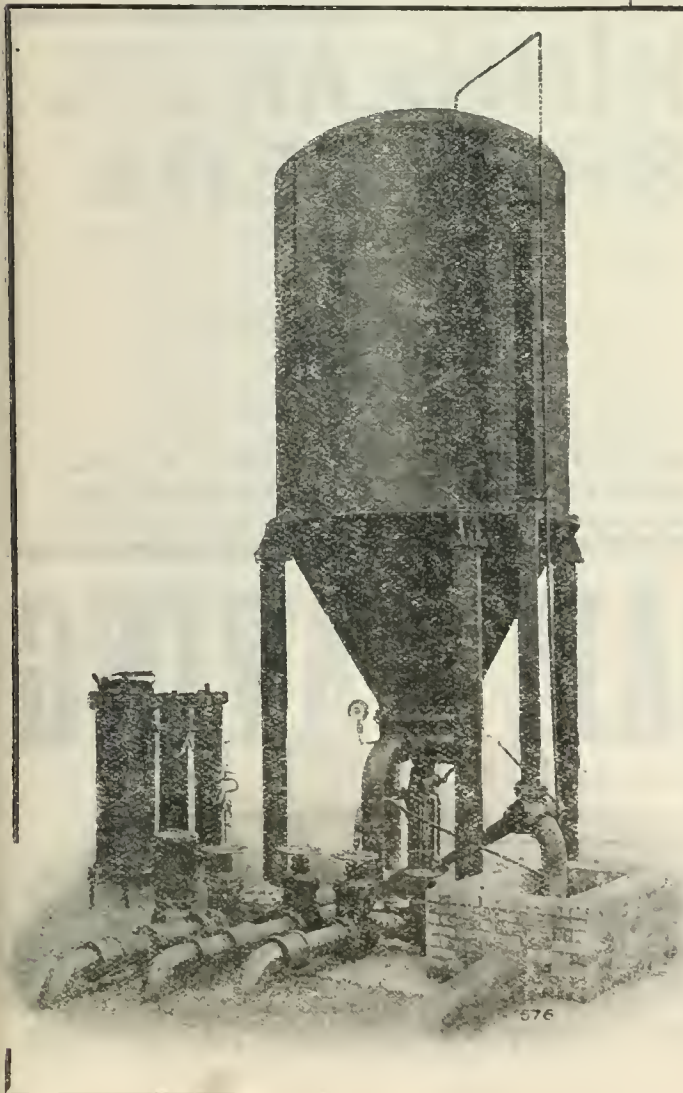
JOHN YATES & CO. Ltd.

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COUNTY BOROUGH OF GRIMSBY. TO CONTRACTORS.

The Corporation are prepared to receive Tenders for the supply of the following materials, in such quantities as may from time to time be required, between April 1st, 1914, and March 31st, 1915:

1. Chalk.
2. Whinstone or Columnar Basalt Macadam (100 tons per fortnight or 200 tons per month).
3. Slag (Lump, Macadam and Specimens, 500 tons per month).
4. Flags, Artificial.
5. Flags, Yorkshire.
6. Yorkshire Kerbs, &c.
7. Granite Setts, Kerbs and Channels.
8. Pitch.
9. Coal Gas Tar.
10. Lime.
11. Portland Cement (6 tons per month).
12. Drainage pipes, &c.
13. Miscellaneous Brushes.
14. Scavenging Brushes.
15. Drysalteries.
16. Lubricating Oils.
17. Oils (except Lubricating).
18. Paints.
19. Bottles and Corks.
20. Carbolic Acid.
21. Carbolic Oil.
22. Disinfectant Fluid.
23. Disinfectant Powder.
24. Formalin.
25. Formalin Tablets.
26. SO₂ Tubes.

Specifications, Forms of Tender (in duplicate), and all requisite information may be obtained at my Office. Applications to be accompanied by addressed foolscap unstamped envelopes (postcards will not be responded to).

Sealed Tenders, addressed to the Chairman of the Highways Committee, and endorsed "Tenders for Annual Supplies," must be delivered at the office of

the Town Clerk, 170 Victoria-street, Grimsby, not later than noon on Friday, January 30, 1914.

By order)

H. GILBERT WHYATT, M.INST.C.E.,
Borough Engineer and Surveyor.

Municipal Buildings,
170 Victoria-street,
Grimsby.

January 10, 1914.

(1,140)

CORPORATION OF NORTHAMPTON.

The Corporation invite Tenders for the Supply of the following materials for a period of twelve months ending March 31st, 1915:—

1. Broken Granite.
2. Granite Kerb, Setts, &c.
3. Artificial Stone Paving.
4. Stoneware Pipes, Gullies, &c.
5. Portland Cement and Lime.
6. Ironmongery, Wrought Iron, Steel, &c.
7. Tar-paving, Tar-macadam.
8. Blue Bricks, Local Lime, Gravel and Sand.
9. Brooms and Brushes.
10. Coal and Coke.
11. Iron Castings.
12. Timber.
13. Team Labour.

Specifications, Schedules and Forms of Tender may be obtained on application to Mr. Alfred Fidler, M.INST.C.E., Borough Engineer, on and after Monday, January 19th.

Sealed Tenders, endorsed "Yearly Contracts," addressed to the undersigned, to be delivered to this office on or before 12 o'clock noon on Saturday, the 14th February, 1914.

(Signed) HERBERT HANKINSON,

Town Clerk.

Guildhall,
Northampton.

January, 1914.

(1,142)



— CORPORATION CAR DEPOT, DERBY. —

KINNEAR PATENT STEEL ROLLING SHUTTERS

Are used very extensively throughout the United Kingdom, as well as Abroad, on

CAR DEPOTS
GENERATING STATIONS
BOILER HOUSES
MOTOR GARAGES
DUST DESTRUCTORS, &c.

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RADNOR WORKS, TWICKENHAM.

Manchester: 33 Arcade Chambers, St. Mary's Gate. Glasgow: 79 West Regent St.

TAR MACADAM PAVING

Telephone: No. 232 North.

Telephone: No. 49 Matlock.

Telephone: No. 35 Walsall.

Josiah Smart & Son.

Offices:—

53 VICTORIA ST., WESTMINSTER, LONDON, S.W.

Quarries and Works:—

MATLOCK, WALSALL, and KETTERING.

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

JANUARY 23, 1914.

No. 1,149.

Minutes of Proceedings.

The Nomenclature of Bituminous Substances.

In a letter contributed to our correspondence columns of last week, "Engineer" comments on certain passages in our reply to a letter from another correspondent, and it may be gathered from the general trend of his letter that he is opposed to interference with present usage as regards the terms "bitumen" and "asphalt." We need not repeat the arguments by which we have sought to show that it is necessary that some action should be taken in the matter, but we may point out that there is no class of persons who, as a class, consistently use these terms in the same way; and if an orderly and convenient use of the term is to be brought about it will be necessary to suppress certain uses of one or both words. Our correspondent states that he cannot see the object of departing from old-established definition and usage except for the purpose of gain. But this statement is based on the assumption that only one usage in the case of each word can be regarded as old-established. There is, on another point, some force in our correspondent's contention that the term "bitumen" has all along been understood to apply to a natural product. Unfortunately, the term "bituminous" has not been so restricted. Again, although, to a considerable extent, natural bitumen and natural asphalt have been considered identical as regards their most important constituent, we cannot practically develop this idea, since there would not then be enough words to go round. A prime difficulty in the way of a satisfactory solution of the problem lies in the fact that while the term "asphalt" is usually applied—in this country at any rate—to materials containing certain natural products, the term "bitumen" is, it seems, that which is going to give us the adjective. At the same time the adjective "asphaltic" is sometimes used in referring, for instance, to a petroleum with an asphaltic base. Probably the most promising line of attack is first to decide what meanings are to be given to the words "tar" and "pitch," and afterwards to allot to "bitumen" and "asphalt" each its proper sphere of application. This course, we understand, is being taken by the sub-committee on bituminous materials appointed by the Engineering Standards Committee which is dealing with the subject of road materials. The proceedings of the sub-committee are conducted in private, and it is not permissible therefore to suggest what arguments were adduced by individual members of the sub-committee for or against certain decisions; but the provisional conclusions to which the committee has come are, we believe, substantially as follows:—

It is proposed, in the first place, to divide the materials into two groups, containing respectively

bitumens, and coal tar and pitches. Materials of a hydro-carbon base used as road binders are to be known as bituminous substances, which settles the choice of a word for the general adjective. This definition covers oils of all kinds, and it may be pointed out that possible developments may lead to the use of non-bituminous hydro-carbons as road binders, materials of a sugary nature having been already so employed—at any rate experimentally. This difficulty could perhaps be met by introducing the words "insoluble in water" after "hydro-carbon base." The distinction between tar and pitch is to be made by defining tar (provisionally) as the condensate at ordinary temperatures (freed from water) from the volatile products of the "destructive" distillation of hydro-carbon matter, and a prefix must indicate the nature or source of the hydro-carbon matter, as coal tar, oil tar, wood tar. Pitch will be defined as the residue from the partial evaporation of tar, and possessing a viscosity of not less than some standard to be defined later. The definition for tar seems to accord with ordinary usage, since the term is usually understood to imply that the material has an origin such as those mentioned. As regards pitch, it may be assumed that the viscosity to be defined later will be such as will give us materials solid at ordinary temperatures, since it would be an advantage to retain the meaning usually given to the word "pitch," which is, in popular language at any rate, always a solid at ordinary air temperatures. It might be necessary, however, to adopt some other measure of viscosity which would imply that the material is quite soft at a defined temperature. It may be suggested that if such definitions as these meet with acceptance, it would be desirable that our American friends should agree to use the term "petroleum-tar" and "petroleum-pitch," or perhaps "petroleum-bitumen," giving up the use of the word "asphalt" in describing products derived from petroleum. It can also be pointed out that those persons who are specially interested in the use of the terms "bitumen" and "asphalt" should feel themselves called upon to give opinions as to the employment of the terms "tar" and "pitch," for, as we have pointed out, there are hardly enough words to go round, and the use that can be made of the former pair of words depends upon the range of the latter pair. We are inclined to suggest that such pure or nearly pure natural products as are known sometimes as "asphalt," and sometimes as "bitumen," should be called "asphalt-pitch," and so be distinguished from rock asphalt. The terms "pitch-mastic," "tar-mastic," and "asphalt-mastic" might be employed to describe artificial mixtures of bitumens with mineral matter, such as are used for road carpets.

The danger of symptoms of lead poisoning appearing as a result of consuming water which has a plumbo solvent action is one to which water engineers are fully alive, but it is happily a rare occurrence for an epidemic of a serious character to be directly attributable to this cause. Dr. Frank Seymour's report to the Local Government Board on an outbreak of lead poisoning in the urban district of Guisborough, and its relation to the public water supply is therefore of special interest. It appears that in May, June and July of last year no fewer than seventy-seven cases of known or suspected lead poisoning were treated by the medical officer of health in the course of his private practice, and on reporting this fact to the Local Government Board, Dr. Seymour was sent down with a view to investigating the cause of the outbreak. By a process of elimination he was led to the conclusion that no supposition other than the action of an agency such as the drinking water common to the whole community would meet the case. In investigating the matter some difficulty was caused by the varying results of analyses made at different periods of the year. Part of the water is obtained from a gathering ground of open peaty moorland, and part from springs, and Dr. Seymour points out that variations in acidity and in plumbo-solvency are to be expected in such a water on account of variations in the amount of rainfall which occurred in the period preceding the time of analysis.

It is well known that in gathering grounds of this nature the first flow of the feeders after a drought is markedly acid in reaction, and has considerable plumbo-solvent properties, whereas at the end of a dry period such water as remains flowing in feeders is often free from these characteristics. Since 1912 the water at Guisborough has been subjected to lime treatment with a view to counteracting its plumbo-solvent activity, and although this must have had a considerable effect in reducing acidity, it is a curious fact that more cases of lead poisoning have been discovered in the town since that date than occurred during the preceding years. This is attributed to the erosive ability of the water in regard to lead, a property which requires particular consideration in a place like Guisborough, where great lengths of lead pipe are commonly found. Dr. Seymour accordingly concludes his report with a recommendation that the water company should employ a competent analyst for a period sufficient to enable him to devise and carry out a series of differential experiments. These should be made in reference both to plumbo-solvency and to plumbo-erosive ability, and extend over some considerable time, so that the nature of the water at different seasons of the year, in storm and in drought, may be fully investigated. Laboratory experiments on different methods of treating the water should be carried out, so that not only the widest possible variations, but also the best possible treatment of this particular water may be fully ascertained.

The Policy of Waste.

The Anglo-Saxon race has been described as the most wasteful on earth, and, though other qualities may mitigate the evil, it must be admitted that there is considerable truth in the accusation. In engineering matters the waste occurs partly through ignorance and stupidity, but largely owing to the essentially English method of ignoring obvious facts and the teachings and warnings of authorities, and muddling through to ultimate success, with the dogged perseverance and obstinacy characteristic of the race. This method of procedure, absorbing as it does a vast amount of energy and causing immense waste of money, is exemplified in the large amount of engineering work which is carried out by local authorities without proper advice. The comparatively small sum of money saved upon the

salary of the district surveyor or engineer is wasted many times over owing to the extravagant and sometimes useless works carried out. When after many years of muddling a competent engineer is appointed to look into matters, the local authority is at last forced to recognise its folly, and by the incontrovertible evidence and reasoning of the engineer, backed by the pressure of the Local Government Board, is made to set things in order at last.

The paper read by Mr. H. J. Coleby at the West Midland District meeting of the Municipal and County Engineers on Thursday the 15th inst., appears to contain a record of money spent to small advantage. We do not pretend to any knowledge of the case beyond the author's statements. It may be that bad luck, which occasionally attends the work of the best engineers, may account largely for the trouble, or it may be that Mr. Coleby is in the position of many other engineers who have to take up and make the best of works which have been muddled, having been carried out practically on the unaided advice of a number of un instructed persons. The failure of a large well, the corrosion of mains, the failure of bituminous coating on pipes, an ill-planned system of mains full of elementary mistakes as to arrangement, sizes and levels, are recorded in a very interesting paper. These are, at any rate, typical of the work carried out at the present time by a large number of district councils who are permitted to waste money which could be entirely saved by the employment of a properly paid engineer.

An Interesting Competition.

As we pointed out last week, in commenting upon the memorandum recently issued by the County Councils Association, there can be no doubt that the rural housing question is distinctly in the air at the present time. The present deplorable conditions have led to more than one scheme being propounded for building cottages on a large scale, and some anxiety is now felt in many quarters lest the countryside should be disfigured by rows of ugly cottages built to a stereotyped design. "It would be a national tragedy," said Lord Curzon of Kedleston some time ago, "if, in the building or rebuilding of labourers' cottages, that is likely to follow any systematic attempt made by the Legislature to improve the conditions of agricultural life, these old buildings were to be replaced by a new type of standardised cottage, dumped down either singly or, still worse, in rows like a lot of hand-boxes, or canisters, or dog-kennels, or whatever may be the parallel suggested by the precise degree of monotony and monstrosity presented in their construction. It is doubtful whether the labourer would be more comfortable—he certainly would not be happier—and a cruel injury would be done to the beauty of the countryside. The best way to prevent such a catastrophe seems to me to lie in the preparation of plans, sketches and models of cottages of different materials and styles, suitable to differences of locality, climate and surroundings, which could be erected at moderate prices. Such a work, abundantly illustrated and accompanied by careful estimates, might be an invaluable guide to landed proprietors, building societies, syndicates, county or district councils, and even to Government departments in the near future."

In order to carry out this suggestion the proprietors of *Country Life* have organised a National Competition, the practical value of which will be considerably enhanced by reason of the fact that a number of landowners have agreed to build a pair of cottages to the prize-winning design in each of the districts into which the competition is divided. The jury of assessors which has been appointed will command full confidence, and many valuable prizes are offered. It is hoped that the architectural profession will prove their ability to produce designs

combining skilful planning, pleasing exteriors, and rigid economy. It is only by solving the difficult problem in this way that the threatened defacement of rural England can be avoided.

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The Design of Signposts: The Road Congress Awards.

In our issue of last week we described the designs for road direction posts, or signposts as they are usually called, which have been placed first, second and third in the competition in connection with the Third Road Congress. It will be noticed that the three designs have several features in common, the point of chief practical importance being the way in which the arms are fitted to the post. In this respect the simplicity and robustness of Mr. Sinnott's design is a very good feature, and we congratulate the county surveyor of Gloucester on his success in satisfying the judges on this and other points. The main features of his design are such as could be utilised with arms of a different pattern, and it is probable that few surveyors will accept the proposal to use stamped steel plates for the lettering. It would, we think, be better to use squares of a very hard wood, or of cast iron, with the letters painted on a flat surface. There would be no difficulty in fitting a plain wooden arm with a metal boss which would fit into the socket of Mr. Sinnott's adjustable collar. The British committee which reported to the congress on the subject of signposts recommended the use of wooden arms, and we endorsed this recommendation in our issue of October 31st.* If raised letters are, as we believe, inferior in visibility to letters painted on a flat surface, the cost of repainting is not a matter that should decide the choice. As regards the precise form of the upper part of Mr. Sinnott's post, the reason for the adoption of the beadings is not apparent, for a simple octagonal section would seem to fulfil all the requirements, and it would be easier to make the collars which have to be slid on to it. The principle is excellent, however, since an octagon would almost always provide a side facing nearly enough in the required direction, and the device provides, in a very practical manner, the advantage of having a post which can be fixed without reference to the directions in which its arms will point. It may be suggested that Messrs. W. & F. Wills' signpost has the disadvantage that the arms cannot readily be removed for alteration or renewal, while the attachments devised by Messrs. W. Weeks & Son are not so simple and are less rigid than that of Mr. Sinnott.

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Lettering and Legibility.

Of the three designs, that of Messrs. Wills appears to us to be the best in one respect, the arms being without bordering, while that of Messrs. Weeks may be commended for the introduction of the name of the place near or in which the post stands. This should not, however, we suggest, be shown on the arm itself, but in some other position, preferably on the top of the post, and in any case with the lettering horizontal. Within a mile of the border of a county the name of the county might be used instead of the name of the place: but not elsewhere, as it is a vital error to introduce symbols or words which may intercept the glance of the traveller. As regards the lettering, there is no advantage whatever in specifying the size of the letters. Two principles should be followed - first, the best shape and thickness for each size of letter should be found by actual tests of their visibility. Some relation of height to depth will give the best visibility for each thickness, and these being found, the letter which is actually the best of a given width will be ascertained by a further test, the width being the dimension deciding the size for a given word in a given space. Next, a further set of tests will disclose what spacing in a given length, and therefore what size of letter,

gives the best results. If larger letters are adopted the word will be less visible, because the letters will be too close together, and if smaller letters are used the word will be less visible for that reason. The usual error is to make the letters too large, visibility being reduced not only by crowding, but also by lack of margin. In many cases the word begins too near the post, where, even when the arms are not at the same level, it may be obscured by another arm. In this respect Mr. Sinnott's design is the best of the three. These principles should be followed, and no attempt made to specify the size of the letters, except that for each length of the word there will be a suitable size fixed, in the case of very short words, by the amount of margin above and below the word which is found to give the best results. In the case of longer words these margins will be ample, and the length assigned will be fixed by the end margins.

* * *

The Beverley Council's Defiance.

By nine votes to eight the Beverley Rural District Council have determined to ignore the order of the Local Government Board to provide an adequate drainage scheme for Elloughton within the space of eighteen months. In other words, the council have resolved openly to defy the board. In vindication of this attitude a councillor pointed triumphantly to the death-rate of Elloughton, which he stated was only six per 1,000. As a mere figure this may appear rosy enough, but translated into the vocabulary of zymotics it may be quite bad enough to demand the serious attention of the health authority. The important point to consider, however, is not so much mortality statistics as the fitness of the local sanitary conditions to ensure as far as this is humanly possible the public health from the danger of preventable disease. In this respect it is notorious that the district is grievously in default. The officer who inspected the locality was an independent expert, and according to his judgment a scheme of sanitation in Elloughton is necessary and urgent. Thus the majority of the Beverley Rural Council are sinning against the light by setting themselves in direct opposition to the advice of the Local Government Board. The chairman, Mr. John Jackson, pleaded vainly with them to pursue a reasonable policy, and pointed out that the only possible result of their obstinacy would be that the council would incur an additional expense of £600 or more if someone else did the work. Even this did not move them, and the vote resulted as stated. Whether the council will persist in this course to the end remains to be seen. If they do we fear they will have a rude awakening, and realise when too late that it is hard to kick against the pricks.

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London Traffic.

A close study of London traffic problems discloses the fact that while the principles upon which these problems must be attacked can be discovered, and are fully applicable, they are so obscured by compromises and apparent paradoxes that a study of London's traffic problems is of less general interest outside the metropolitan area than are technical studies relating to municipal work. In other areas demand and supply in traffic matters are usually more or less balanced; but in London the demand for facilities seems inexhaustible, and when passenger-carrying enterprises suffer reduction of their profits the public gains in convenience and comfort. The Sixth Report of the London Traffic Branch of the Board of Trade, which has just been issued, contains, therefore, much that is of interest to engineers familiar with the Metropolis, but little that need be studied by other engineers and surveyors, and, in the review of this report, which will be found on another page, we have confined our attention to a few leading points.

* See pp. 658 and 684.

London Traffic.

SIXTH REPORT OF THE LONDON TRAFFIC BRANCH OF THE BOARD OF TRADE.

The reports of the London Traffic Branch of the Board of Trade are of much interest to Metropolitan borough engineers, who find in these documents more or less authoritative pronouncements on matters affecting the maintenance of streets, and suggestive of policy as regards street widening, or the construction of new thoroughfares, and the sixth report, which has recently been issued, demands careful consideration. Even the statistics of street accidents, though primarily a matter to be studied by the police authorities, have a bearing upon the work of highway engineers, on whom falls the responsibility for the adaptation of the roads to the requirements of tramway and motor omnibus traffic. As regards the nature of the streets which are classed among the sixteen worst thoroughfares with respect to fatal accidents, nothing can be gathered from a study of their features unless we apply the necessary corrective factors for length, some of these thoroughfares being much longer than others. It has been suggested that the fact that all but three of these roads are tramway routes is "extremely significant," and it is certainly worthy of note that neither Fulham-road nor King's-road is included in the list of roads the accidents in each of which have caused from four to nine deaths. The number of journeys per head of population has increased since 1903 from 145 to 244; and, taking into consideration the passengers carried by local railways, the number of journeys per head taken by road has about doubled. The population has also increased by about one-tenth, so that the proportion of accidents may be considered to be about the same, although the actual number has about doubled.

MOTOR OMNIBUS ACCIDENTS.

The large number of deaths caused by motor omnibuses is, however, a very serious matter. The proportion of fatal accidents per 1,000,000 miles-run was 2.14, against 0.42 for tramcars; or for omnibuses 0.339 per 1,000,000 passengers, against 0.046 per 1,000,000 passengers carried by tramcars. It is quite likely that the latter vehicles were mainly responsible for some of the deaths directly caused by motor omnibuses; but, however they arise, the number of these fatal accidents is too high. The adoption of the rear-wheel guard will, however, considerably reduce the number of fatal accidents, and a front-wheel guard will no doubt be devised. The motor omnibus is responsible for a large number of accidents where traffic is "considerable," "congested," or "very congested," but where the traffic is "medium or light" it compares "most favourably" with other vehicles. Commenting on this the *Engineer* remarks: "Clearly, therefore, if there be room for it to avoid foot passengers it does so; whereas light motor cars, which, if carefully driven, should be much more easily managed than motor omnibuses, account for very nearly half the fatalities that occur where light or medium traffic prevails, and in uncontrolled streets are the most dangerous of vehicles." It may be pointed out, however, that a speed which is safe under some circumstances for a motor omnibus is much too high for some kinds of motor cars under the same circumstances; the reason being that with the latter vehicles the proportion of braked weight to total weight is much smaller than it is with the motor omnibus. Defective as it is in some respects, the motor omnibus is in other respects a much handier vehicle than some of the large private motor cars which use the main roads of London.

CENTRE STANDARDS.

Centre standards are condemned in the report, except in so far as they act as refuges. "Usually, however, there is so little space between them that they become practically one continuous refuge, and as such, in the majority of streets in which they exist, are redundant, and so unnecessarily obstructive. In combination with the failure of slow-moving vehicles to keep to the kerb they form a grave obstruction, and indirectly a danger, in that they induce faster vehicles in overtaking those moving less rapidly to pass either the vehicle or the standard on the wrong side." It is clear that the relatively close spacing is a factor of importance, and the sentence quoted

does not necessarily express a view at variance with our own—namely, that in streets of a certain character refuges properly shaped and spaced at considerable distances apart serve to steady the two streams of traffic, while allowing of a reasonable latitude in the use of the other half of the road. On streets of a different character any kind of central obstruction is a disadvantage, and on semi-urban and country roads they are highly objectionable.

BREAKING UP STREETS.

The right to break up the roads and streets of London is vested in some forty to fifty authorities and companies, and in some individual streets the number of such authorities is considerable. The report recommends that the Commissioner of Police should be consulted as to the breaking up of streets, and that work should be carried on by night as well as by day. It is difficult to see how the Commissioner of Police could expedite matters, and if suitable pains and penalties could be enforced in cases of delay or of needless obstruction, the only person able to weigh the facts would be the borough engineer or highway surveyor. To place matters in the hands of non-technical officials would result, on the one hand, in the acceptance of ingenious but unfounded excuses for delay, and, on the other hand, in a failure to see the importance of real difficulties and consequent friction.

OTHER POINTS.

It is worth noting that in 1913 88 per cent of the trade vehicles in London were horse-drawn, and it is therefore necessary to continue to pay attention to all those features of street paving which have been developed during the last twenty years.

As regards the widening of streets and the creation of new ones, the report is in favour of the latter policy. The widening of a street is always costly, the premises fronting it being much more valuable than the average of the properties of which they form a part, while during the whole of the period occupied by widening traffic is obstructed and business interfered with. In this connection it may be suggested that before any important roads are planned careful consideration should be given to the advantages as regards first cost and future serviceableness which are offered by roads so designed that they shall not be streets. This principle, as applied to by-pass roads, was put forward in an article by Mr. Reginald Ryves, M.CONS.E., which appeared in one of our issues of last year.

Surveyors' Institution.—At a meeting of the Surveyors' Institution to be held on Monday evening next at Great George-street, Mr. George Corderoy, member of the council, will read a paper entitled "Measuring and Quantity Surveying." The chair will be taken at eight o'clock.

Snow Removal in a Canadian City.—In Toronto during the past year the length of sidewalks from which the snow was cleared opposite vacant properties, and for which the owners were charged, was no less than 446 miles. An idea of the extent of other civic works carried out there during the same period—under the direction of Mr. Harris, the Toronto Works Commissioner—is gathered from the fact that over 23 miles of sewers, 54 miles of pavements, and 68 miles of sidewalks were constructed. Five miles of macadamised roadways were resurfaced.

Oaklands' Enterprise.—Direct evidence of the new spirit of enterprise on the Pacific Coast is to be found in the large civic undertakings in which the city of Oaklands, on the east shore of San Francisco Bay, is engaged, including the initial expenditure of £500,000 on the construction of a quay wall along its inner harbour, to be equipped with modern warehouses, electric cranes, and a belt railway; the reclamation of over 400 acres of submerged lands which are to be made available under municipal control for factory and warehouse sites; the erection of a new city hall to cost £300,000, and the elaboration of an extensive system of parks, boulevards, and public recreation grounds. The city is also spending £600,000 in the extension of its educational facilities, and the building of a municipal auditorium and convention hall.—From the *Times* "Pacific Coast Number."

Institution of Municipal and County Engineers.

WEST MIDLAND DISTRICT MEETING AT BIRMINGHAM.

The Institution of Municipal and County Engineers held a district meeting in the Council House, Birmingham, on Thursday afternoon, the 15th inst., the business including the consideration of a paper, "Water Supply in the Atherstone Rural District," prepared by Mr. H. J. Coleby, the engineer and surveyor to the local authority. The contribution in question, we may remind our readers, appeared in last week's issue of *THE SURVEYOR*.

Mr. A. T. Davis (Shrewsbury), county surveyor of Shropshire, presided, and there were present Messrs. H. E. Stilgoe (Birmingham), C. F. Gettings (Worcester), H. J. Coleby (Atherstone), G. W. Lacey (Oswestry), W. Plant (Stafford), W. B. Chancellor (Lichfield), W. H. Jukes (Tipton), A. S. Parsons (Birmingham), H. M. Lawson (Birmingham), R. Fletcher (Worcester), T. Stanford Griffin (Wolverhampton), J. D. Barrs (Bromyard), E. H. Crump (Hinckley), T. H. Eayrs (Birmingham), J. S. King (Birmingham), J. T. Fitch (Birmingham), J. A. Burnett (Nuneaton), R. C. Moon (Nuneaton), E. B. Savage (Birmingham), F. C. Cook (Nuneaton, hon. district secretary), H. J. Clarson (Tamworth), E. J. Goodacre (Nuneaton) and A. J. Dickinson (Redditch). The visitors attending the meeting were Messrs. T. H. Jones (Nuneaton) and T. V. Oliver (Tamworth).

Letters of apology were received from Messrs. S. Douglas (Kenilworth), J. Green (Wolverhampton), E. Hallway (Evesham), A. E. Newey (Foleshill) and W. Ranson (Worcester).

A letter was read from Mr. H. H. Richardson thanking the members of the district for the present of a silver salver made to him on the occasion of his wedding. His wife and himself very much appreciated the gift, but still more did he value it as proof of the fraternal feeling of the members.

THE JOURNAL.

Mr. COOK read letter from Mr. D. Edwards, hon. secretary of the South-Western District, forwarding the following resolution passed at a meeting of the South-Western District of the institution at Paignton: "That this meeting of the Institution of Municipal and County Engineers request the council of the institution to take a postcard poll of all the members of the institution asking them whether they are in favour of retaining the annual volume or not."

The CHAIRMAN said he would like to hear the views of the meeting on this resolution. The South-Western District wanted them to join in petitioning the council with regard to the change from the annual volume to the monthly journal. They had had the journal now for some months, and were in a better position to decide individually which they liked best. He thought in a matter such as this they should sink their individual opinion, and try to ascertain what was best for the institution. He might say that when the change was made he did not like it, and was sorry about the proposal to abolish the annual volume; but he was getting used to the change.

Mr. R. FLETCHER (Worcester) asked why the council did away with the annual volume. He did not understand why the change was made.

The CHAIRMAN took it that the change was made because it was thought it would be in the best interests of the institution that they should have earlier information of the proceedings of the institution. Of course, he was quite aware that they got that information through the various technical publications. He was not a member of the council at the time the change was made.

Mr. H. E. STILGOE (Birmingham) said it was thought by a good many members that the publication of the volume came too late to be of great interest to the members.

Mr. G. W. LACEY (Oswestry) said he was one of those who at the annual meeting at Yarmouth took some objection to the change. Innovation always gave rise to criticism, and one hardly liked to leave the beaten track. He did not think there was a great deal in the fact that they got the papers and discussions earlier, because they had the papers in the technical press, and the bulk of the discussions upon them. He felt himself that there were some advantages in the new arrangement, and seeing also that it had received the sanction of a general meeting, he did not feel disposed to invite the council to take a

poll of the members at this stage. He did not think it was so vital a matter that it was necessary to go behind the council at that meeting. If at the end of twelve months they were not satisfied, then was the time to raise it. His views had not changed since the annual meeting at Yarmouth in that one preferred to get the volume as before, but he thought the change was not so vital that they need make a fuss about it.

The CHAIRMAN: Shall we let the matter rest for twelve months, and send an acknowledgment to this letter intimating that the members of this district are not in favour of asking the council to take a poll on this point at present?

On the proposition of Mr. W. B. CHANCELLOR (Lichfield), seconded by Mr. W. H. JUKES (Tipton), this course was adopted.

WATER SUPPLY IN THE ATHERSTONE RURAL DISTRICT.

In submitting his paper on this subject, Mr. COLEBY added that he had brought with him a section of the borehole. Further it occurred to him that some of the members might be interested in the housing question, and he had brought the plan of ten cottages which his council had just finished in Atherstone. The cost was £148 per house, and they were let at 5s. per week.

Mr. H. J. CLARSON (Tamworth) proposed a vote of thanks to Mr. Coleby for his paper. With regard to the Candy filters, so far as he could judge they had been a great success. They got part of their water from Kingsbury, and in that parish they had more than 30 miles of mains to serve a population of less than 5,000. As Mr. Coleby said, they got a precipitation of iron oxide in the pipes, and although the water was as pure as it possibly could be, and there were no ill effects from drinking it, yet the people were loth to use it because of its discoloration. They went to Buxton and other places and saw different types of filters. Ultimately they decided to ask the colliery company to adopt the Candy filter. The filters had been down a little over twelve months, and so far they had done the duty expected of them. They could not speak too highly of them.

Mr. E. B. SAVAGE (Birmingham) asked Mr. Coleby to give them the degree of hardness, as the question was a very interesting one to Birmingham at the present time. One of the principal points Mr. Coleby put for discussion was whether, in designing a scheme for a country district, it was good policy to provide for mains reaching to every part of every parish for supplying a few scattered houses, where there was already, or where there could be obtained, a good supply from wells on the premises. That put him rather in mind of a sewer which was put in some thirty years ago to drain one farmhouse. That farmhouse belonged to the chairman of the council. So he thought a good deal depended on who lived in the houses and whom they belonged to. Still, he would have thought, taking it all round, that the wells in country districts, if sunk to a proper depth, should be a sufficiently good supply. Mr. Coleby asked whether any member had used Prentice's hydrant flow gauge for testing the capacity of the fire hydrants in his district. He had no experience of that particular gauge, but in Birmingham they used a good many meters, in fact, all the water they used for street watering and flushing purposes was passed through a meter. It was on the turbine principle, and as far as he knew they worked very satisfactorily. The only point was whether the water passing through the gauge, in the case of a fire hydrant would not take off the pressure; but he hardly thought it would, as they were on the turbine principle. Mr. Coleby also asked as to any experience in the use of an air lift. The only place he knew in Birmingham where an air lift was in use was Saltley. So far as he could see it was very simple and very effective.

Mr. W. B. CHANCELLOR (Lichfield) said with regard to providing water mains for scattered houses, if wells were sunk sufficiently deep they ought to be quite satisfactory. The great difficulty in rural districts was with regard to the treatment of sewage. There was always the danger of pollution taking place, particularly when people lived in cottages. Then as to

the prevention of fires, his experience was that in most country parishes they had no means of making use of a fire hydrant. He did not know whether Mr. Coleby had considered the question of providing a good house reel, and instructing a man how to use it. Sometimes it would prevent a good deal of damage.

Mr. J. S. KING (Birmingham) said the cost of carrying the mains to scattered houses in a rural district would be the principal item; but when they got a house with a pigstye at the rear and well close by not properly protected, it was very likely there would be pollution. As the medical officers in rural districts were now equally active as in the towns, it would be as well, where they could possibly do so, to provide mains and supply water. As to fire, a small hose cart was very good if they had a supply of water, but without the pressure it would not be any good at all. At Worcester they had an air lift working on the sewage disposal works.

Mr. A. S. PARSONS (Birmingham) said he noticed that it was proposed to line the 20-in. borehole with lining tubes of 18 in. If it was proposed in that way to blanket the sand, it would be well to get the lining as tight as possible, or otherwise he would get a good deal of sand into the pumps. The lining was to start at a depth of 160 ft., where the friable bed began. As to air-lift plants, Mr. Savage was not correct in saying there was only one in Birmingham. He had put in two himself, and he should say there were a dozen others. An air-lift plant was an uneconomical way of raising water. The maximum efficiency was from 30 to 35 per cent. It seemed to him that 10,000 gallons an hour was a low yield for a borehole of this diameter, and he doubted very much if they would get a great deal more out of it as it took twenty-four hours to regain the saturation level. It indicated that the rock round the well was hard, and offered obstruction to the free flow of water.

Mr. F. C. COOK (Nuneaton) said the whole of the water supply at Nuneaton was obtained from wells sunk in the Permian formation, which had not been regarded as rich in water. They had a very curious experience of what Mr. Coleby called the capricious character of the yield of the water-bearing rocks of this description. Their first well was taken down to a depth of over 600 ft., but it was yielding to-day only 80,000 gallons. That had been the maximum yield, but a well sunk in the same measures, nearer the outcrop, to a depth of 320 ft., was yielding from 600,000 to 700,000 gallons. One curious point in connection with the water from these two wells was that at the deep well they were not troubled with the oxide of iron; yet they got oxide of iron in a considerable degree in the second and shallower well. This oxide of iron was dealt with by sand filters put down twelve or fifteen years ago, and they had very little evidence of the deleterious effect on the coating of the pipes. One point Mr. Coleby mentioned was the small difference in level between the two service reservoirs. That should be taken as a curious instance of optimism in the original calculations for the scheme. In his mind it was absurd; it was a waste of money to extend mains to rural districts where the population was small unless there was a very obvious reason for the extension of those mains. He took it from the paper that the mains had been extended because there was a house here and there. That seemed to be the very reverse of economical administration, and it was rather surprising to hear of its being done.

Mr. W. PLANT (Stafford) said Mr. Coleby had given them records of failures which were more interesting than successes. He would like to ask Mr. Coleby whether he got many complaints as to "dead ends," as he must have a large number of them. He had a few dead ends, and was constantly getting complaints. As regarded the supply of the whole of the houses in scattered districts, assuming they had already got a supply of well water, he should say it was not desirable to extend under such conditions. The paragraph with reference to the connecting main between two service reservoirs was very interesting. It occurred to him whether it would not be useful to keep the main constantly charged to prevent it getting air-locked. He was rather surprised to hear that any local authorities were in the habit of laying 2-in. mains. It left very little room for incrustation, and in the case of fire was almost useless. He wished to know whether the tube to be inserted in the new borehole would be perforated.

Mr. T. S. GRIFFIN (Wolverhampton), speaking of the water supply of farmhouses in country districts, said in the district where he was prior to taking up his present position, they had three water schemes,

but there was a good deal of the district to which it was impossible to take the water under pressure, except at considerable expense. They had to supply a small hamlet of twenty-two houses, for which there was not a good well. A borehole was sunk about 350 ft., a pump was fixed there, and a good supply obtained for the houses. The nearest main to those houses was $3\frac{1}{2}$ miles away. Mr. Coleby had mentioned that the water had attacked the mains in his district and caused trouble, but in a case like that he had spoken of, where they would have to carry the water a long distance, and allow it to lie in the mains, it would cause even greater trouble. Then in the case of a school which was $3\frac{1}{2}$ miles away from the main, a borehole was sunk, and plenty of water was obtained. He could also tell Mr. Coleby of a very successful air-lift plant at Wolverhampton. It was installed at a dairy.

Mr. R. FLETCHER (Wolverhampton) said Mr. Coleby told them that a colliery company supplied him with water in bulk at a cost of 6d. per 1,000 gallons. Would he tell them the cost per 1,000 gallons of the water which he pumped, so that they might have an idea how it compared with the cost of the water he bought in bulk?

Mr. E. J. GOODACRE (Nuneaton) asked the relative positions of the wells in No. 1 and 2 area, considering the success of the one and the failure of the other.

Mr. J. D. BARRS (Bronyard) asked Mr. Coleby how he explained the faults in distribution systems. He said: "In one part of the district a service reservoir is supplied from another reservoir about $1\frac{1}{2}$ miles distant, with only a small difference in level. The main connecting the two reservoirs was laid to follow the contour of the ground, and although it first comes below the hydraulic gradient, considerable trouble is experienced from air-locking at the highest points. The author has reason to believe that when this main was designed the head taken for discharge was that due to difference between top-water level in the upper reservoir and floor level in the lower reservoir. The result is that if the water level in the upper reservoir falls, and the lower reservoir is nearly full, the head is so reduced that the main only discharges about 50 per cent of the amount for which it is designed, while the high points in the main rise above the hydraulic gradient, and the air-locking eventually becomes bad enough to almost stop the flow." He could not see how that was compatible. Then with regard to the elongated air bubbles in the main. He had experienced the same difficulty, and he had got over it by placing a valve on the highest point of the distributing main.

Mr. G. W. LACEY (Oswestry) commented on the very small difference in specific gravity which Mr. Coleby found had an appreciable effect on the working of his oil engine. Motor engines were used with all sorts of specific gravity oils, ranging from 7.2 up to 8.1. One was rather surprised that even such a small range as .005 should have that effect. Still, if Mr. Coleby had proved it, there was nothing like proof. With regard to this question of air locking, some five years ago he laid a main for a subsidiary supply with only 10 degrees of fall between the intake and the delivery. Although he went down 8 ft. or 9 ft. in the lowest point, he was bound to keep the main about 2 ft. above the hydraulic gradient. Notwithstanding that he had difficulty in starting the main with air locks, and a very long time was taken to suppress all the air from the highest points. Even with pretty good-sized air valves the air leaked back, and moved very slowly where they had a main discharging under a low head. The main was from the Liverpool Corporation's aqueduct joined up to the Oswestry service reservoir, the difference of height being the level of water in the Liverpool aqueduct and the height of the water in their own reservoir. It was a combined main of three diameters, and making the calculation for the combined main with the difference in head the delivery was ascertainable. The effect of the delivery through that main was not quite in accordance with that. They got during the period of maximum draught a delivery considerably over what they calculated to be the delivery on the hydraulic gradient between the two reservoirs as a combined main. When he designed the main Mr. Parry, the engineer of the Liverpool works, said to him: "I am afraid you have got it too small; if I had put it in it would be a 10-in. main throughout." They did not want to put it in that size, because they only wanted to use it, perhaps, once in five years. It was interesting to know that they had been getting a larger supply than they expected. He believed the Prentice hydrant flow gauge

was a reliable means of gauging pressure in the mains. When a flow took place it was the only way of ascertaining what pressure they had in their mains under working conditions.

Mr. T. W. EAYRS (Birmingham) said Mr. Coleby told them it remained to be seen whether the destructive action on the bituminous coating of the mains would cease now that the iron had been removed, or whether in oxidising the iron CO_2 had been liberated in sufficient quantity to render the water acid enough to attack the metal of the mains. That was more a matter for the chemist than the engineer; but he did not think it was at all likely it would affect the coating or the metal.

The CHAIRMAN (Mr. A. T. DAVIS) said Mr. Coleby did not tell them who the engineer was; they knew it was not Mr. Coleby for he had only been in the district about twelve years: but whoever was responsible for designing this scheme did not make very careful calculation of the hydraulic gradients; that was pretty obvious. There were two ways of looking at this question of a water supply for a rural district. The medical officer of health was busy in the rural parishes. He looked round and said: "You have not a proper supply; the water is contaminated," and he advised the authorities to go in for a public supply. The question of cost then came in. If they could find wells, and keep them free from surface contamination, all well and good. That was more difficult than it seemed. The wells were sunk in close proximity to offensive matters, manure pits, and so on, and it was most difficult to exclude contaminating matter from the water. With regard to these long links of main radiating from a centre it was foolish to put in a 2-in. main to distribute water a considerable distance from the source. It was ridiculous to expect to get any pressure to combat a conflagration from a 2-in. main. The first cost must be considered, but it would be far better to put in a 3-in. main; then it would be an easy matter to put a hose reel and hydrant in a village, and thus get the full benefit of the water running out to isolated hamlets.

The vote of thanks having been adopted,

Mr. COLEBY, in reply, said that Mr. Savage had asked as to the hardness of the water. The hardness of the water for one half of the water which was covered by the carboniferous formation was about 26 deg. In the other part of the district in which they had just sunk this new borehole in the bunter, or new red sandstone, they had got from the first samples 18 deg. of hardness; but when they had excluded a portion of the water they expected that to fall to 15 deg. As to the hydrant flow gauge Mr. Savage had mentioned, that was an ordinary standpipe with a meter attached. He did not think that arrangement would answer for testing the flow from a fire hydrant, because there was a considerable loss of head in passing the water through the meter. The Prentice hydrant flow gauge was constructed so that there was nothing to obstruct the flow. There was simply a tube with an anemometer and pressure gauges attached, so that they could tell the exact flow at any minute. Mr. Chancellor suggested that a hose cart and reel might be kept in the country parishes in case of fire. In his district the parish councils undertook the maintenance of the fire brigade—that was, where there was a brigade—but there were only two brigades in eleven parishes. The parishes he was more particularly referring to were parishes with very small populations indeed. They were a few scattered houses and farms, and he did not think it would be advisable to get a hose reel.

Mr. CLARSON: They never have a fire, except a rick, and it is better to let that burn out.

Mr. COLEBY remarked that Mr. Parsons asked why the tubes in the borehole were to be 18 in., while the borehole was 20 in. The 18 in. was the size of the interior of the tubes, which were $\frac{7}{8}$ in. thick, and externally socketed, which would bring the external diameter up to the size of the borehole within 4 in. Then it was proposed to cement the tubes. The sand was very fine, and found its way through almost any perforation. Then as to the yield of 10,000 gallons per hour, or 224,000 gallons per twenty-four hours, pumped for fourteen days, it was the opinion of their geological adviser that they could obtain 400,000 gallons a day from the borehole, considering the strata and the outcrop. There were a number of fissures in the strata. The water was good. He was glad to hear from Mr. Cook that the water did not affect the pipes in his district. He was not sure whether in his case some of the trouble was not due to the improper coating of the pipes. There were complaints from

people who lived at the dead ends. The pipes were being constantly flushed. While the water charged with iron was going through there were more complaints. He agreed that a good deal of the foulness was due to sulphuretted hydrogen. There was a distinct tarry smell or flavour about the water, though some of the mains had been down for nine years. Mr. Plant suggested that the mains should be kept charged to prevent air-locking. Since the Candy filters had been installed the trouble from air-locking had been more than usual. It occurred to him that the oxidisation being done by compressed air would have the effect of charging the water with air, which would account for some of the trouble in the mains. He had not found air valves which would act in both directions satisfactorily. The supply of rural villages must always be ruled by circumstances. They had long lengths of main—in one case 3 miles of main which had only six connections for cottages on the whole length. The cost of long mains like that where the rateable value was very small, went very near to the limit of the borrowing power of the parish, and they had nothing left for other work. Mr. Fletcher asked for the cost of water pumped in comparison with water bought, but he was not able to give it. He was asked as to the reason for difference in yield between the wells in No. 1 and 2 districts. They were in the same formation, the perinian. No. 1 was in that part of the perinian which lies immediately over the top of the coalfield, while No. 2 was situated on an outlier on the boundary side of the Warwickshire coalfield. Why there should be such a good supply from No. 2 well while there was a failure in No. 1 he could not tell them, but he should say that the water had been depleted by colliery workings. The hydrant was tested under real working conditions, as if there were a fire. The standpipe was put on with hose and nozzle, and the water was measured through a meter. At the same time, the main was supplying all the houses, and, having only a 2-in. main, the head was reduced in that way before it got to the hydrant. They had to take these things as they were, and these were the absolute conditions as would obtain in the case of a fire. The main ought to be sufficient to supply for a fire as well as the house services at the same time. In this scheme there was evidence of bad designing, but he did not think from what he had heard that the engineer was to blame. They all had to give way to their council. As to the size of the mains, they were laid thirty years ago, and he did not suppose the Local Government Board would sanction a loan for 2-in. mains to-day. He had heard that when this scheme was first introduced a consulting engineer got out a very efficient scheme with nothing less than 4-in. mains, but the cost was so great that the council would not hear of it. Someone else came along and said: "I can do this job for half the amount," and so they had got 2-in. mains throughout the district.

THE ANNUAL MEETING.

The date for the annual meeting of the Institution of Municipal and County Engineers at Cheltenham has been fixed definitely for June 24th, 25th, 26th and 27th next. It has been decided to make a special feature of town planning and of roads, and, if possible, to arrange for an exhibition of town plans.

SOUTH-EASTERN DISTRICT MEETING.

At the meeting of the South-Eastern District held on Saturday last at the institution offices, Mr. A. Dryland presiding, the question of the recognition of the institution by the Town Planning Institute was raised, and it was decided to request the council to take steps to secure the desired representation, which, it was stated on the authority of Mr. T. Adams, the president of the new body, was likely to be forthcoming.

A meeting at Tunbridge Wells on April 4th was announced, mention being also made of one at Dover on May 16th, and of another—since definitely fixed for June 6th—at Southend-on-Sea.

The annual dinner of the South-Eastern District was afterwards held at the Westminster Palace Hotel, among the company being Messrs. H. Percy Boulnois, H. W. Bowen (hon. district secretary), J. H. Brierley, E. R. Capon, R. Chart, junr., A. Clark, T. Cole (secretary), J. S. Crawshaw, W. H. Grieves, F. Harris, R. Honey, W. Hosken, H. W. Longdin, J. Marshall, T. A. F. Phillips, A. E. Pre-cott, G. M. Seels, C. Chambers Smith, G. W. Warr, R. Wilds and W. Wright. Mr. Dryland presided over the gathering.

RAMSBOTTOM'S LATEST MUNICIPAL UNDERTAKING.

REFUSE DESTRUCTOR AND STEAM DISINFECTOR.

A destructor plant which is now completed and in readiness for active operation is the latest feature of development in the town of Ramsbottom. For several years past the unsatisfactory disposal of the town's refuse has been a matter of concern to the council, for it was fully recognised that the tipping of the refuse at certain points was, to say the least, a most insanitary method, and one giving rise to objections from the householders living in the neighbourhood of such places of deposit. As far back as 1907 a sub-committee of the council visited various towns, with a view to ascertaining what was being done in the way of destroying the waste materials collected from the houses. Following on the committee's report, a Local Government Board inquiry was held with regard to the council's application for sanction to borrow £2,150 for the purchase of land, a portion of which it was proposed to utilise as a site for the destructor and disinfector plant. Spirited opposition was met with at this inquiry, but in due course the board's sanction to the loan was obtained and the land was acquired. The site selected is a very central one, and will afford great economy in access, for it has the advantage that practically the whole of the carrying to it will be downhill, the only rising gradient being from the lowest portion of the town, a matter of about 12 ft.

Following upon a report of a sub-committee in July, 1910, Mr. Thos. H. Bell, the engineer to the council, was called upon to draw up a detailed scheme and specification for the erection of a refuse destructor and steam disinfector. It was considered highly desirable that the disinfector should be provided in conjunction with the plant, so that the existing necessity of sending infected goods to the neighbouring town of Bury for disinfection might be avoided. In due course seven tenders were received, and it was decided to place the work in the hands of Messrs. Dawson & Manfield, sanction to a loan of £4,300 to cover the cost being subsequently obtained.

Including the fencing around the buildings, which is yet to be erected, the total cost will be slightly under the figure mentioned.

DESCRIPTION OF THE BUILDINGS.

The plant is situated about one-third of a mile from Ramsbottom Railway Station. The buildings are constructed with Acerington plastic engineering bricks on all exposed faces, and the brickwork is built in Old English bond, set in lime mortar. The angles to all outer walls have stone quoins, and all window heads and door heads and sills are of Fletcher Bank stone. The foundations consist of a ferro-concrete raft laid to one level and extending over the whole site. The raft is constructed of concrete 18 in. in thickness, made with a grit stone aggregate varying from $\frac{1}{4}$ in. to $\frac{3}{4}$ in. in size, and the concrete is reinforced with two layers of expanded metal. The chimney shaft, which is 80 ft. in height, as measured above the ground level, is supported upon foundations of a special character. Eight ferro-concrete piles, each 12 in. by 12 in., reinforced with four steel bars 1 in. in diameter, the bars spirally wound, were made in a horizontal position, and allowed ample time to set. The piles were then driven until the iron shoe of each struck into solid ground, and the heads of the piles were then cut off to a fixed level, and a concrete base 3 ft. in thickness, reinforced on scientific methods with steel bars, was constructed. The depth to which the piles were driven varied from 24 ft. to 26 ft. The chimney, which is on the Alphons Custodis type, with the object of minimising the weight of the shaft, was then built upon the foundation so obtained. The octagonal base of the chimney, for a height of 14 ft. above the ground level, is constructed of Acerington engineering bricks, and the remaining height is a circular shaft erected with the Alphons Custodis blocks, and is firebrick-lined throughout, and is protected from lightning by three copper spikes fixed at the top. The high temperatures which will be passed up the chimney almost compelled the continuous firebrick-lining. The inside diameter of the shaft at the top is 3 ft. 6 in., and at the base 4 ft. 10 in. Steel roof principals have been used, well secured on pad stones built into the walls, and the roofs are all covered with tongued and grooved boards, covered with felt and slated. All windows are fitted with steel window frames, and are glazed with wired glass.

The buildings comprise the destructor house and a spacious unloading shed with storage hopper, clunking floor and boiler-house, which is part of the main destructor building. Other rooms provided are a mess-room 10 ft. by 8 ft. internal dimensions, provided with fireplace, fitted with a small range for cooking purposes; bath-room 8 ft. by 6 ft. internal measurement, fitted with full-size enamelled bath, with hot and cold water supply and drainage complete; store-room, 8 ft. by 6 ft.; and water-closet accommodation.

The disinfector house is so arranged that it is divided into two apartments, the only direct communication being through the disinfector, which is fitted with two hinged doors, one door of which is to be always kept closed. The apparatus, which is of the Manlove, Alliott & Company's make, includes a cradle so arranged that it will run on rails from the receiving apartment into the machine, and thence into the delivery or disinfected apartment. The appointments are complete in all respects, including concrete floor, drainage, wash basin, and other details.

The buildings are lighted throughout with electricity, and are approached from the main highway by a road 18 ft. wide, the gradient for a length of about 70 ft. rising into the unloading shed being 1 in 12. The roadway is formed for part of its length with lounkey setts paved on a foundation of concrete 6 in. in thickness.

The refuse to be destroyed in the destructor is the ordinary general domestic and trade collection from the greater portion of the town's area. The present daily collection of refuse is about 11 tons, and the plant is guaranteed to be capable of destroying a total quantity of 14 tons in sixteen hours. The buildings are, however, designed to give room for further extension if it be found desirable in the future to provide an additional cell. The back-feed system is adopted, and the plant at present provides two cells on the continuous grate type.

The whole of the contracts have been completed under the supervision of Mr. Thos. H. Bell, acting for the council. Certain savings will be brought about by the abolition of rentals which have up to now been paid for tips, and other economies will be brought about by the increased loads which will be possible with so much down-hill carting. Taking these into account, the working of the destructor plant, and repayment of sinking fund and interest charges, will, in the opinion of the council's surveyor, as based on calculations, amount to a trifle under one penny on the rates. This amount, equivalent to £228, is over and above the present cost of disposal of the refuse on tips, but as the loans are gradually paid off, and use is made of the by-products from the burning operations, this charge on the rates will be substantially reduced. The new buildings and plant have already been inspected by representative deputations from various towns, who have the question of refuse destruction under consideration. The Dumfries authorities have as a result of their visit placed a contract with Messrs. Dawson & Manfield for a similar plant.

Health Week.—The Lord Mayor of London has consented to act as chairman of the General Committee promoting Health Week, which will be held from November 15th to 21st.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

Richmond (Surrey) Bridge.—With reference to the improvement of Richmond Bridge the Bridge Commissioners have been advised by their engineer that for an expenditure not exceeding £15,000 the narrowest part of the carriageway could be slightly widened, the gradient on the south side materially improved, and the footways made adequate for the convenience of foot-passengers. The county council, considering that alterations of this nature would meet the present requirements and those of the immediate future, on Tuesday agreed to enter into negotiations with the Middlesex County Council for the provision by the two councils in equal moieties of a sum not exceeding that named, to be expended by the commissioners, subject to plans being first approved by the two councils.

Institution of Municipal Engineers.

NORTHERN DISTRICT MEETING AND ANNUAL DINNER.

The annual meeting of the Northern District of the Institution of Municipal Engineers was held in the Town Hall, Newcastle, on January 10th. Those present comprised Messrs. Wm. Finch, chairman of the Northern District, Chas. Hearder (Ormesby), W. Wallin (Newcastle-on-Tyne), W. H. Butler (Cumberland), Thos. Young (Sunderland), M. Turnbull (Shildon), S. Crisdale (Cockermouth), G. W. Ayton (Chester-le-Street), F. A. Burgess (Stockton-on-Lees), J. W. Pooley (Hexham Urban District Council), W. J. Coulson (Cramlington), Jas. Jameson (Ponteland), H. G. Kaines (Durham), J. W. Holbrook (Houghton-le-Spring), J. T. Pegge (Durham), J. W. Moncur (Sunderland), G. Beaty (Ashington), John J. Davison (Wigton), John Davison (Morpeth), T. S. Dight (Durham Rural District Council), L. Simpson (Barnard Castle), J. H. Mole (Chester-le-Street), R. E. Riddle (Bellingham), John Robinson, honorary district secretary, and B. Wyand, secretary of the institution.

Before commencing the business of the meeting, the chairman read a telegram from Mr. Boot, the president of the institution, expressing his regret that owing to being indisposed he was unable to be present.

The minutes of the previous meeting held in November 22nd were read and confirmed.

SUPERANNUATION.

The secretary read a letter from Mr. Hill, the secretary to the N.A.L.G.O., dated December 10, 1913, and the following resolution was passed: "This meeting of the Northern District of the Institution of Municipal Engineers held in Newcastle on January 10, 1914, bind themselves to give every possible assistance to the N.A.L.G.O. with the object of getting the proposed National Superannuation Bill carried through Parliament, and with this object in view appoint a small committee to interview the various Members of Parliament representing the counties of Northumberland, Durham, Cumberland, Westmorland, and the North Riding of Yorkshire." This committee consists of Messrs. M. Turnbull, J. T. Pegge, and Geo. Gregson, and the district secretary, Mr. Turnbull being asked to convene meetings with various Members of Parliament representing the constituencies of the counties aforementioned. The secretary was also asked to write Mr. Hill to obtain copies of the proposed Superannuation Bill.

DUTIES OF SURVEYOR AND MEDICAL OFFICER OF HEALTH.

The district secretary read a letter from Mr. John Davison, dated December 6, 1913, together with a draft copy of a letter which he suggested should be sent out to members in the Northern Division. Upon the suggestion of the district secretary it was agreed to allow the matter to stand over until a future meeting, and members were asked to send to the district secretary any list of the questions which had been sent out by the Local Government Board, marking those questions which they consider should be submitted direct to the surveyor, as much of the statistical and other information called for could not be properly supplied by the medical officer of health without the surveyor's assistance. The secretary was asked to forward to Mr. Wyand copies of any forms of queries sent out by the Local Government Board upon receiving them from members.

DATE OF NEXT MEETING.

It was decided that the next meeting should be held in the Town Hall, Newcastle, on Saturday, February 14th, at 3.15 p.m.

ANNUAL DINNER.

The annual dinner of the district was held in the evening at the Royal Turk's Head Hotel, Newcastle-on-Tyne. Mr. W. Finch, county surveyor of Cumberland, chairman of the Northern District, presided, and among the guests were the Lord Mayor of Newcastle (Councillor Johnstone Wallace) and the Sheriff (Councillor Herbert Shaw). There were nearly one hundred members and friends present, and prior to the dinner a reception was held by Mr. Finch.

The CHAIRMAN, in proposing the toast of "The King," remarked that one of the most pleasing

features of the International Road Congress held in London last year was the invitation of His Majesty to the members of that congress to visit Windsor Castle, thereby showing the keen appreciation of His Majesty in the objects of the congress. His keen interest and kind feeling in general had been amply proved, too, of late by his several visits to the industrial centres of the country, including his recent visit to the county of Durham.

Mr. J. T. PEGGE proposed "The Army, Navy, and Imperial Forces," which was responded to by Captain H. W. TAYLOR.

Mr. J. W. MONCUR (Sunderland) proposed "The Local Government Board, Road Board, and Administrative bodies." This was a matter which affected them all as officials. He felt that the Local Government Board was a piece of Government machinery that had served its day and generation so far as the works department was concerned. Why should they, as engineers, spend their time and ability, and not only that, but place what had been prepared before gentlemen who very often were not as well qualified to judge of the scheme? His point was that local gentlemen knew the local requirements. This was his feeling, and he was sure he had heard it expressed over and over again. He went on to show the different procedure adopted in Scotland with reference to the borrowing of money for schemes, and stated that some years ago a scheme was prepared which went before the sheriff, to whom the financial position was explained. The scheme involved the borrowing of £20,000. The borough engineer and himself (the speaker), the provost and chairman of the committee explained the scheme to the sheriff, and within three-quarters of an hour the sheriff passed the scheme; further, the money was carefully and well spent. No engineer was appointed now unless he could show he had passed some qualifying examination, and they were therefore able to study and prepare schemes for roads, sewerage and waterworks to meet the requirements of any authority. He considered that by meeting the cost of the schemes out of the rates, as far as possible, a saving of money was effected. For instance, in a very modest scheme—say, £500—it cost £750 before one had paid off interest and sinking fund. Why should not that £250 go into the scheme? The argument was very often heard, "Why should we pay for the future?" They should certainly pay for the future. In regard to the Road Board, he contended that that authority was in its infancy, or anyhow, only cutting its wisdom teeth. By-and-by they would acquire more sense. As regards local authorities, he was convinced that good engineers would find good masters.

Alderman W. Dixon, of the Cumberland County Council, in replying, said that as a member of the county council and other administrative bodies of the county, he had every opportunity of knowing what was required as far as municipal and county work was concerned, and also the good work which the members of the Institution of Municipal Engineers were carrying out in their respective spheres. Regarding the remarks of Mr. Moncur, he agreed with practically everything he had said. The Local Government Board were largely instrumental in seeing that the money allocated for carrying out improvements in their districts was well spent. With reference to the Road Board, this was a new feature. Large sums of money had now been placed in the hands of the Road Board for carrying out improvements in various parts of the country, and up to the present, as far as he could see, the greatest consideration had been given to the man who had been able to spend the most money. He meant the man who had had the most money at his disposal and spent it to the best advantage. In his opinion all the main roads should be in the hands of the Government and paid for by the Government, but there was one thing that he did object to (and he hoped it would never be carried out), and that was to their being administered from London. In his opinion the local authorities were themselves the best judges of what was required.

The SHERIFF, in proposing the toast of "The Institution of Municipal Engineers," said he found that the institution, although only established as recently as the year 1908, was now in a most thriving position.

It held an important position in the United Kingdom. In this short period the institution had no fewer than 1,000 members, and it was very plain from the work they had been doing, and the work they had planned to undertake in the future, that they had a great deal to do for the welfare of the individual members of that institution. One point that had struck him in looking up some notes that had been handed to him was that one of the great objects was the question of the status of engineers and surveyors connected with the various administrative bodies in the country. They were all trying to improve their status. That was a very laudable ambition, and he certainly hoped that whatever else the institution might succeed in doing they would endeavour as far as they possibly could to improve the status of every individual member of the institution. It was very important that an institution of that kind should devote some part of its work to the matter of the status of its members, for unless that were done, unless it looked after the interests of its members, there might be in certain parts of the country under similar administrative bodies injustices done to the members which could not possibly be remedied except by the aid of such a powerful society as the Institution of Municipal Engineers. He knew that, as engineers, they required ability to carry out their duties, but he thought there were other qualities which were equally as important, and these qualities could be summed up in two or three words—tact, common sense, and ability to guide their committees. Tact was a great asset to anyone. He had listened with very great interest to the speech of Mr. Moncur. From his own experience he believed that the less they had to do with Government departments the better. Having obtained little success at their hands, he would like to see them abolished altogether. (Laughter.) There was one point in which they all were considerably interested—the question of the proper maintenance of the roads in this country at the present time. The Road Board had been mentioned. Perhaps it was not sufficiently known what a large sum of money the Road Board, recently established, had at its disposal for the betterment of the roads. He had only been reading that day in a London paper that seven counties in this country were making application for half a million of money for the betterment of roads in different parts of the country. But what had happened? As a result of that being made known, several other counties were already making application to the Road Board for sums of money for the improvement of the roads. He would like to suggest (although he did not know whether it really came within the purview of their powers) that some representation should be made by an institution of that kind that the rights of the ordinary pedestrian should be preserved. He sometimes disappeared from the busy city of Newcastle-on-Tyne and betook himself to a little country village, and he could assure them that as he wandered about the roads there viewing the beauties of Nature one had to skip about from one side of the road to the other in order to preserve one's life. It was quite unnecessary for him to assure them that he wished the institution every happiness and prosperity. He realised that in their important work—and important work it was—the main object was to help towards the happiness and the comfort of those living under the authority of their administrative boards.

Mr. Horace Boot, the president of the institution, who should have responded to this toast, was—as already stated—unable to attend the dinner, being confined to the house by illness. Mr. Finch read a letter from Mr. Boot apologising for his absence and greatly regretting his inability to be present that evening. He appreciated very much the work done by the Northern District, of which he was very proud. The hon. district secretary was asked to write Mr. Boot expressing the sympathy of the members in his illness.

Mr. W. WALLIN (Newcastle), in responding, said that they were, as the Sheriff had remarked, a young institution, but they were exceedingly proud of their youth. Since the institution was formed two or three little improvements had been copied by older institutions. One matter they had been actively engaged upon was security of tenure. This was one of the things a municipal engineer had not. Poor-law authorities had security, but the municipal engineer had nothing of the sort, and if he should, through no fault of his own, fall foul of some of the members of his council, he was asked in a polite way to send in his resigna-

tion, or, to use a vulgarism, he got the "sack." He had no redress, and therefore this was one of the matters that the institution was strongly taking up. On the question of the maintenance of roads that was a far-reaching question which had been ably put by Mr. Moncur and Mr. Alderman Dixon. As to motor traffic, it had to be recognised that motors had now passed the stage of luxury, and had become part and parcel of the commercial success of countries.

Mr. B. WYAND, the secretary of the institution, also responded.

Mr. C. W. HALL (Felling), in the absence of Mr. J. Jardine, town clerk of Morpeth, through illness, proposed the "City and County of Newcastle-on-Tyne and Northern Municipalities."

The LORD MAYOR, in replying, thanked the members for the honour they had done him by inviting him to join them that evening. It was a pleasure to him to see so many engineers who were skilled in their profession and who were doing their best to improve the health and comfort of the community. He gathered from what he had read of the institution that it was largely a mutual improvement society, and although the day of mutual improvement societies had perhaps gone, there was no reason why an institution of that kind should not try and benefit its members as they were trying to do. There was a great deal to be gained by men gathering together and exchanging their opinions on important matters which they were called upon to consider. The many things that an engineer had to know and do were really appalling. They had to look after the making of roads and the formation of streets; they must know something about trams, electricity, gas, water, and many other things, and in these days when it was necessary to have suitable dwellings for the people, and when public buildings should be worthy of the great cities in which they were erected, it was very pleasing to know that the engineers were so ably carrying out the duties they had to fulfil. Newcastle-upon-Tyne were spending a great amount of money. It would be his duty within the next few weeks to preside over the council meeting at which the budget would be presented. They would have to budget for about a million of money. They were quite capable of spending the money, and spending it to the best advantage of the city. He agreed that they wanted as little interference as possible from the Local Government Board in London. He was pleased to see that the institution devoted special attention to the training of young men. One of the most difficult tasks of the engineer in these troublesome times was the management of men, and in that they had to display great tact. It seemed important that the engineer should have more control than he had, and he thought there should be as little interference as possible on the part of the members of municipalities. He hoped the institution would grow and prosper, and the attendance that evening spoke well for the vigour and future of the society.

Mr. J. W. HOLBROOK (Houghton-le-Spring) proposed "Our Guests and Visitors." The institution was, he said, exceedingly honoured by the company of the Lord Mayor of Newcastle, the Sheriff, and the various aldermen and councillors of the adjoining counties, together with the other guests. He believed, and with a certain amount of pride, that not only was their district designated as No. 1 District of the Institution of Municipal Engineers, but they were No. 1. This was undoubtedly largely due to the energy exhibited by the members of the Northern Division. Referring to security of tenure, Mr. Holbrook said there was no getting away from the fact that the speeches they had heard that night had been uplifting and inspired them to go on. They knew that the Lord Mayor took a very keen interest in technical affairs.

Alderman DALTON, of Carlisle, responded. He said he had come from Carlisle for the purpose of making the acquaintance of the members of the institution, and especially for showing his high esteem of the chairman (Mr. Finch). He was very pleased to have been at such an enjoyable gathering.

Mr. J. H. HALSTEAD (Harrogate) proposed "The Chairman," coupling with him the honorary secretary of the Northern Division (Mr. John Robinson). The Northern Division of that institution had been well served in the past by chairmen. They sincerely appreciated their valuable services, and in the election of Mr. Finch they had obtained a gentleman who well maintained the dignity of that office. When they

took into consideration the fact that Mr. Finch had practically risen to the head position where he served his articles he thought that was sufficient to show them what a competent man he was.

Mr. FINCH, replying, said he hardly knew how to thank them sufficiently for the hearty reception they had given him. It was certainly a very great honour for him to occupy the position as chairman of the Northern District of the institution that night, and he took it as an honour to have the company of the Lord Mayor, the Sheriff and the aldermen, councillors, and friends of the members of the institution. This all went to show that they were going ahead in the proper spirit, and he was especially pleased to see so many members present. On several occasions the friends almost outnumbered the members, but that night he was glad to see that the majority were members, which showed that the spirit of the Northern Division had been kept up. He was particularly pleased to see that night his vice-chairman (Alderman Dixon) and Alderman Dalton. It showed that his position as surveyor of the County Council of Cumberland and the work that he was trying to do for that authority was appreciated, and he had every reason to be satisfied with their treatment of him. Referring to the excellent work which had been done for the Northern Division of the institution by Mr. John Robinson, the honorary secretary, any work that he (Mr. Finch) had done in assisting Mr. Robinson had been a pleasure, because the work was practically three parts done before he had the opportunity of touching it. The institution should do everything to retain the services of their hon. secretary.

The pleasure of the evening was much enhanced by the able efforts of Mr. Harry Tomkins (humorist), the Orpheus Quartette Party from Carlisle, and other friends. Mr. V. Raw acted as pianist.

MIDDLESEX COUNTY OFFICERS' ASSOCIATION.

PRESENTATION TO MR. AND MRS. H. T. WAKELAM.

The first Bohemian concert in connection with the Middlesex County Officers' Association was held on Friday last in the Council Chamber of the Holborn Restaurant, and the complete success that attended it should certainly encourage its promoters to arrange other similar functions. Mr. H. T. Wakelam, M.INST.C.E., the county engineer, occupied the chair, and a large number of ladies graced the gathering with their presence. Altogether there was a company of about 240 present.

The music provided left nothing to be desired, the items being varied and well chosen, humorous numbers predominating. Detailed reference to each item in the programme is unnecessary here, but we may instance, as particularly pleasing contributions, Miss Nellie Walker's rendering of "My Ships," and the spirited singing by Mr. John Eversleigh of Wilfrid Sanderson's "Drake Goes West." It may be noted that no fewer than four of the songs in the programme were by this gifted composer. Humorous items at the piano by Miss Haidee Hamilton and Mr. Willie Rouse were also greatly appreciated.

A pleasing little ceremony in the course of the proceedings was the presentation to Mr. and Mrs. H. T. Wakelam of two pairs of handsome silver candlesticks, two pairs of silver vases, and two silver bon-bon dishes, an appropriate gift from the members of the present and former engineering staff of the Middlesex County Council to commemorate the recently celebrated silver wedding of the recipients. In the unavoidable absence of Mr. Alderman Pinkham, the chairman of the Highways Committee, the presentation was made by Mr. County Councillor Goodyear, vice-chairman, who eloquently testified to the high regard in which Mr. Wakelam is alike held by the officials of his own staff and by the members of the county council. Mr. Wakelam, in acknowledging the gift on behalf of his wife and himself, said he felt it difficult to give adequate expression to his feelings in thanking those who had subscribed for the handsome gift, and paid a high tribute to the loyal support given him at all times by those associated with him in his department. Mr. County Councillor Marlow Reed proposed, in humorous terms, a vote of thanks to Mr. Goodyear for making the presentation, and endorsed all that had been said by that gentleman regarding Mr. Wakelam's many excellent qualities, emphasising his exceptional capabilities and broad sympathies.

ASSOCIATION OF SOMERSET SURVEYORS.

ANNUAL GENERAL MEETING AT BRIDGWATER.

On Saturday, the 10th inst., the annual general meeting of the Association of Somerset Surveyors was held at the new police court, Bridgwater. The attendance numbered about thirty members, including Mr. H. T. Chapman, county surveyor of Somerset (recently appointed county surveyor of Kent), and Mr. E. J. Stead, county surveyor of Devon (recently elected to succeed Mr. Chapman as county surveyor of Somerset), and the gathering was presided over by Mr. F. Parr, ASSOC.M.INST.C.E., borough surveyor of Bridgwater.

The officers for the ensuing year were elected as follows:—

President: Mr. W. A. Collins, surveyor, Bridgwater Rural District Council.

Vice-presidents: Messrs. F. Parr, borough surveyor of Bridgwater; F. W. Jones, surveyor, Frome Urban District Council; and J. Ace Beynon, surveyor, Frome Rural District Council.

Hon. Secretary and Treasurer: Mr. D. Edwards, borough surveyor of Taunton.

Executive Committee: Messrs. E. J. Stead, county surveyor; H. C. Sunderland, Midsomer Norton Urban District Council; T. Goldsworthy Crump, Taunton Rural District Council; G. Alves, Glastonbury Urban District Council; Chas. Durie, Williton Rural District Council; J. Johnson, Keynsham Urban District Council; and R. Stevens, Ilminster Rural District Council.

The president, Mr. W. A. Collins, in his inaugural address, thanked the members for electing him to the office, and assured them that his utmost energies would be devoted to promoting the interests of the association and mutual kindly feeling among the members.

Mr. D. Edwards thanked the members for electing him hon. secretary and treasurer, and moved a hearty vote of thanks to Mr. Parr for his services as president during the past year, which was carried unanimously.

A PRESENTATION.

Mr. H. T. Chapman was elected an hon. life member of the association, and presented with an illuminated and framed address containing the names of the whole of the members, together with an expression of regret at his leaving Somerset, and wishing him every success and happiness in his new appointment as county surveyor of Kent.

Mr. Chapman, in thanking the president and members, said that during the six years he had been among them he had looked upon them, not as officials of various authorities, but as personal friends, with whom he had worked in a most harmonious manner. The address would occupy a most prominent position in his office, and always serve to remind him of the very pleasant and happy years he had spent among them. He sincerely hoped he might be as happy in Kent as he had been in Somerset. He wished the association every success in future years. By co-operation many difficulties could be overcome, and the interchange of opinions on subjects appertaining to their work was most helpful. He congratulated the members on Mr. Stead's appointment; he had worked with Mr. Stead for several years, and was quite confident of his ability and suitability for the office.

Mr. E. J. Stead, who was most heartily received, said he had been closely associated with Mr. Chapman, whose personal friendship he valued most highly, and wished him every success in his new sphere.

SUPERANNUATION.

Mr. F. W. Jones introduced the subject of superannuation of officers of local authorities. A discussion ensued in which it was elicited that action was being taken by the County Surveyors' Association to forward the proposed Bill to be introduced into Parliament.

It was resolved to give the Executive Committee power to act should any communication on the matter be received from the Superannuation Committee.

The members were entertained to tea by the kind invitation of Mr. H. T. Chapman.

"THE SURVEYOR" SPECIAL ISSUE.—The Special Annual Issue of "The Surveyor" will be published next week.

THE QUESTION OF MUNICIPAL CREMATORIA.

REPORT BY THE BOROUGH SURVEYOR OF GREAT YARMOUTH.

The borough surveyor of Great Yarmouth, Mr. J. W. Cockrill, M.INST.C.E., A.R.C.B.A., at the town council meeting last week presented the following report to the Cemeteries Committee:—

"You have expended on cemeteries £14,770, of which £1,271 remained unpaid on March 31st. Twenty-six acres between Northgate-street and Nelson-road North, worth at least £26,000, is utterly ruined, and can be of no useful purpose. A further expenditure is about to be undertaken for a necessary extension at Caister. These figures show the waste incurred in polluting soil and atmosphere. The total cost of your cemeteries for the past year was £1,306, which, by payments under the various tables of fees, left £291 to be provided out of the rates. The average cost of each burial is about 25s., of which more than 30s. is paid by the friends of the person buried.

"A plain, suitable building, with up-to-date appliances, can be put up for £3,800. If constructed inside the cemetery grounds no extra expense for attendant and superintendent will be incurred. Interest and sinking fund will amount to about £200 per annum; cost of fuel is about 7s. per cremation when only one takes place in a day, reduced to 5s. if two or more. No crematorium can be erected within 200 yds. of any dwelling-house without written consent of the owner, lessee or occupier of such dwelling-house, nor within 50 yds. of any public highway, nor in the consecrated part of the burial ground of any burial authority. These conditions make it very difficult to secure a site; for such conditions the site of the Nonconformist chapel in the North Cemetery would be the best available, but I dare not venture to hope that consent could be obtained from fifty to sixty occupiers in addition to the owners. No nuisance can be created by this method of disposal. Since the erection of the Golder's Green crematorium houses of large rateable value have been erected inside the distances named in the Act of Parliament. The chief object of providing a crematorium is to reduce the quantity of land spoiled by the present method of disposal. If the increase in population continues, and the present system of burial is persisted in, 1 acre of land will be drawn each year from production. There is also the cost of carrying bodies to Caister, which must be considered. If disposal can be effected by cremation in the existing town cemeteries it means that a saving in each case of an average of £2.

"If the purchase of land at Caister is proceeded with, the unused portions of existing cemeteries, and the opportunities of burying a second body in the same grave in all the cemeteries will give from twenty-five to thirty years before you will need to consider the question again. Cremation by that time will be very general if opportunity is provided to educate the public. This method of disposal is increasing in use. In 1912 there were thirteen crematoria established, Woking, erected in 1885, being the first. In 1892 Manchester, followed in 1895 by Glasgow, 1896 by Liverpool, in 1901 by Hull and Darlington, in 1902 by Golder's Green and Leicester, in 1903 by Birmingham, and in 1905 by Leeds, Hford, Bradford and Sheffield. Six of these establishments are the property of companies and societies, and seven of corporations. Thirteen cremations took place at Woking in 1885 and 1886, and 125 in 1912. Manchester had three cremations in 1892, and 149 in 1912; Golder's Green commenced with five in 1902, and had 591 in 1912; 1,134 cremations took place in 1912 in the thirteen buildings named.

"If you can establish a crematorium, and keep the charges down to the lowest point likely to pay expenses, I have no doubt the custom will become general in a few years, so that the present outlay for land may be the last for that purpose. Charges at private crematoria are usually £5 5s., with a reduction of 21s. if it takes place before 10 a.m., and another cremation follows. Other charges are: Urn, from 10s. 6d.; chaplain, 10s. 6d.; niche for urn, £3 3s. to £5 5s., and other sums for various services. In corporation establishments the charges are £2 2s. and £3 3s. if the person has lived for six months previously within the borough, and larger fees for other persons. Failing the site of the Nonconformist chapel in Yarmouth cemetery, both the Gorleston and Caister cemeteries could be used, but the advantage of the shorter distance for removal is lost. A middle course would be to try and make some arrangements with the

trustees of the Catholic cemetery on Caister-road, where there is ample room. In consequence of the decrease in the death-rate the number of burials per year is now considerably less than it was thirty years ago."

The report is to be considered at another meeting of the committee.

THE CANDY DE-CLOR FILTER.

ROYAL SANITARY INSTITUTE AWARD.

After nearly six months' investigation into the Candy De-Clor filter system, the judges of the Royal Sanitary Institute of Great Britain have given their highest award—a silver medal—to the Candy Filter Company, Limited, of Westminster, for the "De-Clor" waterworks filter, which is claimed to ensure the absolute destruction of the *B. coli*, typhoid bacilli, and other pathogenic bacteria.

By the De-Clor filter system free chlorine (hypochlorite of calcium) is added to the water by means of an extremely simple and automatic arrangement known as the Hydro-Pneumatic Apparatus, which proportions, or adjusts, the quantity to be used according to the flow of the water. The thorough mixing of the chlorine with the water and its proper duration of contact with the water are fully provided for, and the subsequent dechlorination and entire removal of the free chlorine from the water—a matter of the greatest importance—forms a most essential and valuable part of the process.

"The filtered water," the Candy Filter Company assert, "is not only absolutely free from *B. coli* and pathogenic bacteria, but is also highly oxygenated, and of the greatest palatability, being entirely free from the unpleasant taste and odour frequently found in water that have undergone chemical treatment. The enormous value of the De-Clor filter system will be understood when it is remembered that by its use it is impossible for the *B. coli* and pathogenic bacteria to escape destruction."

De-Clor filters have been in use at the Reading Corporation waterworks for three years; they are also employed by the Truro Water Company, the Teignmouth Urban District Council, and at many other places where the water supplies were not bacteriologically satisfactory. We are also informed that they have been shipped to various parts of the world, and in districts where typhoid was hitherto prevalent they have enabled municipal and other authorities to supply a water absolutely safe from water-borne disease.

It is interesting to remember that Mr. Frank Candy, who is so actively associated with the De-Clor and other filter patents, won the Royal Sanitary Institute's Medal thirty years ago for his invention Polaxite—the powerfully active oxidising and purifying substance employed in the De-Clor and other filters.

DISCHARGED WORKMAN'S ALLEGATIONS.

KENT CONTRACTORS' UNPLEASANT EXPERIENCE.

A rather extreme instance of the readiness with which certain individuals will listen to complaints against officials and contractors who are engaged in the execution of public works occurred recently at Dartford. It appears that the rural district council had undertaken the construction of a sewer at Wilmington—a work for which Mr. Reginald Brown, M.INST.C.E., was the engineer, and Messrs. Thomas Wood & Sons, of Swanley, were the contractors. A man who had been employed on the work having been discharged for drunkenness, made a complaint to the council that in certain places the work had been carried out in an improper manner. Instead of the local authority treating information obtained from such a source as it deserved, the contractors were asked to open up the work at the places specified. The result of this investigation was, as might have been expected, a complete vindication of the contractors, the clerk of works and the engineer. Only one cracked joint was found, and it was clearly proved that the damage had been done by the complaining workman himself, the joint being, in fact, watertight under test, and so cleverly concealed by him as to evade detection.

All those responsible for the execution of the work are to be congratulated on this result, and it only remains for the council to make some amends by taking upon themselves the cost of the opening up and inspection.

ROAD IMPROVEMENT PROBLEM.

COLONEL CROMPTON AND FUTURE DEVELOPMENTS.

A meeting of the Epping Forest Municipal Officers' Association was held at the Buckhurst Hill Council Offices last Friday evening, when Mr. L. W. Liell presided over a representative attendance, and Mr. J. A. Simpson, clerk to the Woodford Urban District Council, delivered an address on "The King's Highway: Past, Present and Future." Mr. Simpson said he thought they were tending towards three things: First, an absolutely new classification of highways; secondly, the establishment of a central authority; thirdly, the classification of district roads according to their user.

Colonel R. E. Crompton, consulting engineer to the Road Board, pointed out that the great problem who was to pay for the roads—whether it was to be the taxpayer or the user—was settled long ago. The whole community benefited so much by increased facilities of travel that it was better to spread the burden over the whole community as evenly as possible. He believed they would be doing a fatal thing if they taxed any particular class of user or any particular class of vehicle. It had become apparent that the vehicle which was costing the public the most now was the vehicle the public most used. Any taxation of the motor bus or motor wagon would fall as much on the public as if they paid it in the form of rates. He thought the more advanced politics pointed to a more equal and a fairer division through the rates or from Imperial taxation. The owners of vehicles gained enormously by paying their taxes at present. He had pointed out to the great carrying companies and the private car owners that their tyre bill was such an enormous item that if it was halved it was an important consideration. He was afraid the rubber industry would not approve of what he was saying, but they could not consider that.

The Road Board had very little power and very little money. Those who had come to the Road Board for grants had asked for about twenty times what the board could give them. The Road Board had been fearfully abused because it had succeeded in extracting from every authority a large sum of money in addition to its own grant.

He held that what they wanted was uniformity of road construction. The construction of a modern road was much more difficult than the construction of a railway. The motor car and motor wagon had been developed within a few years, and they expected surveyors to develop a new system and invent new methods of road construction. The Road Board was doing the research work necessary to make roads in all parts of the Kingdom in the cheapest possible manner. That was what he was engaged on. If a surveyor wanted to know what they were doing, what advice they could give from their general study of the subject, they would tell him what they knew. He did not say they knew very much yet, but they were getting on very rapidly, and he hoped in a few years' time they would make great improvements.

Modern road construction differed from the old in this—that it was much more dependent on the weather. Roads must be made in dry weather, and our climate was not a dependable one. It did seem that in future road reconstruction schemes would have to be carried out much in the same way as railways were built. Encouragement would have to be given to a class of contractors who would be responsible for local schemes. The mode of the construction of highways would have to be reconsidered. It would be necessary to consider schemes in order to deal with great lengths at a time. He believed the present high prices of road construction to meet omnibus traffic was due to the short lengths undertaken. He predicted they would see great changes in that respect. The modern road surveyor would find himself able to deal with certain contracting firms, and to give contracts out not only for construction, but for maintenance, as had been done not only in England, but abroad. In those cases the road had been made and maintained for several years at a certain price. At present that was a tentative process. No contractors knew what their liabilities would be under such a system, and they were obliged to put on high prices; but directly the system was understood, and contractors of a high class were attracted to that line of business, they would find prices would go down, and road construction would proceed very rapidly.

He believed there was a great opening for engineers and machinery in this direction, and that in a few years' time highways would show as great a develop-

ment as railways. Facilities for traffic would have a great effect. They would equalise the value of land, population would be spread wider out in consequence, and they would have the ideal state they looked for without arterial roads connecting town-planned areas with the business centre. Town planning was an absolute failure. With the motor bus they could get the town worker 7 or 8 miles from the business centre; but they wanted plenty of roads, and plenty of straight roads, to and from the business centre.

On the motion of the chairman a hearty vote of thanks was accorded to Mr. Simpson and Colonel Crompton for their addresses.

PORTABLE CHEMICAL FIRE EXTINGUISHERS.

BRITISH FIRE PREVENTION COMMITTEE'S WARNINGS.

The British Fire Prevention Committee have found it necessary to formulate a standard test for portable chemical fire extinguishers from a constructional point of view, having regard, firstly, to the several fatalities that have occurred through these appliances bursting when being operated, and, secondly, through the tendency of certain irresponsible makers or their agents to put on the market appliances of the "cheap-jack" type that are distinctly dangerous to handle. The committee have also formulated a provisional specification for standard portable chemical fire extinguishers from the constructional point of view, which should serve as a guide for would-be purchasers of such appliances.

Both memoranda are obtainable from the offices of the British Fire Prevention Committee, 8 Waterloo-place, London, S.W., upon written application to the registrar (with return postage).

The committee's executive has been in communication with various public authorities as to the advisability of adopting the committee's requirements for the extinguishers they purchase for their departments or require to be installed in establishments under their supervision, and various authorities, corporations, &c., at home and overseas, propose in future to adopt the safeguards the committee advocate.

In making this announcement the British Fire Prevention Committee wish to indicate that, while portable chemical fire extinguishers meet a public requirement, the members of the general public, when purchasing extinguishers, should not only see that they conform to the standard test and specification adopted by this committee, but that they should keep constantly in mind that such appliances require care in maintenance and handling.

The committee also desire to impress upon the public that portable chemical fire extinguishers are nothing more than first-aid appliances.

In addition, the public should remember that portable chemical fire extinguishers are not the only form of portable first-aid appliances, but that ordinary buckets of water and hand pumps are equally, if not more, effective in the majority of cases.

New Waterworks for Weston-super-Mare.—The Bill promoted by the urban district council of Weston-super-Mare for further provisions with regard to the water supply and waterworks, including the construction of new and additional waterworks at Banwell, Worle and Weston-super-Mare, has been certified for first reading.

Bristol Corporation and the Tramways.—The Bill of the corporation of Bristol to work tramways and to enter into arrangements with the Bristol Tramways and Carriage Company, Limited, for the purchase or taking on lease of their tramway undertaking, has passed the initial Parliamentary stage, and has been certified for first reading when the House of Commons meets next month.

Birmingham and Town Planning.—At the meeting of the Town Planning Committee of the Birmingham City Council recently, it was stated that the International Garden Cities and Town Planning Association proposed to hold their annual meeting in Birmingham on July 24th. Special interest will attach to the function because the meeting will be held in conjunction with the National Housing and Town Planning Council and other housing bodies. It is expected that the number of English and foreign visitors will be upwards of 200.

DERBYSHIRE COUNTY SURVEYOR'S DUTIES.

A COUNCILLOR'S ILL-JUDGED PROPOSITION WITHDRAWN.

At the meeting of the Derbyshire County Council last week considerable discussion took place on the question of the duties and salary of the county surveyor, Mr. J. W. Horton. The chairman, Alderman J. Oakes (we quote from the *Nottingham Guardian* report), said he had a suggestion to make to Mr. White in regard to a proposition to the effect that the council considered that the terms upon which the county surveyor (Mr. J. W. Horton) was appointed—viz., a maximum salary of £600 a year—should be adhered to, and that should further application for increase be persisted in by the surveyor he be called upon to resign and a successor be advertised for at a salary of £500. The chairman thought that inasmuch as this matter was referred back to the committee at the last meeting, it would be discourteous to them to discuss the proposition prior to considering their reconsidered report.

Mr. White not only accepted this hint, but confessed that he was in a temper when he wrote the second portion of the proposition, which he intended to delete.

Alderman Johnson Pearson then introduced the report of the Highways Committee, which contained a lengthy statement in support of their renewed recommendation that Mr. Horton's salary should be forthwith increased from £600 to £700, and then by two annual instalments to £800 per annum. In this it was pointed out that on his appointment an entirely new system of management was established. Unlike his predecessor, he was not allowed to take private practice, nor did he receive any commission in respect of new works, while he was required to spend a great portion of his time out of doors in actual personal inspection of roads and bridges. The work of the department had enormously increased, as had the expenditure, which latter circumstance, however, could not be charged against the surveyor. He was responsible for the direct maintenance of over 500 miles of main roads and 400 bridges, and for the supervision of 110 miles maintained by local authorities. The cost of the former amounted to £95,000 per annum, and of the latter to an additional £18,000. The efficient performance of the outdoor duties necessarily entailed a great deal of travelling, and there was no better or more economical method than the use of a motor car. The committee felt that it was most unjust to Mr. Horton to suggest that because he had loyally complied with the instructions of the council and spent as much time as possible on outdoor supervision, he had done so for his own amusement. In addition to the duties enumerated he had to examine and report upon all Bills before Parliament, applications to the Board of Trade, &c., affecting county interests, and, if necessary, to give expert evidence thereon. The committee trusted that the council would not refuse to recognise the care and attention which Mr. Horton paid to this work, and the improvement to the roads and bridges throughout the county which had taken place during the past eight years.

Alderman Pearson, in proposing the adoption of the report, amplified these arguments, and denied that a maximum was specified when Mr. Horton was appointed. He added that his present salary was lower than that of any county surveyor.

Mr. White, seconding a motion by Mr. Turner that the matter should again be referred back to the committee, charged the latter with discourtesy in bringing up the same recommendation after the council by an overwhelming majority had sent it back to them. He also drew attention to the facts that when Mr. Horton was appointed there were no fewer than 235 applicants for the post, that his motor car cost the county over £400 per annum, and that since 1901 the salaries of the surveyor and his staff had increased from £2,010 to £2,981.

On a division the amendment to remit the question to the committee was rejected by 36 votes to 23.

Alderman G. Slater then succeeded in bringing about a compromise by which the salary will advance at the rate of £25 per annum to £700.

Thereupon Mr. White definitely abandoned his motion.

CHANGE OF TELEPHONE NUMBER.—Readers are requested to note that "The Surveyor" telephone number is now City 1046.

WATER SUPPLY AND STREET IMPROVEMENTS IN LOS ANGELES.

The policy followed with regard to public utilities has given to the chief city of Southern California one or two notable undertakings. The greatest of these is the water rights, by which water is brought to the city a distance of 240 miles. The plans now in process of execution are designed to provide a water supply for a population of 2,000,000, and a surplus of water will be available for electric lighting and for factories.

A great aqueduct is designed to deliver a minimum of 2,800,000 gallons daily into the San Fernando reservoir, 25 miles north-west of the Los Angeles city hall. The system is gravity throughout. No pumping plants are required. The watercourse is constructed entirely of steel and concrete. There are 47½ miles of tunnel, 14 miles of syphon, 103 miles of lined and covered conduit, 40 miles of open lined conduit, and 21 miles of open unlined canal. Much preparatory work had to be undertaken, including the construction of 225 miles of mountain roads and trails, many cut in solid rock, and a telephone system 350 miles long. The total cost of the work will be about \$25,000,000. It is estimated that the surplus waters of the aqueduct will be sufficient for the irrigation of 135,000 acres of dry land contiguous to the city. The generation of power from a fall of 1,500 ft. in the aqueduct has been provided for. The total power possibilities approximate 120,000-horse power, the major portion of which can be developed within 50 miles of the city.

Considering that twenty-five years ago it had not a single paved street, Los Angeles has made remarkable progress in street improvements. There are now over 660 miles of graded and gravelled streets, including 110 miles of paved streets. There is a complete sewerage system of 523 miles, including an out-fall sewer to the ocean.—From the *Times* "Pacific Coast Number."

TOWN PLANNING LECTURES FOR AUSTRALASIA.

Mr. W. R. Davidge, F.S.I., A.R.I.B.A., ASSOC. M. INST. C.E., has been invited to deliver two addresses on town planning before the Economics Section of the British Association at Sydney and Melbourne during the course of the annual meetings, which are to be held in Australia next August.

Subsequent to the meetings, the Garden Cities and Town Planning Association is arranging for Mr. Davidge and Mr. Charles C. Reade, organiser of the Australasian Town Planning Tour, to deliver a series of lantern lectures in the principal centres of Australia and New Zealand. Mr. Reade is leaving for Australia early in March to make the necessary arrangements.

It is a sign of the times that such an old-established body as the British Association for the Advancement of Science is devoting a section of its activities to the broader aspects of town planning. Mr. Davidge's experience and qualifications should enable him to show the fundamental bearing that town planning has upon every important department of civics.

Recent developments in Australia suggest that town planning lectures in favour of legislation on the subject will be received with interest and popularity. Australia is not only seeking to lay out its new capital on modern lines, but the State of New South Wales has founded a garden suburb near Sydney, while there are a number of similar ventures being carried out in other parts of Sydney and at Newcastle by private enterprise.

As a London district surveyor Mr. Davidge is acquainted with the growth of many large cities both in England and Europe. He has carried out large housing schemes for the London County Council, including housing estates and artisans' colonies in the neighbourhood of London. Mr. Davidge is a member of the Town Planning Committee of the Royal Institute of British Architects, which has done valuable work in securing proper consideration of the subject of town planning of Greater London. He is a member of the Examining Board of the Royal Institute, and holds the gold medal of the Surveyors' Institution of Great Britain for a valuable contribution on the subject of town planning. He is also an active member of the Garden Cities and Town Planning Association, the National Housing and Town Planning Council, and the London Society.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

HIGHWAY: FLOODING.—"Surrey" writes: A repairable highway is occasionally flooded, and has been flooded from time immemorial, by the overflowing of a non-tidal river. The highway authority constructed a raised footpath some years ago along the flooded portion and parallel with the highway for the convenience of foot passengers. The water in the carriageway is sometimes 4 ft. in depth, and there are no lamps at night, and no warnings in existence. Part of the flooding is alleged to be due to obstructions in the river. Motorists sometimes inadvertently drive into the floods at night, and the cars, of course, stop, thereby causing damage to the machines and injury to the clothes and health of the driver and passengers. (1) Is it the duty of the highway authority to raise the carriageway above flood level? (2) Can the highway authority compel the riparian owners or occupiers to remove the obstructions in the river? If so, what is the course to pursue? (3) Could any person suffering damage by the existence of floods successfully sustain an action for damages? (4) The highway authority desire to erect warning signs at each end of the flooded road. If they did so would their action constitute an admission of liability for the flooding, with the consequent liability for damage to persons and property using the highway?

(1) No. "The fact that a highway is occasionally impassable on account of floods does not entail an obligation to raise its level." (Copnall's "Law Relating to Highways," 2nd edition, page 231.) (2) I think the riparian owners who placed the obstructions in the river could be compelled to remove them if they materially increase the floods which would naturally occur without them. In that case the best course would be to bring an action, with the concurrence of the Attorney-General, for an injunction. (3) If the accident was directly attributable to the increase in the floods caused by the obstructions, and if there was no want of ordinary care on the part of the injured party, he could probably sustain an action against the parties who fixed the obstructions. (4) I do not think that the erection of warning signs by the highway authority could properly be held to constitute an admission of liability on their part.

PRIVATE STREET WORKS: FOOTPATH.—"Velox" writes: The parish council of X contemplate making up a footpath between the points marked A and B on the accompanying sketch (Fig. 1). A public right of

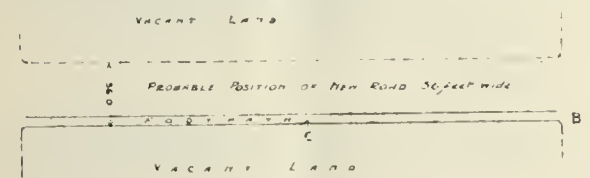


FIG. 1.

way already exists between these two points, but it is not repairable by anyone, and a portion of it, between the points C and B, is ploughed up from time to time. The parish council have suggested that the

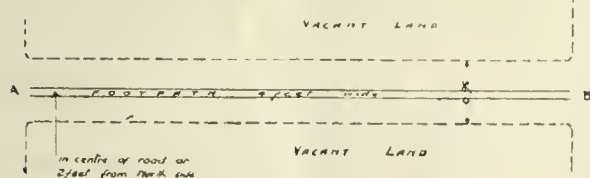


FIG. 2.

path, when made up, should be taken over by the district council. (1) If the district council agree to this, would they, under the Private Street Works Act, be chargeable with half the cost of making up a road which might be laid out (as shown) after the path was put in order? (2) Would the district council be charge-

able with any expenses under the Act if the road was so laid out that the footpath was situate along the centre of the road, or, say, 18 in. or 2 ft. from its north side (see Fig. 2)?

(1) No person would be chargeable in respect of the footpath, whether the district council had adopted it or not. See *Plumstead Board of Works v. British Land Company* (L.R., 10 Q.B., 203). The footpath would, however, have to be included in the provisional apportionment (*Herne Bay Urban District Council v. Payne and Wood*, 1907, 2 K.B., 130); and the proportion of expenses assignable thereto would have to be borne by the district council. (2) If the district council adopted the footpath, and the added strips were treated as separate streets (assuming that this could be done), the position would be practically the same as in the case of sketch 1. If, on the other hand, the strips and footpath were dealt with as an entire street, the frontagers might object on the ground that part of the street was repairable by the inhabitants at large.

NEW BUILDING IN SPACE AT REAR OF DWELLING-HOUSE, ERECTED BEFORE THE ADOPTION OF THE BY-LAWS.

—"Ynys" writes: An owner of a dwelling-house erected about forty years ago, or ten years before the by-laws were adopted in this urban district is desirous of constructing a small wash-house at the rear of his premises. The replies I have hitherto seen to such questions invariably state that it is necessary to decide whether the proposed additions constitute a new building, and that it is a question of fact for the magistrates to decide, &c. But I would like to know, supposing that it is a new building, and that the council could accordingly demand the deposit of a plan, whether they could disapprove of it, seeing that it reduces the air space in connection with the existing house erected before the by-laws were adopted, and not at the rear of a house erected under the by-laws? The by-laws now in force are the Model series, but there were no by-laws in force when the house was built. We have no by-laws as to alteration of buildings.

There does not appear to be anything in the Model By-laws prohibiting the erection of a new building on the ground that it diminishes the air-space in connection with an existing building, unless such air-space was provided in pursuance of the by-laws. In my opinion, therefore, the council cannot disapprove the plan on this ground. But, inasmuch as the wash-house (assuming it to be a new building) comes within the definition of a "domestic building," it must itself be provided with front and rear air spaces in order to comply with the by-laws. As it is not provided with an air space in front (and possibly also not at the rear) the plan can be disapproved on this ground.

BY-LAWS: JOISTS AND RAFTERS.

—"G. R." writes: As a very old subscriber to THE SURVEYOR, I am writing to ask you if you will kindly give me your opinion on the following (by-law copy herewith): Joists and Common Rafters for Domestic Buildings—p. 29, (a). What is your interpretation of (a) *re* the distance apart—viz., 15 in.? p. 30, (b), also your interpretation of (b) *re* the distance apart—viz., 15 in.? How would you explain the distance apart being 15 in. when really they are only 12 in.? The following are the by-laws referred to:—

(a) The rules relating to joists in floors are applicable only to joists laid at a distance of not more than 15 in. apart, measured from the middle of one joist to the middle of the next or to the nearest wall. And joists not exceeding the dimensions specified in the foregoing rules shall be laid and fixed at not more than the aforesaid distance apart—namely, fifteen inches; (b) the rules relating to rafters and purlins in roofs are applicable only to rafters laid at a distance of not more than fifteen inches apart, measured from the middle of one rafter to the middle of the next or to the nearest wall, and to purlins laid at a distance of from six to nine feet apart, measured from the middle of one purlin to the middle of the next or to the ridge or to the bearing upon the wall. And rafters and purlins not exceeding the dimensions specified shall be laid and fixed at not more than the aforesaid distances apart—namely, fifteen inches and nine feet respectively.

The meaning of these clauses evidently is that the joists or rafters (as the case may be) must be at such a distance apart, or at such a distance from the nearest wall, that the measurement from the middle of one joist to the middle of the next, or to the nearest wall, shall be not more than 15 in. The actual "distance apart" will, of course, vary according to the width of the joists and rafters themselves. The by-laws use the expression "distance apart" as meaning "distance apart measured in the manner described."

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. M. INST. C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

Mr. TREVOR W. PHILLIPS, of Bexhill-on-Sea, to whom the premium for December was awarded, has chosen the following books:—

- "Main Drainage of Towns," by F. Noel Taylor (Griffin),
 - "Machine Drawing and Design," by Low & Bevis (Longmans), and
 - "Municipal Engineering" (St. Bride's Press, Ltd.).
- These have been duly sent to him.

QUESTIONS.

This week answers are invited to the following questions:—

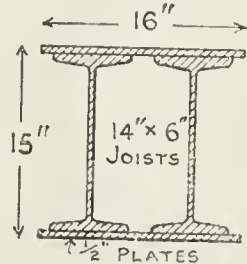
370. Temporary Building Design.—A temporary building is required, 50 ft. long, 30 ft. wide, and 10 ft. to eaves. Design a suitable structure, with steel trusses and stanchions, to be covered with corrugated iron on boards and felt, the bays to be filled in with 4-in. reinforced brickwork. (J. M. N., Hitchin.)

372. Cemetery Lay-out.—A new cemetery is to be provided in an urban district having a population of 17,000, increasing at the rate of 800 per annum. Flat meadow land, in a suitable position, having frontage to a district road (sewered), can be obtained at £350 per acre; subsoil, 5 ft. ballast overlying stiff clay. State area of land which should be acquired; give an approximate estimate of the cost of laying out the same, including buildings; state also principles governing the lay-out, and describe in detail method of drainage, arrangement of plots, disposition of buildings, &c. (Togun.)

374. Magnetic North. What is the difference in degrees between the magnetic and true north? (J. T. C., Nottingham.)

375. Working-class Dwellings.—Twenty working-class dwellings have been built at a cost of £3,500 for the buildings and £250 for the land. What must the rental be to ensure that the income will defray all loans, &c., charges? Give details as to how the allowances for empties, taxes, insurance, repairs, &c., are arrived at in the estimate. The money has been borrowed from the Public Works Loan Board at 3½ per cent for the usual periods. The poor and district rates are 6s. 3d. in the £ per annum. (Togun.)

376. Foundation for Stanchion.—A built-up steel stanchion, as shown in the diagram, transmits a load (including its own weight) of 250 tons. Design a suitable steel base and concrete and steel joist grillage foundation for the stanchion. The safe load on the earth may be taken as 2 tons per square foot. (I. W. S., Clapham Junction.)



[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

373. Strength of Shaft.—What is the safe diameter of a wrought-iron shaft to transmit 60-h.p. at 120 revolutions per minute? (T. R.)

The formula for calculating the diameter of a shaft is:

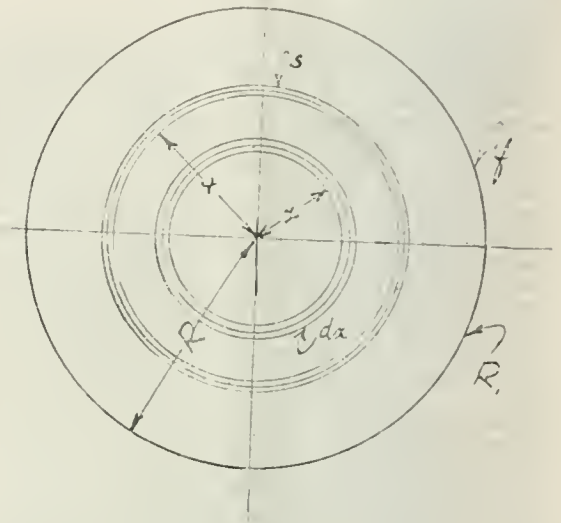
$$Tm = \frac{\pi f d^3}{16} \quad \text{and} \quad d = \sqrt[3]{\frac{Tm \times 16}{\pi \times f}}$$

where Tm = Twisting moment or "torque" in inch-lb.,
 f = Safe working stress in lb. per square inch,
 d = Diameter of shaft in inches.

This formula is determined on the assumption that rupture of a shaft occurs when the shear stress

put upon the outer skin of the shaft exceeds the shear strength of the material.

The diagram shows cross-section of a shaft which is assumed to be split into very fine portions, as



shown by circles dx . The stress on each of the very narrow rings is again assumed proportional to the radius x .

∴ The stress is greatest at the outer radius R , and the

$$\text{rule} = Tm = \frac{\pi f_s D^3}{16}$$

Where f_s = Shearing stress in inch-lb.,

Tm = Moment of resistance and torque in inch-lb.,

R = Outer radius in inches,

x = Radius of any small ring,

s = Stress per square inch at radius x ,

f = Stress per square inch at radius R ,

D = Twice radius ($2R$).

Now since the resistance increases uniformly as distance from centre we have:—

$$\frac{f}{s} = \frac{R}{x} \quad \text{and} \quad s = \frac{f \times x}{R}$$

The area of, say, the inner small ring shown on diagram = $2\pi x dx$ and its resistance = $2\pi x dx s$, which = $2\pi x dx$

$\frac{f x}{R}$, and the moment of this resistance = $2\pi x dx \frac{f x}{R} x$, which

$$= \frac{2\pi f}{R} x^3 dx.$$

Now the sum of all such terms will be the moment of

resistance of the whole section, and that = $\frac{2\pi f}{R} \int_0^R x^3 dx$

which by integration is reduced to $\frac{2\pi f}{R} \frac{x^4}{4}$. And when x

becomes R_1 , the extreme radius, the moment of resistance

$$\text{of the section} = M = \frac{\pi f R^4}{(R^2)^2} = \frac{\pi f R^3}{2^2}$$

$$\text{And} \quad \frac{\pi f R^3}{2^2} = \frac{\pi f \left(\frac{D}{2}\right)^3}{2^2} \quad \text{which} = \frac{\pi f D^3}{16}$$

∴ $Tm = \frac{\pi f D^3}{16}$ The twisting moment Tm of a shaft

transmitting 60 h.p. at 120 revolutions per minute

$$= Tm = \frac{HP \times 12}{n \times 2\pi} \quad (\text{where HP} = \text{Horse power transmitted, } n = \text{revolutions per minute})$$

$$= \frac{60 \times 33,000 \times 12}{120 \times 2 \times \pi} = 31512.6, \text{ say } 31,520 \text{ inch-lb.}$$

∴ $31,520 = \frac{\pi f D^3}{16}$. Now f = Safe tensile stress in lb. per sq. inch.

Allowing ultimate tensile strength of good wrought iron = 50,000 lb. per sq. inch, and allowing a factor of safety

The Surveyor

And Municipal and County Engineer.

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of (say) 5, then $f = \frac{50,000}{5} = 10,000$ lb. per sq. inch.

$$\therefore d = \sqrt[3]{\frac{31,520 \times 16}{10,000 \times 3 \cdot 1416}} = \text{say, } \sqrt[3]{16} = 2 \cdot 54.$$

\therefore Diameter of shaft = 2.54 inches.

The factor of safety must always depend on local conditions. The question of bending moment has not been considered in the above, no data having been given. A safe rule to work to, and which combines bending and twisting moments, is:—

$$T_1 = B + \sqrt{(B^2 + Tm^2)}.$$

Where T_1 = Equivalent twisting moment,
 B = Bending moment,
 Tm = Twisting moment of shaft.

(R. J. M., *Heywood*.)

The formula showing the relationship between the diameter of a shaft and the horse-power transmitted by it is—

$$D = 3 \cdot 3 \sqrt[3]{\frac{H.P.}{N}}$$

Where D = Diameter of shaft in inches,
 N = Revolutions per minute.

$$\begin{aligned} \therefore D &= 3 \cdot 3 \sqrt[3]{\frac{60}{120}} \\ &= 3 \cdot 3 \times \frac{1}{\sqrt[3]{2}} \\ &= \frac{3 \cdot 3}{1 \cdot 26} = 2 \cdot 62 \text{ inches.} \end{aligned}$$

Society of Engineers.—On Monday, February 2nd, Mr. H. C. H. Shenton will deliver his inaugural address as president of the Society of Engineers in succession to Mr. Arthur Valon, M.INST.C.E. The meeting will take place at the Institution of Electrical Engineers, and the chair will be taken at 7.30 p.m. During the evening the premiums awarded for papers published in the Society's "Journal" will be presented.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain,
 Each man's opinion freely is his own
 Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii, 2.

MR. BOULNOIS' "GLOSSARY OF ROAD TERMS."

SIR,—I much appreciate the kind reply of Mr. Boulnois, in your last issue, to my letter of criticism of certain portions of his glossary. He just touches upon the purposes of the work, and so raises the question as to how far they are served by the very brief definitions he has given. It is a matter for consideration to what extent a "glossary" of technical terms should include detailed information. Bare definitions, however correct, may fail to be useful. A little description is often more enlightening. The following definitions, given in response to the invitation Mr. Boulnois is good enough to extend, share this character. But whether a mere definition or a more or less elaborate description is given, it should satisfy the inquirer so far as to leave him in no doubt of the significance of the term when applied to the practice of "road making."

Ammoniacal Liquor is the term applied to the aqueous distillate obtained as a by-product in the manufacture of coal gas. It contains ammonium carbonate, ammonium sulphide, other ammonia compounds, cyanogen compounds, and numerous other substances in solution. On distillation with lime it yields ammonia.

Anthracene is a solid hydrocarbon; formula, $C_{14}H_{10}$; melting at 213 deg. Cent., boiling at 351 deg.; contained in coal tar. Commercial "anthracene" is the solid deposited from "green oil" (*q.v.*), and is composed chiefly of phenanthrene, carbazol, and 30 to 50 per cent of true anthracene.

Asphaltene is the name given originally by Boussingault to the non-volatile portion of the hydrocarbon left on steam-distilling bitumen. Some still persist in this view, but it has long been customary to apply the term to that portion of the bitumen of asphalt which is soluble in carbon disulphide but not soluble in petroleum ether. Some chemists employ other solvents for the separation. "Asphaltene" is not a definite compound.

Bitumen is a naturally occurring mixture of hydrocarbons, usually with an admixture of some sulphur compounds of mineral origin; it is often intimately associated with inorganic matter, as in rock asphalt, and has a nature and properties comparable with those characteristic of the bitumens extractable from rock asphalt. "Bitumen" is employed by some, especially in America, to signify substances other than the naturally occurring hydrocarbon mixtures here described. Such a delimitation of the term is unfortunate and unnecessary, and should be discouraged. (See below also.)

Calcium Chloride.—A compound of calcium and chlorine; formula, $CaCl_2$. It is a white solid, having a great affinity for moisture, so much so that it rapidly deliquesces (*q.v.*) on exposure to air, hence its function as a dust palliative. The commercial article is obtained in large quantity as a by-product in the ammonia and other chemical industries, and holds in absorption a considerable proportion of water.

Carbon is a non-metallic element; symbol, C; atomic weight, 12; the purer forms of lampblack, charcoal, graphite, &c., are composed almost entirely of carbon. The term is applied technically to certain insoluble or non-volatile residues obtained in the chemical analysis of asphalt, pitch, &c., which consist very largely of carbon—as "free carbon," "fixed carbon" (*q.v.*).

Deliquesce (Lat. *deliquesco*—to melt away).—A body is said to deliquesce when on exposure to the atmosphere it not only absorbs moisture therefrom, but becomes liquefied with the moisture thus absorbed. See "Calcium Chloride." (Contrast *Hygroscopic*.)

I would place some reserve on the above definition of "Bitumen." One must remember that the word is used somewhat extensively in the wider sense, and that no other word is in use to comprehend the whole class of substances having bitumen-like properties. It is therefore a matter for very careful consideration to define this term in its technical application. Two words are needed—first, one to signify the pure natural bitumen as defined above; second, one to encompass the whole class of bodies employed for purposes for which true bitumen is especially avail-

able. We have only one word at present, hence the confusion.—Yours, &c.,

S. JUDD LEWIS, D.S.C., F.I.C.

London, W.C.

January 21, 1914.

To the Editor of THE SURVEYOR.

SIR,—With reference to my letter of the 30th ult. [THE SURVEYOR, January 2nd], I am glad to hear your views, but I don't quite understand if it is "the committee" or your good self who propose to issue the definitions.—Yours, &c.,

M. SOAL.

107 Bradgate-road,
Catford, S.E.

January 8, 1914.

[We are prepared to publish any definitions suggested by our readers, and will place the results before Mr. Boulnois for his consideration before he makes a final revision of his glossary. We do not know whether the committee reporting to the Road Congress continues in being, or whether any further action by the Permanent General Committee of Road Congresses may be anticipated in the near future.—Ed. SURVEYOR.]

CAST-IRON v. STEEL PIPES.

To the Editor of THE SURVEYOR.

SIR,—The article published in your issue of December 5th deserves more than passing notice, for the subject of corrosion of water mains must always have the very serious consideration of the authorities responsible for the public water supply.

It was a far cry to Australia to discover a case of the failure of cast-iron pipe, and that, obviously, under altogether exceptional conditions. It is safe to say that this single exception to the generally satisfactory life of cast-iron mains will be considered as a strong testimony to the eminently suitable character of cast iron for water service, and to its universal application.

At the present time an immense amount of trouble is being experienced with the steel mains of the city of Rochester, and the Atlantic City mains are in the process of being replaced by cast iron. The South African instances of deplorable wastage of steel mains by corrosion are too recent and well known to need more than mention. The accumulating cases of failure of steel give rise to fresh investigation of the subject of corrosion and methods for the preservation of steel.

Engineers are satisfied with the protection of cast-iron pipes afforded by the process of Dr. R. Angus Smith as now applied. In some cases engineers have called for sand-blasting the interior of pipes for water conduits, but in others, again, it is strictly enjoined that the surface shall not have the "skin" broken. Experience gained within the foundry is not in favour of sand-blasting or excessive chipping, and the best results will be obtained by solving the conditions of manufacture that will produce a fair, smooth surface from which the moulding sand can be removed without chipping or filing, so that the coating mixture, on being applied in an approved manner, and at the proper temperature, will leave a coated surface when dry—waterproof, tough, elastic, closely adhesive, bright and smooth.

A surface that has been wrought upon will always throw off the coating sooner than the natural surface of the casting. It goes without saying that rust should not be allowed to begin before coating takes place. Pipes that have been well coated will remain intact, and the surface bright and glossy for very long periods.

The question of the coating of cast-iron pipes, perhaps, receives less attention than it deserves because the material, grey cast iron, is itself not subject to rapid or continuous corrosion. It is found to-day that pipes laid down seventy-five years ago with no protection are in continuous service without material deterioration, and are calculated to remain in use for an indefinitely long period.

The increasing care that is being devoted to the quality of iron and its chemical and physical properties is calculated to maintain the highest resisting qualities of cast iron that marked it out as eminently suitable for underground mains, or, indeed, any class of permanent structural work that has to be put in inaccessible places.

In spite of all precautions, growths sometimes accumulate in the inside of pipes and obstruct the flow, but the incrustations may be removed without fear

of damaging the pipe, whose life service will not be diminished, while the original discharge will be restored.

It is well known that the materials presently available for protecting steel are not sufficiently reliable, and that the steel itself is very much more influenced than cast iron by all the causes operating for destructive corrosion, and in the long run cast iron will be found cheaper than steel, even if steel, in the first instance, should appear to show a margin of economy over the cast-iron mains, for the latter have a wider margin of safety, and their practical immunity from corrosion relieves the authorities in their financing from providing funds for replacement.—Yours, &c.,

For COCHRANE & Co., LIMITED
(Cochrane-grove Branch),
H. A. TAYLOR.

Onnesby Ironworks,

Middlesbrough-on-Tees

January 15, 1914.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Derby T.C. (January 13th. Mr. F. H. Tulloch).—£3,750 for the purchase of property for the widening of the Wardwick.—The town clerk, Mr. G. T. Lee, stated the Wardwick was a narrow street carrying a large amount of traffic, and in consequence of the presence of interlacing tram lines in front of the property it was proposed to acquire the road was constantly being blocked. In addition to the removal of this inconvenience, the plans allowed of the improvement of a dangerous corner. The inspector also inquired into a request for sanction to a loan of £1,522 for widening Sten-on-road and the approach to the Normanton recreation ground.

Easington R.D.C. (January 13th. Mr. P. M. Crosthwaite).—£23,200 for the construction of a sewer from Haswell to the sea, a distance of about 7 miles.—Mr. R. I. Simey, barrister, appeared for the council, and explained that the scheme was for the purpose of taking the sewage from Haswell, South Hetton, East Murton, Cold Hesledon, and Dalton-le-Dale to the sea at Seaham Harbour. Filtration schemes had been proposed and rejected, and at length, in 1909, the council decided on the sea scheme, and having done so in regard to Haswell and South Hetton, thought it was obviously the best plan to take in the other places. Though the initial expenditure was large, the sea scheme, besides being the best, would be the most economical in the long run, compared with the current expenses of a filtration scheme.

Littlehampton U.D.C. (January 14th. Mr. R. H. Bicknell).—£1,000 for the purposes of fencing and laying out a new recreation ground in St. Winifred's-road.—The inspector inspected the plans, and, referring to the pavilion, remarked that he had only one fault to find with it, and that was it was too small. A building 12 ft. by 20 ft. would not shelter many people in case of rain. The surveyor, Mr. H. Howard, said it was not intended as a shelter; and tea would be served on the lawn. The inspector pointed out that as the ground was a gift, more money might be spent upon providing a good pavilion. Another foot or two would not involve much extra expense, and would make a much better job of it. The inspector stated, with regard to the period for repayment of the loan, that the council would probably be granted twenty years, and not thirty years as had been asked for.

Nottingham T.C. (January 14th. Mr. F. H. Tulloch).—£23,000 for the purpose of street paving.—The city engineer, Mr. Arthur Brown, stated that various kinds of materials were utilised to meet varying kinds of traffic and varying gradients. Answering the town clerk, the city engineer said that it was in the interests of the property owners and of the rate-payers themselves that North Sherwood-street should be paved with granite setts rather than with tar-macadam. It would be cheaper in the long run. The practice of using granite setts, Durax paving, or tar-macadam, according to circumstances, was general in most large towns.

Scunthorpe U.D.C. (January 8th. Mr. T. C. Ekin).—This was an application for the issue of a Provisional Order to amend the Scunthorpe Gas and Water Act, 1899, to include the urban district of Brumby and Frodingham within the limits of their

gas supply, and to empower the council to use, for the manufacture and storage of gas and residual products, 8 acres of land belonging to Lord St. Oswald, in Dawe's-lane, adjacent to the North Lindsey Light Railway, the land in addition to be used for refuse disposal destructor (2 acres), for an abattoir, and for highway and storage purposes 1 acre each, or 12 acres in all, and asked for power to borrow £9,900 for the purpose. It was stated that the present works were stopping the development of the town westwards, and that there would be a great saving in carting coal and residuals with the new works being placed alongside a railway.

Southmolton R.D.C. (January 2nd. Mr. W. M. Cross).—£700 for works of water supply for the village of Bishopsnympton. It was stated that, after trial pits had been sunk with satisfactory results, Mr. W. S. Gardner, the sanitary surveyor, prepared a scheme for driving an adit and collecting water in the field, building a reservoir, and laying 3-in. distributing mains, with standpipes, throughout the village.

APPLICATIONS FOR LOANS.

Aylesbury U.D.C.—£1,800 for cemetery extension, and £1,700 for the extension of the sewage works.

Bideford R.D.C.—£2,750 for a housing scheme, to be repaid in sixty years.

Bucks C.C.—£4,300 for extensions to the Slough elementary school.

Congleton T.C.—£600 for gas mains extensions.

Derbyshire C.C.—£7,000 for sanatorium purposes.

Dursley R.D.C.—£2,000 for the purchase of land for housing purposes.

Greenock T.C.—£50,000 for gasworks extensions.

Hastings T.C.—£7,150 for laying out the Briscoe estate.

Leigh (Lancs) T.C.—£11,910 for the electricity undertaking, and £11,420 for the gasworks.

Lowestoft T.C.—£2,527 for making up certain roads, and £900 for extensions to the town hall.

Lytham U.D.C.—£23,700 for an electric lighting scheme.

St. Austell U.D.C.—£5,076 for the provision of workmen's dwellings.

Scarborough T.C.—£1,125 for a street improvement.

Tonbridge R.D.C.—£7,496 for the erection of cottages.

Twickenham U.D.C.—£5,300 for resurfacing roads with asphalt macadam.

Walton-on-Thames.—£1,587 for works of sewerage.

West Hartlepool T.C.—£3,000 for additional electricity mains.

Wigton U.D.C.—£550 for footpaths.

Yarmouth T.C.—£4,800 for paving works.

LOANS SANCTIONED.

Belfast T.C.—£10,975 for paving purposes.

Bourne U.D.C.—£915 for the erection of six workmen's dwellings.

Chingford U.D.C.—£1,819 for private street improvements.

Derry C.C.—£2,500 for the new courthouse at Limavady.

Dewsbury T.C.—£58,678 for works of sewage disposal.

Edmonton T.C.—£1,520 for resurfacing The Green.

Featherstone U.D.C.—£5,806 for private street works.

Grantham T.C.—£5,646 for the erection of a council school.

Hampton U.D.C.—£2,000 for sewage disposal, to be repaid within fifteen years.

Hemel Hempstead T.C.—£5,132 for the erection of working-class dwellings.

Howden R.D.C.—£545 for experimental works in connection with the water supply.

Linthwaite U.D.C.—£22,043 for a housing scheme.

Margate T.C.—£1,253 for laying out a recreation ground.

Margate T.C.—£3,300 for the enlargement of Westonville pavilion.

Monmouthshire C.C.—£8,277 for a new school at Sirlhowy.

Nelson T.C.—£2,013 for electricity mains, and £1,937 for services.

Sawbridgworth U.D.C.—£277 for the construction of new council offices over the fire station.

Swansea T.C.—£24,500 for road work and sewerage.

Wakefield T.C.—£2,100 for the purchase of property for the widening of Kirkgate.

Westport U.D.C.—£2,553 for new sewage disposal works.

West Riding C.C.—£786 for the erection of a school at Stainforth.

Widnes T.C.—£19,170 for the extension of the Netherley waterworks.

FORTHCOMING INQUIRIES.

JANUARY.

	£
25.— Warrington. For the purposes of a dispensary (Dr. Miles B. Arnold) ...	—
27.— Bristol. For the purchase of property for road improvement (Mr. W. O. E. Meade-King) ...	1,860
27.— Finchley. For the provision of a swimming bath (Mr. H. Shelford Bidwell) ...	—
27.— Holmürth. For the provision of electricity plant (Mr. M. K. North) ...	7,500
27.— Holywell. For water supply purposes (Mr. R. G. Hetherington) ...	16,000
27.— Minehead. For street improvement works and the construction of a sea wall (Mr. P. M. Crosthwaite) ...	2,260
27.— Polesworth. For the provision of a recreation ground (Mr. F. H. Tulloch) ...	250
27.— Taunton. For recreation ground and electricity purposes (Mr. A. G. Drury) ...	5,100
28.— Barnsley. For works of sewerage (Mr. M. K. North) ...	4,000
28.— Dulverton. For sewage disposal purposes (Mr. P. M. Crosthwaite) ...	770
28.— Macclesfield. For the purposes of the water undertaking (Mr. R. G. Hetherington) ...	14,100
29.— Bradford-on-Avon. For a housing scheme (Mr. W. H. Collin) ...	1,690
29.— Hoylelake. For bath extension purposes (Mr. F. H. Tulloch) ...	825
29.— Northam. For works of sewerage and road improvement (Mr. P. M. Crosthwaite) ...	6,000
30.— Hayfield. For water supply purposes (Mr. R. G. Hetherington) ...	250
30.— Rotherham. For the purposes of road improvement (Mr. M. K. North) ...	—
30.— Sidmouth. For works of storm-water drainage (Mr. P. M. Crosthwaite) ...	570
30.— Swanage. For water supply purposes (Mr. W. M. Cross) ...	9,500
30.— Whitworth. For works of paving (Mr. F. H. Tulloch) ...	5,000

FEBRUARY.

2.— Exeter. For housing purposes (Mr. Courtenay Clifton) ...	2,115
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Journal or Volume?—The Journal Committee of the Institution of Municipal and County Engineers have had before them the recent resolution of the South-Western District suggesting that the council should take a poll of the members on this question. At the last council meeting the committee recommended, and it was agreed, that a reply should be sent pointing out that "the principle of the journal was accepted at the last annual meeting, and that in issuing the proceedings in the form of a journal the council are acting under the instructions of the annual meeting."

Flashlights on Roads.—At Ruxley Corner, Sidcup, there has been installed a lamp which, flashing sixty times to the minute, acts as a warning to night motorists to proceed cautiously. The lamp has been devised by a London firm, and is called the "Aga" flashlight. Its flicker principle is that of the lighthouse, but it has the enormous advantage of burning for a year, without attention, on a tubeful of compressed acetylene gas not much bigger than an ordinary vegetable marrow. The yearly cost is 30s., and the initial cost little more than that of an ordinary street lamp. The light of the lamp set up at Ruxley is visible 200 yds. away.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Essex £45,000, Middleton £18,000, Newcastle-on-Tyne £20,000; housing and town planning—Holsworthy, Southampton; roads and materials—Hyde £2,100, Surrey, Yarmouth £4,800; sewerage and sewage disposal—Banbury £30,500, Woking £9,450; water, gas and electricity—Alloa £6,000, Edinburgh. Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Aberdeen T.C.—The question is under consideration of purchasing the militia barracks as an administrative centre of the tramway undertaking.

Coventry T.C.—It is proposed to bring before the council in the near future a comprehensive scheme for public conveniences.

Essex T.C.—A scheme has been approved for the erection of new county offices at Chelmsford, at an estimated cost of £46,000.

Hitchin R.D.C.—The question of providing an isolation hospital is under consideration.

Leds T.C.—A deputation from the corporation has visited Edinburgh for the purpose of inspecting the markets and slaughter-houses in that city.

Licicester T.C.—A public convenience is to be erected in the Newark at an estimated cost of £630.

Lowestoft T.C.—The council have approved and adopted the plans of the borough surveyor, Mr. G. H. Hamby, for extensions to the town hall, at an estimated cost of £887.

Middleton T.C.—It is proposed to build new municipal offices at an estimated cost of £18,000.

Newcastle-on-Tyne T.C.—Plans have been approved by the Education Committee for the extension of the Rutherford Technical College, at an estimated cost of £20,000.

Richmond (Surrey) T.C.—At the January meeting it was decided to authorise a committee to have prepared plans and estimates for extending the town hall by the inclusion of the whole site of the premises now occupied by Messrs. Mawers, Limited. It was stated that the original extension scheme of 1911 was estimated to cost £7,500; for the new scheme they would have to add, say, another £3,000, exclusive of furnishing, which would mean an annual charge of £600.—The suggestion that the first-class swimming bath should be floored over was revived owing to offers from badminton clubs to rent the hall for evenings at a total for the season of £120. Mr. J. H. Brierley, the borough surveyor, estimated the cost of the floor at £285, a shed for storing it at £50, and annual expenditure at £95. Decision was deferred pending definite arrangements for letting for badminton and other purposes.

Stoke-on-Trent T.C.—A new fire station has been built in Welch-street at a cost of £1,400.

Thirsk R.D.C.—It has been agreed to build an additional block to the isolation hospital, at an approximate cost of £1,000.

Wembley U.D.C.—Arrangements have been completed for the erection of a new fire station.

Yarmouth T.C.—Plans have been adopted for the extension of the isolation hospital, at an estimated cost of £750.

HOUSING AND TOWN PLANNING.

Belfast T.C. The tender of Mr. W. McVicker, Belfast, has been accepted for the erection of 252 working-class houses for the accommodation of people dis housed by a clearance scheme. The houses will be built in compliance with the plans which were prepared in the department of the city surveyor, Mr. H. A. Cudler, M.INST.C.E., after the abandonment of the maisonette design originally adopted. They will be of what is known as the kitchen house type, but the rooms will be somewhat larger. Half of them will be two-roomed and the other half three-roomed houses, the former containing a kitchen or living room, one bedroom and a scullery, and the latter including an additional bedroom. The houses can be

built in blocks of four or more, but are equally suitable for larger blocks or even continuous rows.

Bideford R.D.C.—It has been agreed, subject to the sanction of the Local Government Board, to build ten cottages—two at Buckland Brewer, four at Hartland, two at Parkham, and two at Woolsey. The estimate of the total cost of the scheme, exclusive of land, is £2,725.

Brixham U.D.C.—Three acres of land at Garlic Rea have been purchased for £100 for the purpose of a housing scheme.

Derbyshire C.C.—The council at their meeting last week, having considered a report by the county medical officer, decided to forward to the Local Government Board a formal complaint that the Clay Cross Urban District Council had failed to exercise their powers under the Housing of the Working Classes Act. It was stated that it was twenty years since the medical officer first drew attention to the sanitation of Clay Cross.

Foleshill R.D.C.—As the result of an inspection made on behalf of the Local Government Board by Mr. Courtenay Clifton, in company with the medical and sanitary officers, the council have been called upon forthwith to take into serious consideration the carrying out of a municipal housing scheme for a portion of the district, especially the populous parishes of Bedworth and Foleshill. The board also think houses are required in the parish of Walsgrave-on-Sowe, but the opinion of the Foleshill authorities is that there is a far greater need at Keresley, where a new colliery is being established.

Holsworthy U.D.C.—The Housing Committee have gone into the plans submitted for the proposed workmen's dwellings, and, subject to the proviso that the houses could be built for £200 each, they recommend the acceptance of one set.

Llanelli U.D.C.—The surveyor, Mr. George Watkeys, has reported upon a scheme for laying out on town planning lines the Stepeny estate lands situated between Andrew-street and Felinfoel, known as the Llanerch and Penynglawdd districts. The area to be dealt with is 80 acres, and sites are provided for 664 houses, equal to about nine houses per acre, including road area, but not including the 4½ acres devoted to open spaces. The Estates Committee recommend the council to adopt the scheme.

Mansfield T.C.—The General Purposes Committee have adopted the recommendation of the Town Planning Committee that the borough surveyor, Mr. T. P. Collinge, be instructed to prepare a plan of the undeveloped land in the western part of the borough, and including such part of the district of Mansfield Woodhouse as he might consider desirable, the plan to be submitted to the committee with a view to a scheme for this area being prepared and proceeded with as rapidly as possible. The committee also recommended that the scheme for the two areas in the town planning scheme for 1913 be proceeded with at once.

Newton Abbot R.D.C.—Arrangements have been completed for the purchase of land at Chudleigh for a housing scheme.

Sidmouth U.D.C.—A sum of £1,700 is to be paid for a site at Higher Salter's Meadow for the purpose of a housing scheme.

Southampton T.C.—The borough engineer, Mr. J. A. Crowther, has received instructions to submit alternative schemes for the erection of terrace houses (16 ft. frontages), or semi-detached houses (15 ft. frontages), on the land southward of the schools in Manor Farm-road, together with a report on the subject of rentals.

Troon T.C.—The question of promoting a suitable housing scheme has been referred to the council in committee.

Wishaw T.C.—In consideration of the fact that there is a scarcity of workmen's dwellings in this locality, and that the people ejected from their homes would have nowhere to go, the council have declined to grant closing orders meantime, or until the Housing Committee had gone further into the question of providing accommodation for these people.

PARKS AND OPEN SPACES.

Hastings T.C.—The work of laying out the Brisco estate land is proceeding. The council have sanctioned the expenditure of over £7,000, including £600 for bowling greens, £250 for tennis lawns, £250 for promenade lawns, £500 for terraces, £750 for shelters, £400 for pavilions, and £500 for lifts.

Llandudno U.D.C.—The council have purchased land for a new golf links. The area of land included in the purchase is 123 acres, and the agreed price is £103 per acre, making a total of £14,256, which amount the council will now seek power to borrow, together with a sum for laying out the links.

REFUSE COLLECTION AND DISPOSAL.

Hexham R.D.C.—The question of a properly organised system of scavenging has been referred to the Sanitary Committee for report.

ROADS AND MATERIALS.

Aberdeen T.C.—The Streets and Roads Committee recommend the widening of Guild-street at a cost of £300.

Abergele U.D.C.—It has been agreed to lay an asphalt belt 9 ft. wide along the whole length within the chains on the promenade at Pensarn, at a cost of £70.

Ballymoney R.D.C.—The council have agreed to the proposal of the county surveyor, Mr. John H. Brett, to improve the surface of the main road from Ballymena to Ballymoney for a distance of about 3½ miles from the Ballymena rural district boundary; to steam roll and coat with tar-spray in such a manner as would be approved by the Road Board, at a cost of £2,240, half to be defrayed by the Road Board, a quarter by the county at large, and the remainder by the rural district of Ballymoney. The council's share will be £560, and the period of repayment is to be spread over two years.

Balrothery R.D.C.—The county surveyor, Mr. William Collen, reports that, as a result of the strong recommendations made to the Road Board with regard to the uncompleted improvement of the Dublin to Dundalk road, a grant of £3,900 has been obtained.

Blackburn T.C.—The Finance Committee recommend an expenditure of £10,330 on improvements in Whalley, New-road, Bolton-road, and Victoria-street.

Bradford T.C.—It is proposed to carry out street works in several thoroughfares at a cost of £750.

Coleraine R.D.C.—After considering the list of road contracts, the council recently agreed to curtail the quantity of metal on a number of first and second class roads. By this a "saving," as it was termed, was effected of £525, of which they authorised an expenditure of £445 on urgent repairs to bridges, including a sum of £100 for the extension of the granite path promenade at Portstewart.

Colwyn Bay U.D.C.—The surveyor, Mr. William Jones, has been instructed to set back by 6 ft. the kerb in Station-road—the main entrance to the town from the railway station.

Fermanagh C.C.—An intimation has been received from the Road Board that they will be prepared to make grants of 50 per cent of the cost of improving roads leading to Bundoran, Omagh, Clones, and Swanlinbar. The grant amounts to £1,005.

Haddingtonshire C.C.—The Eastern District Committee have adopted a scheme for the maintenance of the great post roads for five years, including the purchase of the necessary plant. The scheme involves an expenditure of £11,800, towards which it is understood that the Road Board will make a grant estimated at £3,431, and also give a grant of £6,931, free of interest. The district road surveyor has been instructed to prepare a formal scheme to be submitted to the Road Board.

Hyde T.C.—Works of road improvement have been approved, at an estimated cost of £2,100.

Peterborough T.C.—The difficulty of dealing with the grievance of horses slipping on tarred roads was illustrated to the council recently by the borough surveyor, Mr. J. W. Walshaw, who stated that once they used sand and small gravel, but the sand got into a disagreeable state of mud and the gravel was injurious to the horses' feet, and sometimes the horses slipped on it because it would not grip. They then used granite chips as a preventative to slipping, and that was really best, but it affected cycles and motor tyres, so he gave it up, and lately had been using slug dust.

Sunderland T.C.—The Road Board have made a grant of £2,000 towards the £4,000 expended in paving a section of the Newcastle and Shields road.

Surrey C.C.—Plans and suggestions for the improvement of the East and West road between Shalford and Reigate have been sent to the local authorities interested, and Reigate (borough and rural) and Borking urban approve the scheme, but suggest further widenings. Hambledon, Guildford and Dorking rural councils disapprove, but favour certain widenings, and the Duke of Northumberland, who is the landowner for the greater portion of the route, also disapproves. It was decided on Tuesday that the county surveyor, Mr. A. Dryland, should negotiate with the approving authorities with a view to carrying out the widenings and improvements in their areas.—The Road Board have offered £800, approximately half the cost, of widening the Portsmouth main road between Windows Bridge and Griggs-hill, and will contribute to the widening of London-road, Guildford, if the land can be obtained at a reasonable cost. The extensive widening between Merton High-street and the Masonic Hall, estimated to cost £5,950, the board think, is a matter for a long loan. They will contribute about one-third of the cost of diverting and widening the Surbiton and Ewell-road near Tolworth Court Farm, a dangerous bend. The board also promise a third of the cost of widening and straightening the Esher and Molesey road, and of rounding-off and widening corners on the Godstone and Westerham road, and towards the rebuilding and widening of the bridge over the Ash Vale Canal.—The contemplated improvement of Richmond Bridge is referred to elsewhere.

Tiverton R.D.C.—The council have adopted the recommendation of the Highways Committee to employ labour direct on the district roads on the expiration of the manual labour contracts in March.

Wells (Norfolk) U.D.C.—The council have approved the plans of the surveyor, Mr. R. G. Coles, for repairing the Butlands roads at an estimated cost of £386.

West Dean R.D.C.—The surveyor, Mr. P. Phipps, has reported that the estimated cost of making a road at Worrall Hill would be £1,300, and the council have decided to schedule the scheme for future consideration.

Windsorham (Surrey) U.D.C.—Reference was made recently in the Highway Committee's report to the scheme for widening Bagshot Bridge and its approaches, and to the alternative scheme of constructing another roadway from a point near Bagshot Park Lodge to join the main road near the Fighting Cocks inn, in order to deal with the difficulty of the through motor traffic. The surveyor, Mr. O. G. Stanley, reported that the second scheme would mean the construction of an entirely new road 40 ft. wide, with a carriageway 26 ft. wide, and a new bridge would have to be built over Windle brook. The council decided to ask the county council to adopt the second scheme, provided that the Road Board were willing to contribute three-fourths of the cost and the county council two-thirds of the remainder.

Yarmouth T.C.—The council have adopted the estimate of the borough surveyor, Mr. J. W. Cockrill, for paving works estimated to cost £4,800.

SEWERAGE AND SEWAGE DISPOSAL.

Aspatia U.D.C.—The council have adopted the plans of Mr. Redwell for the extension of the sewers at an estimated cost of £319.

Atcham R.D.C.—A new sewerage scheme for the village of Pontesbury, constructed at a cost of about £3,000, has been formally opened.

Banbury T.C.—An extensive drainage scheme, estimated to cost over £30,000, is to be carried out under the direction of the borough surveyor, Mr. N. H. Dawson, by means of direct labour.

Coseley U.D.C.—The surveyor, Mr. C. E. Horton, has received instructions to prepare plans for a sewer extension scheme.

Halifax T.C.—Sewerage works, estimated to cost £2,295, are to be carried out under the direction of the borough engineer, Mr. J. Lord.

Ham U.D.C.—A sewerage extension scheme prepared by the surveyor, Mr. K. W. Hindhaugh, and estimated to cost £874, with an annual charge for electricity and water of about £25, has been adopted, and the usual application will be made to the Local Government Board.

Porthcawl U.D.C.—It has been decided to comply with the request of the Local Government Board to

submit at once a suitable sewerage scheme for the eastern portions of the district.

Woking U.D.C.—The council have approved a scheme prepared by Mr. G. Midgley Taylor for the improvement of the sewage disposal works, at an estimated cost of £9,450.

WATER, GAS, AND ELECTRICITY.

Alloa T.C.—The Water Committee have received authority to report upon a scheme for an improved water supply estimated to cost £6,000.

Edinburgh T.C.—The council have approved of a draft Provisional Order for extending the corporation area of supply of electricity so as to include the parishes of Cramond, Corstorphine, Colinton, Liberton, and Newton, in the county of Mid-Lothian.

Essex and the Dittons U.D.C.—At the last monthly meeting Mr. H. C. Fread, the surveyor, presented a statement showing terms quoted by the gas company and the electric light company for lighting the public-street lamps of the district. For a three years' contract the gas company's terms amounted to £1,121, being the terms of the present contract. The terms of the electric light company, including repayment of loan for cost of installation, were £625, but the latter estimate was for only 183 lamps, whereas the gas company's estimate was for the whole of the lamps—116. On a ten years' contract the figures were: Gas company £1,331, electric light company £1,560.

Frome R.D.C.—Consideration is being given to a water supply scheme for the village, which is estimated to cost £1,850.

Lexden and Winstree R.D.C.—The council have instructed Messrs. Taylor & Wallin, civil engineers, of Newcastle-on-Tyne and London, to prepare a scheme for and report upon water supply for the parish of Layer Marney.

Newport (Salop) R.D.C.—The services of an engineer are to be engaged to advise the council upon the matter of the provision of a scheme for supplying water to contributory districts within the council's area.

Plympton R.D.C.—The water engineer, Mr. F. A. Clark, recommends that a new 4-in. pipe should be laid for the supply of Lower Hooe and Turnchapel, the cost being estimated at £450. In connection therewith, the council's engineer, Mr. F. A. Clark, has been appointed to interview the superintendent civil engineer at Devonport to ascertain what contribution the Admiralty would be prepared to make towards the proposed scheme, together with the construction of a tank or reservoir at the highest part of Turnchapel.

Yarmouth T.C.—The tender of Messrs. Crompton & Co., Limited, at £883, has been accepted for a high tension switchboard.

MISCELLANEOUS.

Bermondsey B.O.—The borough council and the London County Council have been at variance for over a year as to whether the conduit system or the overhead system of traction should be adopted for electrifying the existing horse tramways from Tower Bridge-road to Lower-road, Deptford. It was stated that whereas the cost of the overhead system would be £56,940, the cost of the conduit system would be £137,030. The borough council have now submitted a scheme for reconstructing the line on the conduit system, the widenings to cost only £17,000 (instead of £67,000, as estimated, if the conduit system was adopted), and it is understood this proposal has commended itself to the Highways Committee, and will in all probability be recommended for adoption by the county council.

Brierley Hill U.D.C.—Brierley Hill fire brigade are to be congratulated upon the success which has met their appeal for funds for the provision of a steam fire engine; they have received just over £600, and on February 5th the new engine, which is of the Merryweather "Gem" type, will be "christened" and presented to the town.

Redcar U.D.O.—The "too old at forty" controversy was renewed at a recent meeting of the council, when, as on a previous occasion, an attempt was made to rescind the minute passed in September, 1912, that no new workmen over the age of forty be engaged permanently. Mr. T. Wrightson, who brought the subject forward, said the council were setting a bad example by having such a minute on the books. If other firms acted similarly

what would become of the workers? Mr. Tomlinson seconded the rescinding resolution, and after discussion it was carried with unanimity, the council also resolving that the surveyor, Mr. J. Howeroft, should have entire freedom in dealing with appointments.

Strabane U.D.C.—The Duke of Abercorn has offered to sell his market rights to the council, and a committee of the whole council has been appointed to go into the matter.

PERSONAL.

Mr. F. Hopkinson, surveyor and inspector to the Blyth and Cuckney Rural District Council, has resigned.

Mr. G. J. Wooldridge, surveyor to the Woking Urban District Council, has had his salary increased by £50 per annum.

Mr. F. W. Knight, surveyor and water engineer to the Teignmouth Urban District Council, has had his salary increased from £230 to £275 per annum.

Mr. J. H. Edmondson, chief assistant at the Hacken sewage works of the Bolton Corporation, has been appointed chemist and manager of the Southall-Norwood sewage works, Middlesex.

Mr. A. E. Darby, ASSOC. INST. C.E., A.M.I. MECH. E., borough engineer and surveyor of Bethnal Green, has had his salary increased to £500 per annum by a unanimous vote of the borough council.

Mr. J. H. Moore, assistant surveyor and nuisance inspector to the Hipperholme Urban District Council, having resigned, Mr. S. W. Thompson (the present clerk and surveyor) has been appointed in his place.

Messrs. T. W. A. Hayward (Battersea), P. H. Palmer (Hastings) and H. T. Wakelam (Middlesex) were, at the last council meeting, nominated as vice-presidents of the Institution of Municipal and County Engineers.

Mr. Richard Thomas Porter, engineer, of Beckenham and Rochester—whose death, at the age of seventy-nine, was recently announced—was the chairman of Messrs. Aveling & Porter. He left estate of the gross value of £108,284.

Mr. James Jerman, hitherto architect and surveyor to the Exeter Education Authority, has been appointed consulting architect to the authority at a salary of £52 10s. per annum. The town council have resolved to appoint an architect in the city surveyor's department at a salary of £220, rising to £250.

Mr. Herbert Goodyear, borough surveyor of Colchester, has resigned after twenty-eight years' service, and Mr. A. E. Slater, ASSOC. INST. C.E., is meanwhile acting as borough surveyor. Mr. Slater is the author of the work "Structural Economy," published by the St. Bride's Press, Limited, a little over a year ago.

Mr. Frederick P. Dixon, M. INST. C.E., surveyor to the Rathmines (co. Dublin) Urban District Council, was recently presented with a silver salver and a pair of sauce-boats, on the occasion of his retirement, as a token of the high appreciation in which he was held by his colleagues. He is succeeded in the position by Mr. W. R. Stephens, M. INST. C.E.I., who has been his assistant for the past twenty-two years.

Mr. Thomas Fenn, who died recently at the age of seventy, was for some years surveyor to the Short Heath Local Board. He was subsequently engaged in mining operations in South America, and on returning home was appointed clerk of the works in connection with the storm-water culvert constructed by the Leicester Corporation. His last appointment in a similar capacity was in connection with the construction of the high and low level sewers at Belper. Mr. Thomas Fenn, surveyor to the Belper Urban District Council, is the eldest son of the deceased.

Messrs. C. L. Roberts, borough surveyor, Pwllheli; E. W. Jones, county surveyor (Eastern Division), Denbighshire; J. A. Manning, divisional main road surveyor, Hampshire County Council; W. L. Jenkins, county surveyor, West Suffolk; E. J. Stead, county surveyor, North Devon; H. S. Wood, chief assistant to borough engineer, Brighton; F. Wood, borough engineer, Fulham, and W. F. Y. Molineux, surveyor, Ulverston Rural District Council, have been elected members. Messrs. T. Gourlay, chief assistant road surveyor to Fife County Council, and S. Brassy-Edwards, engineering assistant to city engineer, Liverpool, associate-members, and Messrs. P. G. Thorby, borough

engineer's office, Southend-on-Sea; E. T. Mobbs, engineer's office, Watford Urban District Council, and L. F. Dunbar, borough surveyor's office, Hemel Hempstead, students, of the Institution of Municipal and County Engineers. Messrs. H. K. De Kretser, district engineer, public works department, Ceylon, and J. Pryde, road surveyor for Western District of Kirkeudbright, have been transferred from the class of associate-member to that of member.

Brighton Aquarium Scheme.—The official report of the General Purposes Committee of the Brighton Town Council on the question of polling the town concerning the proposed developments at the Brighton Aquarium recommends that there be no poll of the town, and that the proposed Bill be withdrawn in order that the whole matter may be further considered. The scheme was recently condemned at a formally convened town's meeting.

FOR OTHER ADVERTISEMENTS

See End of Paper.

CITY OF ST. ALBAN.

APPOINTMENT OF SURVEYOR'S CLERK.

The Council invite applications for the above appointment. Applicants must have had experience in a Municipal Surveyor's Office, including the keeping of all the various books, and be an efficient Short-hand Typist.

The salary will be at the rate of £70 per annum.

Applications, in candidate's own handwriting, stating age and qualifications, to be addressed and delivered to the undersigned, accompanied by copies of three testimonials, not later than Thursday, the 12th February, endorsed "Surveyor's Clerk." Canvassing will be deemed a disqualification.

E. P. DEBENHAM,
Town Clerk.

Town Clerk's Office,
St. Albans.
January 21, 1914.

(1,182)

COUNTY BOROUGH OF STOCKPORT.

CHIEF ASSISTANT—BOROUGH SURVEYOR'S OFFICE.

The Highways and Sewers Committee of the County Borough of Stockport invite applications from qualified persons from 30 years to 35 years of age, for the position of Chief Assistant in the Borough Surveyor's Office. Salary £200 per annum, rising to £260 by annual instalments of £10.

It is essential that each candidate should be a fully qualified Civil Engineer, and have had the necessary Education and Municipal Training of a Borough Surveyor's Office, to fill the position—including actual experience in the design and supervision of Tramways and Bridge Construction, Sewage Works, Private Street Improvement Works, &c.—and sufficient Architectural knowledge to design Buildings in connection with Engineering Works.

Full particulars of the duties and conditions relating to the appointment, together with Form of Application, can be obtained on application to the undersigned.

Applications to be on the prescribed Form (no other will be considered), and addressed to the Borough Surveyor, endorsed "Chief Assistant," and must be delivered not later than Thursday, 12th February next.

JOHN ATKINSON, ASSOC. M. INST. C. E.,
Borough Surveyor.

Town Hall,
Stockport.

January 21, 1914.

(1,191)

METROPOLITAN BOROUGH OF WOOLWICH.

SUPPLY OF ROAD MATERIAL, FORAGE, STORES, &c.

The Council of the Metropolitan Borough of Woolwich are prepared to receive Tenders for the supply of the undermentioned Road Material, Forage, Stores, &c., from the 1st April, 1914, to the 31st March, 1915.

1. Ballast, Sand, &c.
2. Brooms, Brushes, &c.
3. Cement.
4. Chandlery.
5. Drain Pipes.

6. Forage (for six months only from 1st April, 1914).
7. Granite Kerb.
8. Harness.
9. Ironmongery.
10. Road Material.
11. Sewer Ironwork.
12. Timber.

Forms of Tender, with Schedules and further particulars, can be obtained from the office of Mr. J. Rush Dixon, M. INST. C. E., Borough Engineer, Town Hall, Woolwich.

The persons or firms tendering will be required to make a declaration that they have paid and will pay trades union rates of wages, and have observed and will observe trades union hours of labour upon all work carried out for the council. The persons or firms whose tenders are accepted will be required to enter into formal contracts.

Samples may be inspected at the Town Hall, Woolwich, between 9 a.m. and 1 p.m., and 2 p.m. and 5 p.m. (Saturday, 9 a.m. to 1 p.m.). No Tender will be considered in cases where samples are provided unless the tenderer or his agent has inspected them and signed the book to that effect. No tender will be considered unless on the authorised Form of Tender. Sealed Tenders, based on properly priced out Schedules, must be delivered to me at the Town Hall, Woolwich, not later than 12 o'clock noon on Wednesday, the 11th February, 1914, in envelope endorsed "Tender for—."

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

ARTHUR B. BRYCESON,
Town Clerk.

Town Hall,
Woolwich.

January 20, 1914.

(1,190)

ILFORD URBAN DISTRICT COUNCIL.

TO CONTRACTORS, MERCHANTS, IRON-MONGERS AND OTHERS.

The above-named Council invites Tenders for the following for the twelve months ending 31st March, 1915:—

1. Granite Macadam.
2. Broken Flints.
3. Tar Paving.
4. Portland Cement.
5. Lime, &c.
6. Stock and other Bricks.
7. Thames Ballast, &c.
8. Stoneware Pipes.
9. Iron Castings.
10. Coal and Coke.
11. Provender (six months only).
12. General Horse Hire and Cartage.
13. Miscellaneous Oils and Paints.
14. Wheelwrights' Timber, Tools, &c.
15. General Timber.
16. Brooms, Brushes, Baskets, &c.
17. Engineers' Sundries, Tools, &c.
18. Iron Farriers' Tools, Nails, Screws, &c.
19. Drysaltery, Soaps, and Sundries.
20. Draughtsmen's Materials.
21. Harness, &c.
22. Winding Clocks.
23. Pitch, Croosote, Oil, &c.
24. Hire of Cycles.
- Disinfectants.

Forms of Tender, conditions and full particulars may be obtained on application to Mr. H. Shaw, M. INST. C. E., Engineer and Surveyor, Town Hall, Ilford.

All applications for Forms of Tender to be accompanied by a deposit of 5s., which will be returned on receipt of bona-fide Tenders, and after adjudication by the Council on the Tenders received.

Sealed Tenders, endorsed "Tender for —" (as the case may be), to be delivered to the undersigned on or before Monday, 9th February, 1914.

The Council does not bind itself to accept the lowest or any Tender.

(By order)

ADAM PARTINGTON,
Clerk of the Council.

Town Hall, Ilford.

January 22, 1914.

(1,202)

METROPOLITAN BOROUGH OF SHOREDITCH.

ANNUAL CONTRACTS.

The Council of the Metropolitan Borough of Shoreditch are prepared to receive Proposals and to Contract with any person or persons for the following Articles and Works for one year from the 1st day of April next to the 31st day of March, 1915 (inclusive) viz.:-

1. Highways Department.—For Paving, Repairing, and Relaying the Footway and Carriageway Pavements within the said Borough, and the Supply of Materials. (A £10 Bank of England Note to be deposited with the Borough Accountant at the Town Hall at the time the Tender is lodged, otherwise the Council will not be responsible for same.)
2. For Supplying and Laying Patent or Manufactured Stone or other Paving Material.
3. Asphaltting.
 4. Broken Granite.
 5. Plumbers' Work.
 6. Smiths' Work.
 7. Drain Pipes, Junctions, Bends, &c.
 8. Drain Rods, Pails, Ropes, &c.
 9. Timber.
10. Sewer Ironwork and Street Posts
11. Lime, Cement, &c.
12. General Cartage. (A £10 Bank of England Note to be deposited with the Borough Accountant at the Town Hall at the time the Tender is lodged, otherwise the Council will not be responsible for same.)
13. Street Name Plates, Notice Boards, Writer's Work.
14. Ballast, Hoggin, Shingle and Sand.
Samples of the above Articles can be seen at the Depot, Flemming-street, Kingsland-road, N.
15. Scavenging and other Departments.—Iron, Ironmongery, Coach Ironmongery, Coal and Coke, Basket Work, and Miscellaneous Indianrubber Work, Brooms, Brushes, Harness, Sundries, Loin Cloths, and Sail Cloth Covers.
16. Uniforms and Costumes.
17. Paints, Oil, Cotton Waste, &c.
18. Gas Mantles and Chimneys.
Samples of the Articles required for these Departments may be seen at the Town Hall, Old-street, E.C.
19. Printing for 3 years.
20. Stationery for 3 years.

Samples may be seen at the Town Clerk's Office.

Forms of Tender for all the above-mentioned can be obtained on application to the undersigned.

Tenders must be sent, properly endorsed, to the Town Clerk at his Offices as under, before 3 o'clock on Tuesday, the 17th February, 1914, after which time no Tenders can be received.

Contractors must agree to pay the Trade Union rate of wages observed at the date of the Contract, and to observe the usual hours of labour recognised by the trade, and not to sub-let the Contract.

The Council does not pledge itself to accept the lowest or any Tender, and none but Tenders on the official printed Forms will be received, which, with any further information, may be obtained from the various Departments of the Council, or from

J. A. D. MILNE,
Town Clerk.

Shoreditch Town Hall,
Old-street, E.C.

January 20, 1914. (1,201)

NORTHAMPTONSHIRE COUNTY COUNCIL.

MAIN ROADS.

SUPPLY OF GRANITE.

The Roads and Bridges Committee invite Tenders for the Supply of Broken Granite, delivered at various Stations and Wharves in the County.

Tenders to be sent in not later than February 9th next to the undersigned, from whom Forms of Tender and other particulars may be obtained.

C. S. MORRIS,
County Surveyor.

County Hall,
Northampton.

January 21, 1914. (1,196)

RURAL DISTRICT COUNCIL OF NEWARK.

TENDERS FOR ROAD MATERIALS.

The above Council invite Tenders for the supply of about 850 tons of Granite, 1,900 tons of Slag, and 250 tons of Tar-macadam, to be delivered in such quantities and at such times and places in their district as the Council, or their District Surveyor, shall require and direct.

Sealed Tenders, marked "Tender for Materials," to be sent to me, the undersigned, on or before Saturday, February 7th, 1914, and samples must be delivered, free of expense, to the Board Room, The Ossington, Newark, on or before Monday, the 9th day of February next.

The Council do not bind themselves to accept the lowest or any Tender, and they reserve to themselves the right to accept such part of any Tender as they may deem proper.

The Contractor will be required to enter into a Bond for the due fulfilment of his Contract.

Further particulars, Specifications and Forms of Tender may be obtained from Mr. R. Oakden, junr., 27 Winchilsea-avenue, Newark, upon receipt of a foolscap stamped and addressed envelope.

(By order of the Council)

A. J. FRANKS,
Clerk.

Union Offices,
24 Lombard-street, Newark.
January 21, 1914.

(1,193)

PENRITH URBAN DISTRICT COUNCIL.

DRAINAGE PIPES.

The Council invite Tenders for the immediate supply of about 1,000 yds. of second quality 9-in. diameter Earthenware or Stoneware Glazed Socketed Pipes, delivered at Penrith Station. Sealed Tenders, endorsed "Drainage Pipes," stating full particulars of Pipe offered, accompanied by a sample pipe, must be delivered to the undersigned not later than 12 o'clock noon on Thursday, February 5th, 1914.

GEORGE WAINWRIGHT,

Clerk of Urban Council.

Town Hall,
Penrith.

January 22, 1914.

(1,194)

CUDWORTH URBAN DISTRICT COUNCIL.

The above Council invite Tenders for the supply and delivery of a 10-ton Steam Road Roller, fitted with an approved Scarifier.

Tenders, including Specifications, to be forwarded to the undersigned not later than 12 o'clock noon on Thursday, the 5th February, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

W. E. RALEY,

Solicitor and Clerk to the Council.

Regent-street,
Barnsley.

January 21, 1914.

(1,195)

NORTHAMPTONSHIRE COUNTY COUNCIL.

TO HAULAGE CONTRACTORS.

Tenders are invited for the Haulage of Granite by Motor Wagons from railway stations to the various main roads in the County.

Tenders to be sent in not later than February 9th next to the undersigned, from whom Forms of Tender and Schedule of Quantities may be obtained.

C. S. MORRIS,

County Surveyor.

County Hall,
Northampton.

January 21, 1914.

(1,197)

PARTNERSHIPS.—CHIEF ENGINEER and SURVEYOR to important Municipality desires Partnership in well-established firm of Civil Engineers and Surveyors; fullest investigation.—Box 1,364, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,200)

JUNIOR ASSISTANT (21) desires position; 3 years articled, 2 years assistant. Plans, tracings, surveying, levelling, typing; office routine. Good testimonials; moderate salary.—Box 1,365, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,198)

TO PUPILS and ASSISTANTS.—Advertiser has for disposal, cheap, a large supply of Engineering Books, all practically new. Write for list.—Box 1,366, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,199)

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

NORTH-WESTERN DISTRICT.

A meeting of the institution is to be held in the North-Western District at Manchester on February 20th and 21st.

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District will be held at Wakefield on Saturday, March 21, 1914.

THOMAS COLE,
Secretary.

92 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District of the Institution of Municipal Engineers will be held at Manchester on Saturday, January 31st.

PROGRAMME.

- 1.30 p.m.—Business meeting at the Mitre Hotel, Cathedral-close, to elect district chairman and hon. district secretary, and to arrange programme.
- 3 p.m.—Visit to the Stuart-street station of the Manchester Corporation electricity works, by kind permission of Mr. S. L. Pearce, M.INST.C.E., M.I.E.E., the chief engineer. Members are requested to assemble at 3 o'clock sharp.

B. WYAND,
Secretary.

39 Victoria-street, S.W.

CONCRETE INSTITUTE.

The forty-third ordinary general meeting will be held at Denison House, 296 Vauxhall Bridge-road, Westminster, S.W. (close to Victoria Station), on Thursday, January 29th, at 7.30 p.m., when a discussion will take place on the following reports:—

- (1) Draft report of the Joint Committee of Representatives from the Quantity Surveyors' Association, the Quantity Surveyor members of the Concrete Institute, and the Reinforced Concrete Practice Standing Committee of the Concrete Institute on a standard method of measurement for reinforced concrete.
- (2) Draft report of the Reinforced Concrete Practice Standing Committee of the Concrete Institute on a suggested tabulated form for preparing quantities for reinforced concrete.

The reports are compiled with a view to securing uniform practice and of economising labour, and contain illustrated suggestions for the manner of preparation of preliminary drawings by engineers for the information of their surveyors when preparing the quantities, and the discussion is arranged with a view to ascertaining the views of members collectively so that the reports may be put in final form subsequently.

Visitors' cards can be had on application.

H. KEMPTON DYSON,
Secretary.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

SURVEYOR'S ASSISTANT.—January 26th. Corporation of Harrogate. £100 per annum. Mr. C. E. Rivers, borough engineer and surveyor.

CLERK OF WORKS.—January 26th. Finchley Urban District Council. £3 3s. per week.—Mr. E. H. Lister, clerk.

BOROUGH SURVEYOR'S ASSISTANT.—January 26th.—Islington Borough Council. £90—£120 per annum.—Mr. W. F. Dewey, town clerk.

CLERK OF WORKS.—January 26th.—Bognor Urban District Council. £3 10s. per week.—Mr. J. Jubb, clerk.

SURVEYOR AND INSPECTOR.—January 26th.—Wellington (Salop) Rural District Council. £240 per annum.—Mr. J. V. Lander, clerk.

INSPECTOR OF NUISANCES.—January 26th.—Chadderton Urban District Council. £150—£170 per annum.—Mr. H. Hoyle, clerk.

SURVEYOR'S ASSISTANT.—January 27th.—Corporation of Newark. £90—£120.—Mr. Godfrey Tallents, town clerk.

JUNIOR ASSISTANT.—January 28th.—Ealing Town Council. £50 per annum.—Borough Surveyor.

SURVEYOR'S CLERK.—January 30th.—Cannock Urban District Council. 25s. a week.—Mr. C. A. Loxton, clerk.

MECHANICAL ENGINEER AND FOREMAN.—January 30th.—Corporation of Bedford. £2 10s.—£3 per week, with house, coal, and light.—Mr. N. Greenshields, borough engineer and surveyor.

MAIN ROAD INSPECTORS.—January 30th.—Essex County Council. £175—£230 per annum.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

ASSISTANT.—January 30th.—Bourne Rural District Council. £65 per annum.—Mr. Thomas Lake, district surveyor, Bourne, Lines.

ENGINEER AND SURVEYOR.—January 31st.—Rhondda Urban District Council. £500—£750.—Mr. W. P. Nicholas, clerk, Pentre, Rhondda.

BOROUGH SURVEYOR AND WATER ENGINEER.—January 31st.—Borough of Godalming. £250—£350.—Mr. T. Percival Whatley, town clerk.

ASSISTANT HIGHWAY SURVEYOR.—January 31st.—Bowland Rural District Council. £60 per annum.—Mr. Thomas Eastham, clerk, 21 Church-street, Clitheroe.

SURVEYOR'S CLERK.—January 31st.—Gellygaer Urban District Council. £80—£100 per annum.—Mr. Frank T. James, clerk.

INSPECTOR OF NUISANCES.—February 1st.—Faversham Rural District Council. £145 per annum.—Mr. Guy Tassell, clerk.

INSPECTOR OF NUISANCES.—February 2nd.—Blyth and Cuckney Rural District Council. £130 per annum.—Mr. J. S. Whall, clerk.

ROAD AND GENERAL FOREMAN.—February 5th.—Corporation of Gravesend. 45s. per week.—Mr. H. H. Brown, town clerk.

ASSISTANT SANITARY ENGINEERS.—February 7th.—Government of India. 800—1,000, 500—700 and 400—620 rupees a month.—Secretary, Revenue Department, India Office, London, S.W.

BRIDGE AND MAIN ROAD SURVEYOR.—February 9th.—Devon County Council. £400 a year, with £200 a year for expenses.—Mr. F. Bailey, clerk, The Castle, Exeter.

GAS ENGINEER AND MANAGER.—February 9th.—Swinton and Mexborough Gas Board. £200 per annum.—Mr. J. W. Hattersley, clerk, Mexborough, nr. Rotherham.

SUPERINTENDENT OF FIRE BRIGADE.—February 28th.—Municipality of Karachi. 200 rupees per month, with free quarters.—Mr. Measham Lea chief officer and chief engineer.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

ASSISTANT ENGINEERS AND DRAUGHTSMEN.—Public Works Department of Sierra Leone. Engineers, £300—£400; draughtsmen, £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

OFFICE ASSISTANT AND PROVINCIAL ENGINEER.—Public Works Department of the Gold Coast Government. Office assistant, £500, with duty allowance of £100; provincial engineer, £400—£500, with duty allowance of £80.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

TEMPORARY ASSISTANT.—Erith Urban District Council.—Mr. H. Hind, surveyor.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

COVENTRY.—February 1st.—Sketch plans for a technical institute, for the corporation.—Education Offices, 44 Bayley-lane.

FARNBOROUGH.—February 11th.—Designs for three types of artisans' dwellings, for the urban district council. Premium, 20 guineas.—Mr. J. E. Hargreaves, surveyor.

HENDON.—March 2nd.—Designs for public baths, for the urban district council. Premiums £100, £75, and £50.—The Clerk.

TWRCELYN.—March 9th.—Plans and specifications for a water supply and drainage scheme for Cemaes.—Mr. T. H. Hughes, clerk, Fir-grove, Menai Bridge.

BELFAST.—March 20th.—Designs for an art gallery and museum, for the corporation.—Mr. R. Meyer, town clerk.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

BEDWELLTY.—January 26th.—For the erection of a pumping station and meter-house, for the urban district council.—The Surveyor, Aberbargoed.

MANCHESTER.—January 27th.—For extensions and alterations at the electric car shed, for the Tramways Committee.—Mr. J. McElroy, tramways manager, 55 Piccadilly, Manchester.

BIRKENHEAD.—January 27th.—For the erection of buildings at the refuse destructor, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor.

KENT.—January 27th.—February 6th.—For the erection of a teacher's house at Sevenoaks, for the Education Committee.—Mr. W. H. Robinson, architect, Sessions House, Maidstone.

SHOREHAM.—January 27th.—For the erection of a school, for the Joint Education Committee.—Mr. H. P. Roberts, county education architect, Thurloe House, High-street, Worthing.

WOOD GREEN.—January 28th.—For the erection of a pavilion in the recreation ground, for the urban district council.—Mr. C. H. Croxford, engineer and surveyor.

FLINTSHIRE.—January 28th.—For the construction of a school and works of repair, for the Education Committee.—Mr. Sam Evans, county architect, Mold.

MANCHESTER.—January 28th.—For the erection of a pavilion at sanatorium, for the corporation.—Mr. Thomas Hudson, town clerk.

EAST AND WEST MOLESEY.—January 28th.—For the erection of stores, for the urban district council.—The Surveyor.

DARLINGTON.—January 28th.—For the erection of a school, for the corporation.—Mr. G. Winter, borough surveyor.

GOOLE.—January 28th.—For the erection of a brick urinal, for the urban district council.—Mr. R. Tyson, clerk.

WIDNES.—January 29th.—For alterations and additions to the accident hospital, for the corporation.—Mr. J. Sinclair, borough surveyor.

HERTFORD.—January 29th.—For the erection of a public school, for the Education Committee.—County Surveyor, Hatfield.

BARNET.—January 29th.—For the erection of new council offices, and an underground convenienco, for the urban district council.—Mr. W. F. Wilkins, surveyor.

SHEFFIELD.—January 29th.—For the construction of weighbridge office, steel roof to tipping dock, entrance gates, dock walls, fences and other works, for the corporation.—City Engineer.

DORSET.—January 30th.—For the erection of a school, for the Education Committee.—Messrs. Fletcher & Bratt, Wimborne.

WHARFEDALE.—January 30th.—For the erection of a diphtheria pavilion, and additions to administration block at isolation hospital, for the Joint Hospital Committee.—Mr. Phil. S. Wade, clerk, Union Offices, Otley.

EGREMONT.—January 30th.—For the erection of seventy-six houses, for the urban district council.—Mr. J. S. Stout, architect, 36 Lowther-street, Whitehaven.

EDINBURGH.—January 30th.—For the demolition of old buildings and building retaining walls, and forming a playground, for the corporation.—Mr. A. H. Campbell.

SOUTH SHIELDS.—January 30th.—For the erection of a dispensary, for the corporation.—Mr. L. Roseveare, borough engineer.

HUDDERSFIELD.—January 30th.—For the erection of thirty-six workmen's dwellings, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

RYE.—January 31st.—For the supply and fixing of oil engine and pumps, and enlargement of existing engine-house, for the rural district council.—Mr. H. M. Jeffery, surveyor.

GLAMORGAN.—January 31st.—For the erection of a police station, for the Standing Joint Committee.—The Clerk, County Hall, Cardiff.

YORK.—February 2nd.—For piling and laying out the west bank of the river Ouse, between Lendal Bridge and Scarborough Bridge, for the corporation.—Mr. F. W. Spurr, city engineer.

NORTON (Malton).—February 2nd.—For the supply and laying of cast-iron mains and hydrants, for the rural district council.—Mr. G. S. Cattle, clerk.

MERTHYR TYDFIL.—February 2nd.—For the erection of buildings for manual instruction and domestic subjects, for the corporation.—Borough Architect.

LONDON.—February 3rd.—For the supply of building materials and tools, for the Prison Commissioners.—Prison Commission, Home Office, Whitehall, London, S.W.

SWANSEA.—February 3rd.—For the erection of an electric power sub-station, for the corporation.—Mr. E. Morgan, borough architect.

SCUNTHORPE.—February 4th.—For the sinking of a pump well, 12 ft. clear internal diameter by about 60 ft. deep, driving adits and sinking boreholes, for the urban district council.—Mr. C. Curtis Gray, engineer and surveyor.

HESTON AND ISLEWORTH.—February 4th.—For the erection of schools and caretaker's cottage, for the Education Committee.—Mr. J. G. Carey, architect and surveyor, Council House, Hounslow.

HOVE.—February 4th.—For additions to police station and the construction of underground lavatories, for the corporation.—Mr. H. H. Scott, borough surveyor.

BECKENHAM.—February 5th—18th.—For the erection of a school, for the urban district council.—Messrs. A. Boxall & Son, 8 Adam-street, Adelphi, W.C.

ST. THOMAS.—February 5th.—For the erection of six houses, for the rural district council.—Mr. E. E. Ellis, architect, Pol-lee-road, Exeter.

SWAFFHAM.—February 6th.—For the erection of three pairs of cottages, for the rural district council.—Mr. S. Matthews, clerk.

EAST WESTMORLAND.—February 6th.—For excavating for, providing and laying cast-iron pipes for water supply, and constructing reservoir, for the rural district council.—Mr. Alfred Knewstubb, engineer, St. Andrew's Chambers, Penrith.

DEVON.—February 11th.—For rebuilding two bridges in reinforced concrete, for the county council.—Mr. F. Bailey, clerk, The Castle, Exeter.

BEACONSFIELD.—February 14th.—For the erection of thirty-four cottages, for the urban district council.—Mr. H. Sargeant, surveyor.

WARMINSTER.—February 20th.—For the erection of an isolation hospital, for the Joint Isolation Hospital Committee.—Mr. C. H. Lawson, architect, 32 High-street, Warminster.

Iron and Steel.

STROUD.—January 24th.—For providing and fixing unclimbable wrought-iron fence, for the Joint Burial Committee.—Mr. G. P. Milnes, architect, 7 Rowercroft, Stroud.

EAST HAM.—January 25th.—For supplying and erecting wrought-iron unclimbable fencing and gates, for the corporation.—Mr. J. Birch, borough engineer.

CLEETHORPES.—January 26th.—For the supply of cast-iron turned and bored pipes, sluice valves and sewer penstocks, for the urban district council.—Mr. J. McKie, engineer.

MANCHESTER.—January 26th.—For the supply of ventilating grids and other castings, for the corporation.—Mr. H. Prescott, manager, Drainage Department.

LONDON.—January 27th.—For the supply of 584 tons of special section-rolled steel bar for magnetic brake shoes, for the county council.—Chief Officer, London County Council Tramways, 62 Finsbury-pavement, E.C.

NEW ROMNEY.—January 31st.—For the supply of hole posts, rails, wire fence posts, and shutting posts, for the corporation.—Mr. W. Lamacraft, town clerk.

SHEFFIELD.—February 3rd.—For structural steel-work at power-house, for the Electric Supply Committee.—Mr. S. E. Fedden, general manager and engineer, Commercial-street.

SOUTHEND.—February 6th.—For the supply of steel tramway rails, for the corporation.—Mr. E. J. Elford, borough engineer.

WARSAW.—February 16th.—For the supply of two vertical compound engines, with plunger, piston, or differential pumps, or of two turbines, with centrifugal or turbo pumps, for the Municipality.—Sir William H. Lindley, 29 Blittersdorpherplatz, Frankfort-on-Maine.

Roads.

WORKSOP.—January 26th.—For the supply of slag, for the urban district council.—Mr. G. Featherstone, clerk.

WANGFORD.—January 26th.—For the supply of granite, red broken gravel and fine marl, for the rural district council.—Mr. S. W. Rix, clerk, Beccles.

CUCKFIELD.—January 26th.—For the supply of about 6,500 tons of broken granite, tarred material, and flints, for the rural district council.—Mr. A. Macarthur, surveyor, Haywards Heath.

SLEAFORD.—January 26th.—For the supply of granite, slag and gravel, for the rural district council.—Mr. Edmund Clements, clerk.

DEVON.—January 26th.—For steam rolling and scarifying on the main roads in the Bideford Rural District, for the county council.—Mr. Edward Stead, county surveyor, No. 1 Division, Barnstaple.

EPSOM.—January 26th.—For the supply of about 100,000 gallons of coal tar, for the rural district council.—Mr. T. E. Ware, surveyor.

PLOMESGATE.—January 26th.—For the supply of broken granite, and flint, broken or unbroken, for the rural district council.—Mr. David R. Read, clerk.

BURGESS HILL.—January 26th.—For the supply of 12,000 gallons of coal tar, for the urban district council.—Mr. A. F. Hardwick, clerk.

TORQUAY.—January 26th.—For road widening works, for the corporation.—Mr. H. A. Garrett, borough engineer.

MERIDEN.—January 26th.—For the supply of granite or other similar stone, for the rural district council.—Mr. A. W. Liggins, clerk, 11 Priory-street, Coventry.

ROMFORD.—January 26th.—For work of road improvement, for the urban district council.—Mr. H. T. Ridge, Council Offices.

THIRSK.—January 26th.—For the supply of whinstone, unbroken limestone, slag, tar, and carting, for the rural district council.—Mr. C. A. Lake, highway surveyor.

ISLINGTON.—January 27th.—For the supply of Jarrah or other hard wood and creosoted deal paving blocks, for the borough council.—Mr. J. Patten Barber, borough engineer.

LARNE.—January 27th.—For repairs to roads and bridges, for the rural district council.—Mr. S. M. Wallace, clerk.

WILLESDEN.—January 27th.—For the execution of road work, for the urban district council.—Mr. O. C. Robson, engineer.

WIMBLEDON.—January 27th.—For making up both or either of the following streets—viz., Wilton-grove and section 2 of Compton-road, for the corporation.—Borough Engineer and Surveyor.

SOUTHALL-NORWOOD.—January 27th.—For work of making-up, for the urban district council.—Mr. R. Brown, engineer and surveyor.

NESTON.—January 28th.—For the supply of broken stone chippings, tarred macadam, kerbs and setts, for the urban district council.—The Surveyor, Neston, Cheshire.

ROCHDALE.—January 28th.—For road work in certain streets, for the corporation.—Borough Surveyor.

BIRMINGHAM.—January 28th.—For the supply of about 1,500 tons of coal-gas tar, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

RAMSGATE.—January 28th.—For the supply of granite chippings, for the corporation.—Mr. T. G. Taylor, borough engineer.

WOODBIDGE.—January 29th.—For the supply of granite or basalt, flint, and other materials, for the rural district council.—Mr. G. Cook, district surveyor, Ipswich-road, Woodbridge.

BRINWORTH.—January 29th.—For the supply of granite, tarrivated granite, tarred chippings, and screened chippings, for the rural district council.—Mr. W. C. Woodford, clerk, 31 Market-square, Northampton.

LARNE.—January 29th.—For the supply of whinstone and steam roller and scarifier, for the urban district council.—Mr. W. G. Younge, clerk.

BRACKLEY.—January 30th.—For the supply of granite, for the corporation.—Mr. A. A. Green, borough surveyor.

GRIMSBY.—January 30th.—For the sale, by the corporation, of a steam road roller, with Morrison scarifier, made by Messrs. Aveling & Porter.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

SEVENOAKS.—January 30th.—For the supply of chert, flints, ragstone, granite, quartz, basalt, steam rolling, team labour, cartage, and haulage from stations, for the rural district council.—Mr. F. H. Vibert, clerk.

SOMERSET.—January 31st.—For the supply of broken granite or basalt, for the county council.—Mr. H. T. Chapman, county surveyor.

SOMERSET.—January 31st.—For steam rolling and scarifying on the main roads, for the county council.—Mr. H. T. Chapman, county surveyor.

WITNEY.—January 31st.—For the supply of granite, for the rural district council.—Mr. H. T. Ravenor, clerk.

WITNEY.—January 31st.—For the supply of the best 2-in. clean, broken Clee Hill, Hartshill, Mendip, Pyx, and Rowley Regis granites, for the rural district council.—Mr. G. Wallis, district surveyor, Bampton, Oxon, and Mr. D. H. W. Powell, Brizenorton, Oxon.

WORCESTERSHIRE.—January 31st.—For the supply of granite, for the Highways and Bridges Committee.—Mr. G. F. Gettings, county surveyor.

BRIDGWATER.—January 31st.—For the supply of stone for the roads, for the rural district council.—Mr. W. A. Collins, 56a Eastover, Bridgwater.

EARBY.—January 31st.—For making up certain streets, for the urban district council.—Mr. J. E. Aldersley, surveyor.

CANTERBURY.—January 31st.—For the supply of road materials, for the corporation.—Mr. A. C. Turley, city surveyor.

BLACKPOOL.—January 31st.—For the supply of materials and labour in connection with the laying out of the Upper Promenade, for the corporation.—Mr. John S. Brodie, borough engineer.

ESCRICK.—January 31st.—For the supply of best whinstone, tar-macadam, slag and granite, for the rural district council.—Mr. J. H. Hudson, surveyor.

RENFREW.—January 31st.—For the supply of road metal, for the county council.—Mr. J. A. McCallum, district clerk, 15 West George-street, Glasgow.

BROMLEY (Kent).—February 2nd.—For the execution of sewerage, levelling, paving, metalling, channelling and making good portion of a road, for the rural district council.—The Surveyor, Maulden House, Sideup-hill, Sideup.

BLYTH AND CUCKNEY.—February 2nd.—For road widening, for the rural district council.—Mr. F. Hopkinson, surveyor, Worksop.

EAST GRINSTEAD.—February 2nd.—For the supply of 400 cub. yds. of fine compo sand, flint grit, or other material for the surface-tarring of roads, for the rural district council.—Mr. Francis S. White, clerk.

YORK.—February 2nd.—For the supply of Portland cement, pitch and creosote oil, stoneware pipes, building and sewage line, Yorkshire stone flags, kerbing and edging, broken and rough whinstone, broken and rough slag and limestone chippings, for the corporation.—Mr. F. W. Spurr, city engineer.

DROXFORD.—February 2nd.—For the hire of steam rollers and scarifiers, for the rural district council.—Mr. A. V. Carter, surveyor, Droxford, Hants.

HENDON.—February 2nd.—For making up certain roads, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

POOLE.—February 2nd.—For the supply of granite, for the corporation.—Mr. S. J. Newman, borough surveyor.

PORT GLASGOW.—February 2nd.—For paving, tar-macadam and other work, for the corporation.—Mr. A. Paton, town clerk.

WORKSOP.—February 2nd.—For the supply of slag, for the urban district council.—Mr. G. Featherstone, clerk.

SUTTON-IN-ASHFIELD.—February 2nd.—For the supply of tar-macadam and broken slag, for the urban district council.—Mr. W. Burn, surveyor.

LEWISHAM.—February 3rd.—For making up Grove Park-road, for the borough council.—Borough Surveyor.

CHINGFORD.—February 3rd.—For the supply of granite, stone ballast, hoggin, and boiler clinker, and steam roller and scarifier, for the urban district council.—Mr. L. C. Bowen, clerk.

MIDDLESBROUGH.—February 3rd.—For the supply of whinstone and tarred slag, for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley, Yorks.

ROTHERHAM.—February 4th.—For the supply of granite, slag, and team labour, for the rural district council.—Mr. R. Bradbury, district surveyor.

MIDDLESEX.—February 4th.—For the supply of about 12,000 tons of 2-in. and 1½-in. hand-broken basalt for road construction, and 2,000 tons of ¾-in. chippings, for the county council.—Mr. H. T. Wakeham, Middlesex Guildhall, Westminster, S.W.

HERTFORDSHIRE.—February 5th.—For the supply of broken granite, slag and tar-macadam required for the main roads during the year ending March 31, 1915, for the county council.—Mr. Urban A. Smith, county surveyor, Hatfield.

WORCESTER.—February 5th.—For the construction of roads, drains and entrance gates at the Fort Royal recreation ground, for the corporation.—Mr. Thomas Caink, city engineer.

SUTTON (Surrey).—February 5th.—For tar-spraying various roads, for the urban district council.—Mr. H. Hedley Grieves, surveyor.

STOKESLEY.—February 5th.—For the supply of whinstone, limestone, and tarred slag and whinstone, for the rural district council.—Mr. W. H. Dixon, Kirkby-in-Cleveland, near Stokesley, Yorks.

OXFORD.—February 6th.—For the supply of road materials, for the rural district council.—Mr. W. J. Smith, surveyor, Rothwell House, Market Harborough.

PAIGNTON.—February 6th.—For work of road widening, for the urban district council.—The Surveyor.

HAVANT.—February 7th.—For the supply of road materials, for the rural district council.—Mr. W. L. Hibberd, surveyor.

SOUTHAMPTON.—February 9th.—For the supply of a 10-ton steam road roller fitted with Morrison's scarifier, for the corporation.—Mr. R. R. Linthorne, town clerk.

LONG SUTTON.—February 10th.—For the supply of road materials, for the urban district council.—Mr. S. S. Mossop, clerk.

LITTLEBOROUGH.—February 10th.—For the supply of 3,700 tons of 4-in. and 5-in. granite setts, for the urban district council.—The Surveyor.

BRADFORD.—February 11th.—For the supply of materials and cartage, for the corporation.—Mr. W. H. S. Dawson, city engineer and surveyor.

BARNET.—February 11th.—For repaving, rekerbing and channelling in Wood-street, for the urban district council.—Mr. W. F. Wilkins, surveyor.

KEYNSHAM.—February 13th.—For the supply of granite or basalt, for the rural district council.—Mr. T. Johnson, surveyor.

SURBITON.—February 16th.—For the supply of road materials, for the urban district council.—The Surveyor.

THORNE.—February 17th.—For the supply of cross, screenings, granite and tar, for the rural district council.—Mr. G. Kenyon, clerk, Thorne, viâ Doncaster.

OTLEY.—February 27th.—For the supply of granite macadam, furnace slag dust, kerbs and flags, limestone macadam, tar-macadam, brushes, pitch, and carting road metal, for the urban district council.—Mr. C. F. Hodgeson, surveyor.

MIDDLELOTHIAN.—(No date.)—For the supply of refined coal tar, coal-tar pitch, and pitch oil, for the county council.—Mr. Robert Moir, road surveyor, County Buildings, Edinburgh.

Sanitary.

CLEETHORPES.—January 26th.—For the supply of 30-in. cast-iron turned and bored pipes, sluice valves, sewer penstocks, and other articles for the construction of sewerage works, for the urban district council.—Mr. J. McKie, resident engineer.

DOWNHAM MARKET.—January 26th.—For constructing 2,100 yds. of stoneware pipe sewers, manholes and appurtenant works, storage chamber, pumping station, 712 yds. of 5-in. rising main, tanks, and bacterial filters, for the urban district council.—Messrs. Elliott & Brown, Burton Buildings, Parliament-street, Nottingham.

MANCHESTER.—January 26th.—For the execution of general drainage work, for the corporation.—Mr. H. Prescott, manager, Drainage Department.

GODSTONE.—January 26th.—For the construction of sewerage works, for the rural district council.—Mr. G. H. Widger, sanitary inspector.

EPSOM.—January 27th.—For the removal of house refuse, for the rural district council.—Mr. F. A. Pratley, surveyor.

SOUTHAMPTON.—January 27th.—For the construction of a storm-water sewer and manholes, for the corporation.—Borough Engineer.

NEWBURN.—January 27th.—For the conversion of privies into water-closets, for the urban district council.—Mr. T. Gregory, surveyor.

TRING.—January 28th.—For laying stoneware pipe sewer and manholes, for the urban district council.—Mr. S. S. Gettings, surveyor.

WESTHAMPTON.—January 29th.—For laying sewers, building manholes and lamp-holes, and all necessary work connected with the main drainage of Felpham, for the rural district council.—Mr. H. Howard Humphreys, 28 Victoria-street, Westminster, S.W.

NEWCASTLE (Co. Down).—January 31st.—For the construction of a complete sewerage scheme, for the urban district council.—Messrs. Swiney & Croasdale, Avenue Chambers, Belfast.

UPPER STOUR.—January 31st.—For the construction of cast-iron pipe sewers and other works, for the Sewerage Board.—Mr. George Green, clerk, High-street, Cradley Heath.

SEDFIELD.—January 31st.—For work of scavenging, for the rural district council.—Mr. J. E. Robinson, inspector, 3 Firwood-terrace, Ferryhill.

WINCHICOMB.—January 31st.—For the construction of branch drains, for the rural district council.—Messrs. Phillott & George, engineers, 31 Promenade, Cheltenham.

SWANSEA.—January 31st.—For the construction of a 9-in. sewer and manholes, for the rural district council.—Mr. T. Trevor Williams, engineer.

MELTON MOWBRAY.—February 1st.—For the construction of a stoneware sewer, for the rural district council.—Mr. G. E. Fryer, surveyor and inspector.

MALDEN AND COOMBE.—February 2nd.—For additions to the sewage disposal works, comprising raising walls of existing sedimentation tanks, constructing detritus tanks, No. 5 percolating filters, high and low level humus tanks, ejector chamber, ejectors, carriers, sludge pipes, forming sludge beds, and preparing storm-water filtration area, for the urban district council.—Mr. R. H. Jeffes, engineer and surveyor.

LONDON.—February 2nd.—For the execution of works for three years in the reparation, maintenance, and reconstruction of sewers and drains, for the corporation of the city.—Bell, Guildhall, E.C.

ROWLEY REGIS.—February 2nd.—For the removal of house refuse, for the urban district council.—Mr. D. Wright, clerk, Council House, Old Hill, Staffs.

LONDON.—February 2nd.—For the supply of drain pipes to the Royal parks.—Office of Works, Storey's-gate, London, S.W.

CRAMLINGTON.—February 3rd.—For carting work and scavenging, for the urban district council.—Mr. W. J. Coulson, surveyor.

OLDHAM.—February 4th.—For the supply of 200 wash-down water-closets, cisterns, and fittings, for the corporation.—Borough Surveyor.

SOUTHPORT.—February 5th.—For the construction of storm-overflow sewer, concrete storm tank to hold 500,000 gallons, and other works appertaining thereto.—Mr. J. Ernest Jarratt, town clerk.

PORTRICAWL.—February 5th.—For the construction of stoneware and iron sewers, concrete tube sewers, flushing tanks, and other appurtenances, for the urban district council.—Messrs. John Taylor & Sons, Caxton House, Westminster, S.W.

ST. MELLONS.—February 9th.—For laying stoneware pipe sewer, manholes, and ventilators, for the rural district council.—Mr. C. S. Morgan, engineer, Pontypridd.

SHERINGHAM.—February 9th.—For the construction of stoneware pipe sewer and manholes, for the urban district council.—Mr. F. H. Smith, engineer.

BEACONSFIELD.—February 14th.—For the construction of sewage disposal works and sewerage, for the urban district council.—Mr. H. Sergeant, surveyor.

TENTERDEN.—February 14th.—For the construction of 5 miles of stoneware and iron pipe intercepting sewers and appurtenances, for the corporation.—Messrs. John Taylor & Sons, Caxton House, Westminster.

BATH.—February 14th.—For the construction of 12 miles of stoneware pipe sewers, and about 1 mile of cast-iron sewer, railway, canal, and river crossings, manholes, lampholes, and flushing chambers, for the rural district council.—Messrs. Willeox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

HALIFAX.—February 14th.—For the construction of cast-iron pipe sewers, for the corporation.—Mr. J. Lord, borough engineer.

SOUTHPORT.—February 16th.—For the construction of stoneware pipe sewers, surface-water drains, and other works, for the corporation.—Borough Engineer and Surveyor.

Stores.

SHEFFIELD.—January 26th.—For the supply of asphaltting or tar-paving (labour and materials), bricks, castings for sewer and other work (manhole covers), cement, earthenware pipes, blocks, traps, free-stone and gritstone kerb and setts, flags, quarry sand, granite setts, kerb, ring-small, gravel and chips, limestone, slag shingle, pitch, tar and creosote oil, timber, iron, steel, tools and sundries, oils, paints and brushes, for the corporation.—Mr. W. J. Hadfield, surveyor of highways.

FROME.—January 26th.—For the supply of scavenging brushes, Portland cement, broken limestone, broken granite, tarred material, tools, kerbing, channelling, pennant and concrete flagging, and coal, for the urban district council.—Mr. F. W. Jones, surveyor.

WILLESDEN.—January 27th.—For the supply of jobbing works (sewer, mason, and pavior), artificial slab paving, tar paving, gravel, flints, burnt ballast, broken granite, lime, cement, stoneware pipes, lamp columns, oils, chandlery, coal, coke, barging road sloop, horse provender, ironmongery, tools, timber, and wood paving, for the urban district council.—Mr. O. Claude Robson, engineer.

ERITH.—January 28th.—For the supply of Guernsey granite, Cherbourg quartzite, pit flints, ballast and sand, bricks, Tees scoriae blocks, Kentish rag-stone, tar paving, Norway granite setts, Portland cement, drain pipes, bends, bass brooms and brooms for road-sweeping machines, and shovels, picks, for the urban district council.—Mr. J. Atkinson, clerk.

GRIMSBY.—January 30th.—For the supply of chalk, whinstone, or columnar basalt macadam, slag, artificial flags, Yorkshire flags, Yorkshire kerbs, granite setts, kerbs, channel, pitch, coal-gas tar, lime, Portland cement, drainage pipes, miscellaneous brushes, scavenging brushes, drysalteries, lubricating

oils, oils, paints, disinfectant fluid, disinfectant powder, formalin, formalin tablets, and SO₂ tubes, for the corporation.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

CHELTENHAM.—January 31st.—For the supply of Portland cement, forage, stoneware pipes, broken stone, kerbs, setts, disinfectants, oils, colours, ironmongery, timber, indiarubber goods, lead, brass fittings, tools for highways, wrought iron, steel, files, electric light fittings, road brooms, lias lime, bricks, clothing, and cast-iron pipes, for the corporation.—Mr. J. S. Pickering, borough engineer.

WEST HAM.—February 6th.—For the supply of paving materials, broken granite and chippings, road flints, sand, tar and pitch, ironmongery, iron castings, lime, plaster, Portland cement, rope and tarpaulins, hardwood, lead, zinc, solder, oils, colours, stoneware pipes, brooms, brushes, boots, sanitary articles, disinfectants, domestic articles, clothing, soaps, and electrical fittings, for the corporation.—Mr. H. W. Greaves, town clerk.

STEPNEY.—February 10th.—For the supply of bricks, lime, fireclay, brooms, cast-iron work, colours, varnishes, painters' brushes, drainage materials, oilman's goods, Portland cement, pitch, tar, green oil, bitumen, timber, tools, implements, ironmongery, wheelwrights' materials, ballast, shingle, sand, hoggin, flints, uniform clothing, boots, disinfectants, paving materials, horse hire, and squaring and re-dressing old paving materials, for the borough council.—Mr. M. W. Jameson, borough engineer.

GOOLE.—February 19th.—For the supply of road metal (Guernsey granite and chippings), granite setts, slag (broken and unbroken), hardcore (broken and unbroken for foundations), concrete flags, York flags, kerb, channel, stoneware pipes, bends, Portland cement, tar-macadam, gravel, coal, and bricks, for the urban district council.—Mr. C. G. Bradley, engineer and surveyor.

Miscellaneous.

MANCHESTER.—January 26th.—For fencing at Knutsford-road, for the corporation.—City Surveyor.

RAMSGATE.—January 28th.—For fixing a hydraulic flag-making plant, and revolving mixer and grinding mill, for the corporation.—Mr. T. G. Taylor, borough engineer.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.

BROMLEY.—For making good Moreland-road, Weston-road, and Weston-grove, for the corporation.—Mr. Stanley Hawkings, borough engineer:—
E. Free & Sons.†—Moreland-road, £576; Weston-road, £534; Weston-grove, £512.
Fry Brothers.—£590, £556, £531.
J. Mowlem & Co., Limited.—£619, £564, £540.
W. Pearce.—£595, £546, £535.
H. Woodhams & Sons.—£601, £550, 527.

LONDON.—For the construction of a tunnel under the River Thames between Twickenham and Richmond, for the Metropolitan Water Board:—

TUNNEL DRIVEN FROM BOTH SHAFTS—COMPRESSED AIR NOT USED.

J. Mowlem & Co., Limited	£55,005
S. Pearson & Son, Limited	54,106
Perry & Co. (Bow), Limited	44,633
G. Shellabear & Son	43,077
F. W. Southorn & Co.	42,423
Dick, Kerr & Co., Limited	37,955
R. McAlpine & Sons	37,860

COMPRESSED AIR USED.

S. Pearson & Son, Limited	£60,579
J. Mowlem & Co., Limited	60,219
G. Shellabear & Son	51,914
Perry & Co. (Bow), Limited	51,000
F. W. Southorn & Co.	49,076
Dick, Kerr & Co., Limited	47,807
R. McAlpine & Sons	40,365

TUNNEL DRIVEN FROM ONE SHAFT—COMPRESSED AIR NOT USED.

J. Mowlem & Co., Limited	£52,705
S. Pearson & Son, Limited	51,739
W. Muirhead & Co., Limited	50,025
Perry & Co. (Bow), Limited	40,433
G. Shellabear & Son	40,077
F. W. Southorn & Co.	39,243
W. Scott & Middleton, Limited	38,406
R. McAlpine & Sons	35,529
J. Price & Son	35,427
Dick, Kerr & Co., Limited	35,155

COMPRESSED AIR USED.

J. Mowlem & Co., Limited	£57,919
S. Pearson & Son, Limited	56,252
W. Muirhead & Co., Limited	55,958
G. Shellabear & Son	46,114
F. W. Southorn & Co.	45,896
Perry & Co. (Bow), Limited	45,323
Dick, Kerr & Co., Limited	43,407
W. Scott & Middleton, Limited	41,990
J. Price & Son	40,888
R. McAlpine & Sons*	37,404

MALDEN AND COOMBE.—The following tenders have been accepted by the urban district council:—
 Forbes, Abbott & Leonard, Limited.—Distilled tar at 4½d per gallon.
 Kingston Gas Company.—15,000 gallons of crude tar at 2½d per gallon.
 J. Mowlem & Co., Limited, Westminster.—Erection of street improvement works in Selwyn-road, £652.
 J. Wainwright & Co., Shepton Mallet.—Supplying, laying, and maintaining artificial stone paving for footways in Selwyn-road, £201.
 From both the last-mentioned firms for similar works in Melrose-gardens, the figures being £521 for the works, and £159 for the paving.

WARBLINGTON.—For the construction of sewerage and sewage disposal works, comprising 1,900 yds. of 15-in., 16-in., 18-in., and 24-in. cast-iron, stoneware, and concrete outfall sewer, with manholes, ventilators, pumping-station, rising main, septic tanks, and trickling filters, for the urban district council.—Mr. Arthur J. Martin, engineer, Westminster, S.W.:

T. Wilkinson & Co., Bosscombe, Hants	£13,643
T. W. Pedrette, Enfield, Middlesex	12,771
Clifford Bentley, Havant	12,554
A. G. Osenton, West Horsley, Sussex	11,933

WINDSOR.—For the supply of iron pipes (Contract C) in connection with the Sunninghill and Sunningdale sewerage scheme, for the rural district council:—

Clay Cross Company, Limited, Chesterfield	£7,074
Staveley Coal and Iron Co., Limited, Chesterfield	7,032
Stanton Ironworks Company, Limited, Nottingham	6,909
Cochrane & Co., Limited (Cochrane Grove Branch), Middlesbrough-on-Tees	6,783
Sheepbridge Coal and Iron Company, Limited, Chesterfield	6,734
Cochrane & Co. (Woodside), Limited, Dudley	6,512
Holwell Iron Company, Limited, Melton Mowbray	6,382
A. Gardner Coake, London	6,328
J. Oakes & Co., Alfreton Ironworks, Derbyshire	

(Quotation of prices but no tender.)

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JANUARY.

- 23.—Institution of Civil Engineers (Students' Meeting): Mr. E. W. Monkhouse, M.A., M.INST.C.E., on "The Testing of Materials for Use in Engineering Construction." 8 p.m.
- 26.—Surveyors' Institution: Mr. George Corderoy on "Measuring and Quantity Surveying."
- 26.—Royal Institute of British Architects: Sir Herbert Jekyll on "London Traffic Problems." 8 p.m.
- 28.—Institution of Civil Engineers: Students' Visit to Southwark Bridge and Messrs. Kirkaldy's Testing Works.
- 29.—Concrete Institute: Discussion on Joint Report of the Reinforced Concrete Practice Committee and the Quantity Surveyors' Association, on "Standard Methods of Measurement for Reinforced Concrete Work." 7.30 p.m.
- 30.—Institution of Civil Engineers (Students' Meeting): Mr. E. W. Monkhouse, M.A., M.INST.C.E., on "The Testing of Materials for Use in Engineering Construction." 8 p.m.
- 31.—Institution of Municipal Engineers: North-Western District Meeting, Mitre Hotel, Manchester. 1.30 p.m.

FEBRUARY.

- 2.—Society of Engineers: Mr. H. C. H. Shenton delivers his Presidential Address. Institution of Electrical Engineers. 7.30 p.m.
- 4.—Institute of Sanitary Engineers: Annual Dinner, Holborn Restaurant.
- 9.—Royal Institute of British Architects: President's Address to Students; Presentation of Prizes and Studentships.
- 16.—Institute of Sanitary Engineers: Mr. F. R. O'Shaughnessy, F.I.C., on "The Significance of Colloidal Matter in the Problem of Sewage Disposal." Caxton Hall, Westminster. 8 p.m.
- 20-21.—Institution of Municipal and County Engineers: Meeting at Manchester.
- 23.—Surveyors' Institution: Annual Dinner, Whitehall Rooms. 7 p.m.

MARCH.

- 21.—Institution of Municipal and County Engineers: North-Eastern District Meeting at Wakefield.

APPOINTMENTS OPEN.

OFFICIALS AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, BUT THOSE RESPONSIBLE FOR THEIR DISPATCH ARE RECOMMENDED TO ARRANGE THAT THEY SHALL REACH THE SURVEYOR'S OFFICE BY NOON ON WEDNESDAYS TO ENSURE THEIR INCLUSION IN THE WEEKLY LIST OF SUMMARIES. SUCH ADVERTISEMENTS MAY, IN CASES OF EMERGENCY ONLY, BE TELEPHONED (CITY NO. 1040) SUBJECT TO LATER CONFIRMATION BY LETTER.

BOROUGH OF BEDFORD.

APPOINTMENT OF MECHANICAL ENGINEER AND FOREMAN.

Applications are invited for the appointment of Mechanical Engineer and Foreman to take charge (under the direction of the Borough Engineer) of the Sewage Pumping Stations and the Refuse Destructor.

Applicants should not be under 30 or over 40 years of age.

Candidates should be able to execute small repairs, and preference will be given to those who have had experience in similar work.

Wages will commence at £2 10s. per week, rising by four annual increments to a maximum of £3 per week, together with house, coal, rates, and light free.

Applications, in candidate's own handwriting, stating age, previous experience, together with copies

of not more than three recent testimonials, to be sent to the undersigned not later than 12 noon on Friday, January 30th, 1914.

Canvassing is strictly prohibited, and will be deemed a disqualification.

N. GREENSHIELDS, ASSOC. M.INST.C.E.,
 Borough Engineer and Surveyor.

Town Hall, Bedford.

January 9, 1914.

(1,137)

BOROUGH OF NEWARK.

SURVEYOR'S ASSISTANT.

The Council invite applications for the appointment of an Assistant to the Borough Surveyor, at a commencing salary of £90 per annum, rising by annual increments of £10 to £120 per annum.

Candidates should be neat draughtsmen, accurate Surveyors and Levellers, and should have had experience in Building Construction and Sewerage Works.

Applications, endorsed "Surveyor's Assistant," stating age and experience, accompanied by copies of not more than three recent testimonials, must reach the undersigned not later than Tuesday, the 27th January.

GODFREY TALLENTS.

Town Clerk.

Town Clerk's Office,
 Newark.

January 10, 1914.

(1,141)

KARACHI MUNICIPALITY.

APPOINTMENT OF SUPERINTENDENT OF FIRE BRIGADE.

Applications are invited for the post of Superintendent of the Municipal Fire Brigade. Salary Rs.200/- per mensem, with Free Quarters, unfurnished.

The Superintendent will be a full-time Officer, and, in addition to taking charge of a Motor Fire Engine at fires, will be required to organise the Brigade, to conduct fire drills regularly, and to see that all fire appliances are always in good working order, and generally to act under the orders of the Chief Engineer of the Municipality.

Preference will be given to a young, active man, with experience in a properly organised Brigade, used to obeying and enforcing discipline.

The selected candidate will be subject to all the Municipal Rules, including Leave and Provident Fund Rules, and the appointment may be terminated at any time by three months' notice on either side.

Single second-class fare will be paid to enable the candidate to join his appointment.

Applications, stating age, nationality, qualifications and experience, will be received up to 28th February, 1914.

MEASHAM LEA, ASSOC. M.INST.C.E.,
 Chief Officer and Chief Engineer,
 Karachi Municipality.

(1,138)

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

APPOINTMENT OF MAIN ROAD INSPECTORS.

The above Council are prepared to receive applications for the appointment of three District Inspectors of Main Roads in the County, under the superintendence and direction of the County Surveyor.

Applicants must not exceed the age of 35 years, have had previous experience in the repair and maintenance of roads, and be conversant with modern forms of construction; they must also devote their whole time to the duties of their office.

Salary, £175 per annum, rising by annual increments of £5 to a maximum of £220 per annum.

Applicants must be competent to ride the motor cycle provided by the Council, for the upkeep of which an allowance will be made additional to the salary stated above.

Applications, on the form to be supplied, accompanied by copies of three testimonials of recent date, are to be delivered to the undersigned not later than the first post on Friday, January 30th, 1914.

PERCY J. SHELDON, M.INST.C.E.,
 County Surveyor of Essex.

County Surveyor's Office,
 Chelmsford.

January 16, 1914.

(1,160)

EALING TOWN COUNCIL.—Wanted, in the Drawing Office of the Borough Surveyor, a Junior, age between 18 and 21. Preference will be given to one who has occupied a similar position, and is a neat and accurate tracer, and used to helping in the making of Surveys, &c. Salary £50 per annum. Applications, in Candidate's own handwriting (endorsed "Junior"), enclosing copies of three recent testimonials, to be addressed to the Borough Surveyor, Town Hall, Ealing, W., not later than Wednesday, 28th January, 1914. (1,165)

BOROUGH OF GRAVESEND.
The Corporation invite applications for the Appointment of Road and General Foreman.

Applicants must possess a thoroughly practical experience in the control of Men, the making of Macadamised and Flint Roads, General Mason's and Paving Work, Drain and Sewer Work, Tar Paving and Tar-macadam work, and Scavenging of a district, and must be able to keep Time Books, &c.

Wages 45s. per week.
None but thoroughly competent men need apply, and canvassing is strictly prohibited and will disqualify.

Applications, in candidate's own handwriting, giving full particulars of age, qualifications, previous experience and present employment, and accompanied by copies of not more than three recent testimonials, to be sent to my Office not later than Thursday, February 5th, endorsed "Road Foreman." Applications must be made on a Form which will be supplied on application to the undersigned.

H. H. BROWN,
Town Clerk. (1,178)

WILLESDEN DISTRICT COUNCIL.
The services of an Assistant in the Engineer's Department of the Willesden District Council are required forthwith.

Applicants should state if they have had any experience in the preparation of Town Planning schemes, and it will be necessary for selected candidates to submit specimens of their draughtsmanship. It is likewise desirable that they should have passed the Examination of the Institution of Municipal and County Engineers.

The commencing salary will be £150 per annum. Applications, accompanied by copies only of three testimonials, to be delivered to the undersigned not later than Thursday, January 22nd, 1914.

O. CLAUDE ROBSON,
Engineer to the Council.
Municipal Offices,
Dyne-road, Kilburn, N.W.
January 6, 1914. (1,106)

GELLYGAER URBAN DISTRICT COUNCIL.
SURVEYOR'S CLERK.

The above Council require the services of a Clerk in their Surveyor's Department. Applicants must have had previous experience in a similar position, and must be capable of checking and allocating all bills, keeping and balancing wages books, cash and other accounts, and have a knowledge of the general routine of the office. Preference will be given to candidates who have also a knowledge of shorthand and typewriting. Salary, £80 per annum, rising by yearly increments of £5 to £100.

Applications, giving age and full particulars of experience, and accompanied by copies of not more than three recent testimonials, to be sent to me not later than the 31st day of January, 1914.

FRANK T. JAMES,
Clerk to the Council.
Council Offices,
Hengoed, Glam. (1,187)

THE RURAL DISTRICT COUNCIL OF BOURNE.

Wanted immediately, an Assistant, in the Office of the District Surveyor. Applicants must have experience of drawing and be capable book-keepers. Commencing salary £65 per annum. Applications, stating age and experience, accompanied by two recent testimonials, to be sent to me, the undersigned, on or before the 30th instant.

THOMAS LAKE,
District Surveyor.
Bourne, Lincolnshire. (1,183)

THE RURAL DISTRICT COUNCIL OF WELLINGTON, SALOP.

APPOINTMENT OF SURVEYOR AND INSPECTOR.

The above Council invites applications for the appointment of Surveyor and Inspector of Nuisances for the Rural District Council of Wellington, Salop. Area of District, 33,472 acres. Population, 11,901 (1911).

The appointment will be subject to the approval of the Local Government Board, and to the combination of the above offices.

The person appointed will be required to perform all the usual duties of Surveyor of Highways, Inspector of Nuisances, and Sanitary Surveyor to a Rural District Council.

The person appointed will be required to provide, maintain and use at his own expense, a motor bicycle, or other motor vehicle for use in connection with his duties.

The Council provide office, printing, stationery, and postage. Salary as Surveyor £100 per annum, and as Inspector of Nuisances £140 per annum.

He may be required to reside in some central part of the District, or in the Urban District of Wellington, and will be required to devote his whole time to the service of the Council.

The appointment will be as from the 1st day of April next.

A memorandum setting out more fully the terms of the appointment and duties, together with the prescribed Form of Application, may be had from the undersigned. Preference will be given to applicants possessing the Certificate of the Royal Sanitary Institute.

Applications must be sent to the undersigned, with copies of not more than three testimonials, on or before the 27th day of January, 1914.

Applicant must not in any way approach individual members of the Council, and any infringement of this clause may be treated as a disqualification.

(By order of the Council)
J. V. LANDER,
Clerk.

Queen-street Chambers,
Wellington, Salop.
January 15, 1914. (1,171)

THE GOVERNMENT OF INDIA have four vacancies for Assistant Sanitary Engineers, two on salaries of Rs.800 a month, rising by annual increments of Rs.50 to Rs.1,000 a month; one on a salary of Rs.500 a month, rising by annual increments of Rs.50 to Rs.700 a month; and one on Rs.400 a month, rising by annual increments of Rs.40 to Rs.620 a month.

Candidates for the two last-mentioned posts must not be above 33 years of age, and should either have passed the qualifying examination for A.M.I.C.E., or should hold such other engineering degrees, diplomas or certificates as are sufficient to show that they have attained the requisite standard implied by the above examination. They must also have had considerable practical experience both in the design and execution of works of water and sanitary engineering.

For the two other posts there is no fixed upper limit of age, but preference would be given to candidates not above 33 years of age, if highly qualified in all respects. Candidates must have a sound knowledge of modern methods of construction of water-works installations, and long—in one case not less than ten years'—practical experience of the working of such installations. Some drainage experience will be regarded as a strong additional qualification.

Further particulars and Forms of Application can be obtained from the Secretary, Revenue Department, India Office, London, S.W., to whom applications should be submitted not later than 7th February.

(1,175)

THE SERVICES OF A CHIEF ASSISTANT are required in the Offices of a North Country Municipal Engineer. In addition to professional attainments, applicants must have an intimate acquaintance with the routine work of such an office. Commencing salary £2 15s. weekly.

Applications, with copies of testimonials, are to be sent to Box 1,363, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C., not later than Monday, the 2nd February. (1,182)

EXAMINATIONS.

ROYAL SANITARY INSTITUTE.

PATRON - - HIS MAJESTY THE KING.

EXAMINATIONS

SANITARY SCIENCE,
INSPECTORS OF NUISANCES,
SMOKE INSPECTORS,
MEAT INSPECTORS,
SCHOOL HYGIENE,

HEALTH VISITORS AND SCHOOL NURSES.

Centres for 1914 (those marked * are for Meat Inspectors only):—

Plymouth—January.	Cardiff—June.
Hull—February.	Liverpool—June.
Preston—February.	*Leeds—July.
Hereford—February.	London—July.
Southampton—March.	Birmingham—October.
*Hull—March.	Aberdeen—October.
Bristol—March.	Nottingham—October.
Edinburgh—March.	*Dublin—October.
Norwich—April.	Liverpool—October.
*Liverpool—April.	*Cardiff—November.
London—April.	Sheffield—November.
Manchester—May.	Newcastle—November.
*London—May.	Manchester—December.
Leeds—May.	London—December.
Dublin—June.	*London—December.
Birmingham—June.	

The Examinations are officially recognised as qualifications for appointments by Government Departments and Municipal Authorities.

Courses of Lectures for candidates preparing for Examinations are held by the Institute in London in the Spring and Autumn.

Application Forms and full particulars can be had from the Secretary, 90 Buckingham Palace-road, London, S.W. (1,113)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1056) subject to later confirmation by letter.

COUNTY BOROUGH OF WEST HAM.
TENDERS FOR SUPPLIES, &c.

The Council hereby invite Tenders for the Supply of

Paving Materials,
Broken Granite and Chippings,
Road Flints,
Sand for Tramways,
Tar and Pitch,
Ironmongery, &c.,
Iron Castings,
Lime, Plaster, &c.,
Portland Cement,
Rope and Tarpaulins, &c.,
Hardwood,
Lead, Zinc and Solder,
Oils and Colours, &c.,
Stoneware Pipes, &c.,
Brooms and Brushes,
Boots,
Sanitary Articles and Disinfectants,
Domestic Articles,
Clothing,
Soaps.

Forms of Tender and further particulars may be obtained at the Borough Engineer's Office, Town Hall, West Ham, E. (where the Standard Samples may also be seen).

For the Supply of—

Newspapers and Periodicals,
New Books, and for
Bookbinding

for the Public Libraries and Technical Institute.

Forms of Tender and further particulars may be obtained at the Central Public Library, Water-lane, Stratford, or at the Central Public Library, Barking-road, Canning Town, E.

For the Supply of—

Meat,
Fish,
Ice,
Bread and Flour,
Druggist's Sundries,
Groceries,
Tea and Coffee,
Linen,
Drapery, Boots and Slippers.

for use in the Council's Hospitals.

For the Supply of—

Bread and Flour,
Meat,

to the Council's Convalescent Home, The Grange, Harold Wood, Essex.

Forms of Tender and further particulars may be obtained of the Physician Superintendent, at the Hospital, Samson-street, Plaistow.

For the Supply of—

Engine Room Stores,
House Service A.C. Wattmeters,
Electrical Fittings and Accessories,
1 R. Covered Wires and Cables.

Forms of Tender and further particulars may be obtained of the Electrical Engineer, 84 Romford-road, Stratford, E.

A deposit of £1 will be required in respect of each Form of Tender, which will be returned on receipt of a *bona-fide* Tender.

NOTE.—No Tender will be considered unless the same is delivered at the Office of the Town Clerk, Town Hall, West Ham, E., in the envelope supplied, by registered post, not later than 12 o'clock noon on Friday, 6th February, 1914.

The Tenders will be opened at the Town Hall, West Ham, at 6.30 p.m. on Friday, 6th February, 1914, and persons tendering may be present if they so desire, but no guarantee is given that any information, beyond the names of persons tendering, will be read out.

The Council do not bind themselves to accept the lowest or any Tender. The contractor will be required to enter into a Bond, with sureties, for the due performance of the contract, and no goods, materials, &c., will be ordered under the contract until such Bond has been duly executed.

The contractor whose Tender is accepted, and with whom a contract is entered into, will be required to pay to the whole of his workmen such rate of wages, and observe such hours of labour as are recognised by the Workmen's Trade Unions, and in force at the time of signing the contract. In the event of any breach of such agreement the Council will enforce the penalty clauses in their entirety.

(By order of the Council)

H. W. GREAVES,

Town Clerk.

Town Hall,

West Ham, E.

January, 1914.

(1,169)

BARNET URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

STREET-PAVING WORKS.

The Council invite Tenders for Works of Repaving, Rekerbing and Channelling in Wood-street, Barnet.

Persons desiring to submit Tenders may, upon depositing with the Council the sum of £2 2s., obtain copies of the Bill of Quantities, and inspect the Drawings and Specification, and obtain all information from Mr. W. F. Wilkins, Surveyor to the Council, at his Office, No. 40 High-street, Barnet.

Upon receipt of a *bona-fide* Tender, together with all documents relating thereto, such deposit will be returned.

The Contractor will be required to pay all trades the standard rate of wages for the district.

The Council do not bind themselves to accept the lowest or any Tender.

Approved Sureties will be required as security for the due performance of the Contract.

Tenders, on the Bill of Quantities supplied, sealed and endorsed "Wood-street Paving," must be addressed to the undersigned at No. 40 High-street, Barnet, and delivered not later than noon on the 11th day of February, 1914.

H. W. POOLE,

Clerk of the Council.

January 16, 1914.

(1,184)

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

JANUARY 30, 1914.

No. 1,150.

Municipal Engineering in 1913.

This year we have once again attempted in our Special Annual Issue to present to our readers in the form of a series of articles from the pens of experts a survey of the progress which has been made during the past year in every part of the wide field of municipal engineering practice. It has been no easy task for the several writers to deal adequately with their respective subjects within the limits of the available space, and it would therefore evidently be impossible in an introductory article of this kind to do more than point to the most salient features of the year's work. The issue of the appendix to the eighth Report of the Royal Commission on Sewage Disposal aroused considerable discussion, and must be reckoned among the most important publications issued by that body. The pollution of streams is a manifest danger to the public health, and the information and records of investigations which have been rendered available by the appearance of the appendix will prove of the greatest possible value to all who are interested in their purification. The most important scheme of sewerage decided upon during the past year is undoubtedly that concerning the main drainage of Rochester and Chatham—a happy example of co-operation between adjoining towns—while, in regard to disposal, attention may be called to the new works at Sheffield, Halifax, Surbiton, Wakefield, and other places. It can be said generally that some progress has been made towards solving the sewage problem, a result which can only be fully achieved by the biologist, the chemist, and the engineer working hand in hand. It may safely be said that during the year 1913 the modern revival of interest in all matters appertaining to highway construction and maintenance has shown no sign of abatement. Signs of the activity that is being displayed are to be found in the appointment by the Scottish District of the Institution of Municipal and County Engineers of a Roads Committee, the Conference held under our auspices in the spring, and the third International Road Congress. The last-mentioned provided an opportunity for collecting data and statistics relating to road administration and road engineering in many different countries, and the various papers submitted contained a good deal of information, which will enable the student of road administration to realise how the systems of different countries have been formed and how they are developing. The necessity for standardisation of road materials is now generally recognised, and has often been discussed in our pages. In this connection the work of the Engineering Standards Committee on road materials is of the first importance, and will be watched with the greatest interest. The question of terminology has received much attention during the past year. It is essential that there should be agreement between highway engineers as to the precise meanings to be attached to various technical terms, and that there should be one accepted word or

phrase, and one only, to describe any given thing or process. The preparation of a standard glossary is a difficult matter, and Mr. Boulnois is to be congratulated upon his courage in essaying such a task. If the co-operation and friendly criticism which he has invited are forthcoming, however, there is no reason why the results of his efforts should not prove of great practical value. The next branch of municipal work which claims attention is that of water supply. The formation of a central authority is still "in the air," and long deferred legislation dealing with this important subject does not appear to have made any considerable advance during the year under review. The necessity for a pure supply is conceded on every hand, except, perhaps, by a few self-styled economists, who would even go so far as to carry their penny-wise policy into this sphere; but each of the two schools of thought—namely, those demanding purity at the source and those who are content with purification by artificial processes—still finds many champions. It is reassuring to learn from the investigations of Dr. Houston that the typhoid germ is not so generally present in water as is ordinarily supposed, and that sewage pollution does not necessarily mean typhoid pollution. In architectural and building work the most notable feature has been the continued interest which has been taken in the housing of the working classes. Efforts to produce houses which can be let at economic rents have again been forthcoming, and, while the ideal has not yet been attained, the nature of the accommodation which is necessary is better understood, and the importance of certain principles of construction is beginning to be realised. In the tramway world considerable progress has been made, due, in part at all events, to the keenness of the motor omnibus competition. The cry has been heard that the day of the tramway is over, but the experts are not afraid, and the improvements which have been made in the Metropolitan system are symptomatic of what is being done throughout the country. Not only are tramways very much alive, but we shall be surprised if important extensions and developments are not forthcoming in the near future. The question of street lighting has been comparatively quiescent during the past year. The chief matter to record is the increase in the use of distant control for gas lamps, several important towns now having the whole of their street lamps actuated in this way. There are two noteworthy features to be observed in regard to the collection and disposal of house refuse. One is the increased use of motor-vans for collection, and the other is the more general recognition of the efficiency of disposal by burning. Modern destructor development is largely in the direction of increasing the efficiency of furnaces so as to secure a maximum of heat available for power production. Although in various parts of the world there has been consider-

able activity in the building of large bridges during the past year, there are no works of the first magnitude to record in this country. The use of ferro-concrete, however, has become distinctly more general, and important works have been carried out in Northumberland, Surrey, Warrington, and elsewhere. Finally, in regard to progress in electrical work, many large municipal undertakings have important extensions in hand, and it is noteworthy that those which have hitherto generated continuous current only have been obliged to adopt high-pressure alternating current to cope with the larger powers and longer distances now met with. The

above review and the special articles which follow are amply sufficient to show that, although the past year may not have witnessed any epoch-making achievement, municipal engineers have again been called upon to execute an enormous amount of public works of a very diverse character. A good deal of this work is not such as to strike the public imagination, although it apparently makes a strong appeal to the critical faculty. Nevertheless the profession as a whole, while not neglecting any attempt to obtain just recognition, may rest in the assurance that work well done is its own reward.

BRIDGES.

In many different parts of the world the year 1913 has been one of great activity in bridge building. The authorities directing the administration and construction of highways in the United States have paid special attention to this, and in many far parts of the British Empire steady progress has been made in the provision of bridges on important roads. At home a considerable number of narrow or otherwise inadequate bridges have been replaced by new ones, and some important town bridges have been built. In spite, however, of the importance of the subject of bridge-building as a part of highway engineering, none of the "questions" or "communications" of the Third International Road Congress was devoted to bridge design, except in so far as the communication on the subject of the kinds of surfacing to be adopted on bridges included papers in which there was some discussion of other features of bridge design. The design of bridge floors did in fact receive a considerable amount of attention in the papers sent in, and some very useful information will be found in these reports (see *THE SURVEYOR* of July 11th).

ROAD BOARD GRANTS.

Road Board grants for the "reconstruction and improvement of bridges" in the financial year 1912-13 were as follows:—England and Wales, £24,458 (all within the area of extra-metropolitan administrative counties); Scotland, £4,801; Ireland, £90. No loans were made under this head. In addition to these grants some expenditure on bridges is included under the head of "new roads and bridges," the grants for which in England and Wales amounted to £55,650, of which £30,000 went to county boroughs and £25,650 to counties outside the metropolitan area. No grants were made under this head in Scotland or Ireland.

STEEL BRIDGES.

The Lower Ganges Bridge, now in course of erection, will have fifteen spans of 359 ft. centres and six spans of 75 ft. It will carry a double line of 5 ft. 6 in. railway. Bow N-girders with triangular end bays are employed for the large spans. Each girder has eleven bays, and there is a brace from the middle of each diagonal to the next intersection point on the lower chord.

SYDNEY HARBOUR BRIDGE.

As a fine example of its type, Sydney Harbour Bridge, the construction of which was decided upon last year, may be included in our selection of examples of bridge design in 1913. More than twelve years ago a number of competitive designs for Sydney Harbour bridge were considered, one of them involving the construction of a central span of 1,900 ft. The design now accepted will have a central span of 1,600 ft. between centres of the main piers, the middle 500 ft. being the length of the central girder. The shore spans will be each 550 ft. in length, and will be approached by viaducts of reinforced concrete or steel arches at both ends. The cantilevers and central girder will be of nickel steel, and the anchor piers will be built of masonry and bluestone concrete. The bridge will carry four lines of electric railway and a 35 ft. roadway between the girders, and outside them there will be a motor

roadway on one side and a footway 15 ft. wide on the other side. The estimated cost is £2,250,000. (See *THE SURVEYOR* of July 11th.)

TIMBER AND COMPOSITE TRUSSES.

A number of timber truss-bridges for 14 ft. roadways have recently been built in Washington State, U.S.A., on mountain roads which pass through forests. They were designed for floor loads of 80 lb. per sq. ft., and for spans of 40, 60, and 75 ft. A 40 ft. span is carried by two king-post or A-trusses with timbers equivalent to 12 in. by 12 in. The bottom chords are single poles. A 12 in. by 14 in. floor beam at the middle of the span is carried by two 1 in. round iron rods hanging from the apex of each truss, and the floor beam extends beyond the trusses to provide for lateral bracing. The 60 ft. spans are 3-panel queen-post trusses with counter braces in the central panel, the bottom chords being single poles of 68 ft. overall length. These poles were placed in position first, and supported the light staging used in erecting the other members of the trusses. Carpentry joints were made for the 40 ft. and 60 ft. spans.

The 75 ft. span is a 5-panel Pratt truss with steel eye bars for the lower chords and rigid upper and lower lateral bracing. Howe truss castings were used for the joints. The timbers were left round except at the joints.

A paper of great interest to bridge engineers was read before the Society of Arts towards the end of 1912, by Professor W. H. Warren, of Sydney University. (See *THE SURVEYOR* of January 3rd, 1913.) The life of timber bridges in New South Wales—that is, of the timber bridges of the Public Works Department—already averages about twenty-five years, with the exception of the floors, and Professor Warren has seen sound timbers which had been in use from forty to sixty years. In his paper Professor Warren described the tests which he carries out on timber specimens of considerable size, and furnished tables of the results.

FERRO-CONCRETE BRIDGES.

The reinforced-concrete bridges which have been constructed recently, and have been described in the engineering Press during the past year, fall into three main classes, and it is difficult to say which class is the most interesting. First, there are those bridges in which the design follows types which are definitely accepted and well understood, such as mass masonry bridges, girder bridges, and those the decking of which is supported by arch ribs or by beams spaced fairly closely together. In this class we may include twin arch bridges, or those with three arch ribs, since, although this type has only recently been developed, it has taken a very important place, and its ancestral forms may be found in some early timber bridges of large span. The next class includes those bridges in which reinforced concrete has been employed so as meet special features or special difficulties of the site. In some such cases the use of ferro-concrete is desirable, because it can withstand bending stresses: in other cases the material is very strong in proportion to its bulk, compared with the strength and bulk of alternative materials, or, thirdly, its use

may considerably reduce the loads upon foundations or the thrusts upon abutments. The third class consists of bridges which are unusual in the sense that the designer has deliberately aimed at an obvious and notable departure from ordinary design—as, for instance, in the case of through arches of reinforced concrete or arches intersected by the roadway. It must also be pointed out that in some cases a bridge of ferro-concrete is to be preferred to one of steel or timber, on account of its power of resistance to erosion or decay. The comparison is not by any means confined to that between the normal durability of the materials in question, since it is often necessary to allow for a greatly increased rate of corrosion of certain parts of a steel bridge, or for the rapid decay of timber which is sometimes dry and sometimes wet, or is buried in organically active soil.

A considerable number of the bridges of reinforced concrete which have been built during the past few years are by no means satisfactory, the designs showing, in some cases, a lack of knowledge of the distribution of stresses and a failure to grasp some of the important elements of stability and ultimate economy. It is not, however, expedient to criticise individual works which seem to fall into this category. In the first place, the particulars furnished are often such that a criticism would be alternative in character on account of the paucity of the information published. That is to say, the critic could only say "either this is wrong or that is wrong," which is not sufficiently definite for purposes of argument, although the conclusion formed may be logically beyond attack. In the second place, it would hardly be fair to attack particular designs which might be by no means the worst. Thirdly, such criticism would be a trespass upon the field of the consulting engineer, who could, in most of the cases referred to, have prevented the mistakes from being made had his services been retained, if only to check the designs.

LARIMER AVENUE BRIDGE, PITTSBURG.

A bridge which was completed in 1912, particulars of which were not to hand in time for inclusion in our article in last year's Annual Issue, may be mentioned here as a fine example of recent work, the type being the now well-known one in which the main arch consists of a pair of arch ribs upon which the decking is supported by spandrel columns or cross walls. In bridges of this type the arch ribs are sometimes of masonry or of plain concrete, and the rest of the superstructure of ferro-concrete. In other cases the ribs are lightly or strongly reinforced, in accordance with the nature of the loading and the ratio of rise to span. In this case, the Larimer Avenue Bridge at Pittsburg, the arch ribs are of ferro-concrete. The overall width of the bridge is 48 ft., a 30 ft. roadway and two footways, the latter being carried on cantilevers projecting beyond the arch ribs. The choice of this position for the footways must be considered one of the leading elements of economy in bridges of this type. The span is 300 ft. clear, with 67 ft. clear rise, or 312 ft. span and 70 ft. rise between centres. The ribs are spaced 33 ft. apart, centres, and each is 8 ft. wide, by 11 ft. deep at the springings and 6½ ft. at the crown. The spandrel columns are 19½ ft. apart, panel distance, carrying 30 in. by 84 in. floor beams, with 24 in. by 36 in. stringers, and a 10 in. floor slab. There is a stringer at each curb, two under the wheelway, and a fascia stringer at the outer edge of the footways. The tops of the spandrel columns are connected by spandrel arches, and as the approach spans on the steep sides of the valley are carried on similar columns, the design of the bridge as a whole is harmonious; but no attempt is made to force the approaches of the span into a closer conformity than is consistent with the natural development of the type to suit the site.

A single span arch-rib ferro-concrete bridge with masonry abutments has been built across the river Wansbeck, in Northumberland (Mr. J. A. Bean,

county surveyor—Details of Ferro-Concrete work by L. G. Mouchel and Partners). The span is 70 ft. with a rise of 15 ft. A little more than a third of the span rests directly upon the arch-ribs, the remainder of the decking being carried by spandrel stringers supported by columns, three over each haunch. The wheelway is 27 ft. wide, the footway being carried on cantilevers. The spandrel columns and the closely set pillars forming the parapet harmonise very well with the surroundings, and the whole effect is one satisfactory to a bridge engineer's sense of what is appropriate to the site (see THE SURVEYOR of November 14th).

A ferro-concrete arch-rib bridge of 70 ft. span at Guildford (Mr. A. Dryland, county surveyor) has a wheelway 27 ft. wide, with two footways of 6 ft. 6 in. Being an important town bridge, it has been designed to carry a load of 200 lb. per square foot, and for a test load of three 20-ton traction engines. The cost, approximately £5,500, works out to about 39s. per square foot of waterway roadway—by no means a very high rate for a single span bridge with heavy abutments.

WARRINGTON BRIDGE.

The new town bridge at Warrington (THE SURVEYOR of July 11th), the first half of which was opened by the King last July, is noteworthy as an example in ferro-concrete of a very important type, in which, by making the main members of a material which will stand fairly high compressive stresses, and by using a sufficiently large number of these members the cost of secondary members and of decking is small, and the rise of the arch is less than that necessary in some other types. Many bridges of this type have been built, the arch-ribs being of steel, as in the case of the new Vauxhall Bridge and other Thames bridges. The type is suitable for wide bridges, and differs essentially from that in which a pair of timber arches, or in modern practice, a pair of ferro-concrete arch-ribs, support a relatively narrow roadway. The Warrington bridge (Mr. J. J. Webster, M.INST.C.E., engineer) consists of ten parabolic ribs of ferro-concrete, supporting a roadway 80 ft. wide between parapets. The span is 134 ft. clear. The ribs are 3 ft. 9 in. wide, 4ft. 6 in. deep at the springings and 2 ft. 6 in. deep at the crown. About a third of the 6 in. slab decking rests directly upon the ribs, and over each haunch of every rib there are four relatively short columns, supporting stringers and cross beams. The bridge was hinged at the crown and springings during construction, the hinges being afterwards made up solid.

NEATH CANAL BRIDGE.

Having noticed a type of bridge well adapted for carrying highways across steep-sided valleys of small width which can be crossed in one span, and suitable also for small stream crossings, and having noticed also an example of a type suitable for wide urban roads carrying heavy traffic, we will now direct our attention to an example of another development of ferro-concrete in which the tensile strength of the material is fully made use of in the main members of the bridge. The ordinary through girder bridge with cross girders, usually of the same material as the main trusses or girders, is a general type, large numbers of which have been built both with steel and with timber. The number of ferro-concrete bridges of this type is steadily increasing, and the particular form in which ferro-concrete can most readily be used is that in which, when the bridge is of steel, the main members are plate girders and the cross girders are rolled steel joists, or joists built up of plates and angles. The cross girders are usually in rigid connection with the main girders. A good example of a ferro-concrete bridge corresponding to this form is the bridge over the Neath Canal, at Neath, S. Wales. The width between parapets is 24 ft. and the span is 49 ft. The parapet-girders are about 6 ft. deep, and a little more than 5 ft. deep between centres of reinforcement. The upper or compression member is

about 10 in. wide by 13 in. deep, the lower member 10 in. by 20 in. deep. The web of the girder is about 3 in. thick, and the stiffeners about 6 in. thick. There are ten stiffeners to each girder, and the spacing does not increase towards the centre of the span, since each of them corresponds to one of the cross beams, which are 4 ft. 6 in. apart. The cross beams, the under sides of which are flush with the under-sides of the main girders, are 24 in. deep by 8 in. wide, the 5 in. floor slab being between them and flush with their tops, so that each beam is effectively a T-beam with an ample area of concrete in compression. The foundations of the bridge rest on piles, and as the penetration showed that there was on the North bank hardly sufficient sustaining force, a ferro-concrete raft, 5 ft. in diameter and 9 in. to 14 in. in thickness, was formed *in situ* around the head of a pile under this abutment, in order to provide increased sustaining force.

Provision has been made for adding footways outside the main girders should that be necessary in the future.

AT MARSHALLTOWN, OHIO.

While the through girder type is suitable for road bridges of small or moderate width, the increasing cost of the cross girders with increase of their span sets a limit to the use of this convenient type except when it is permissible and practicable to divide the roadway into two parts. When there is sufficient headway for navigation or waterway for floods beneath the bridge the under girder bridge may be a suitable type. Recent examples of this type include a bridge which has recently been built near Marshalltown, Ohio, U.S.A. There are four similar spans of about 42 ft. clear, carrying a 16 ft. roadway. The three girders, which are physically continuous over the piers, are spaced 7 ft. apart, centres. They are 12 in. wide by 36 in. deep. The main reinforcement consists, in the middle of the span, of nine $1\frac{1}{2}$ in. sq. bars in three rows, two of which are bent up diagonally at suitable distances from the centre. There is, it seems, one row of these rods extending for about 9 ft. from the centre line of the pier towards the middle of the span; but the amount of such reinforcement is not such as would be provided if the girder were a truly continuous beam. This bridge is not a wide one, but a similar bridge of any greater width could obviously be built by adding to the number of the under girders.

Another beam bridge which deserves mention is that built over Whittle Burn, Northumberland (Mr. J. A. Bean, county surveyor). There are four spans of 20 ft. carrying a roadway 25 ft. wide between parapets. The spans are carried on trestles each consisting of three columns 12 in. square, connected by top and bottom cross braces and diagonal bracing (see THE SURVEYOR of Nov. 14th).

TWO BRIDGES AT CHINGFORD.

Two bridges built at Chingford in connection with the construction of the new reservoir of the Metropolitan Water Board provide examples of the use of ferro-concrete as mass masonry. When reinforcement is used in this way the design usually comes into somewhat severe competition with designs of the same type in plain concrete or masonry. In some cases, however, the reduced bulk of the reinforced concrete is an advantage; and in other cases it may be desirable so to design the bridge that occasional extraordinary loading of a half span is not likely to cause damage. One of the bridges to which reference has just been made is that over the intake channel of Chingford reservoir (THE SURVEYOR of May 30th). This bridge has an arch ring of reinforced concrete, the width of the arch being 14 ft. 8 in. The span is 50 ft., the rise 5 ft., the thickness at springings 2 ft. 6 in., and that at the crown 15 in. The lengthwise reinforcement of Kahn bars is carried into the mass concrete abutments. The spandrel walls are reinforced with $\frac{1}{2}$ in. and $\frac{1}{4}$ in. rods. Though the arch is considerably thinner, at the crown at any rate, than a corresponding arch of plain concrete, the bridge is

essentially a masonry arch under compression, with reinforced concrete spandrel walls, the adoption of which is in a sense a greater departure from construction in plain masonry than is that involved in the reinforcement of the arch ring.

The other bridge—that over the river diversion—is a massive masonry arch bridge of three spans of about 27 ft. The reinforcement is in part designed to strengthen the middle portion of the arch span, and seems to be partly intended to add to the margin of strength generally. This is essentially a bridge in which ferro-concrete plays the part of mass masonry, except as regards a small portion in the middle of each span (THE SURVEYOR of May 30th).

SOME UNUSUAL DESIGNS.

So far we have dealt with bridges which belong to definite types suited to a fairly wide range of conditions in each case. We will now consider a case in which ferro-concrete was employed in such a manner that a similar bridge could hardly be constructed of any other material but timber, which, under the circumstances of the case, would not have lasted for an economical life. We shall then consider a few examples of bridges which are unusual in character rather than the result of the free choice of the designer than on account of the special difficulties of the site.

MELLOR-STREET BRIDGES, ROCHDALE.

The interesting features of these bridges are the pile foundations, the use of ferro-concrete in the construction of light walls and slabs forming the abutments, and the adoption of a simple arch-ring of ferro-concrete, without ribs. The design is adapted to a site affected by colliery workings. The bridge is 40 ft. wide and 23 ft. 6 in. span, and has a considerable skew. Each foundation consists of two rows of ferro-concrete piles, the rows being 7 ft. apart, and the piles in each row from 8 ft. to 11 ft. 6 in. apart. On these piles rests a 9 in. ferro-concrete slab, and at the front edge of this slab, and resting directly over the front row of piles, is the abutment wall, 10 in. thick, which is buttressed over each pair of piles by 10 in. buttresses extending across the slab. With the earth filling, the slab buttresses and wing walls form the abutment for the arch, which has a rise of 2 ft., and is 14 in. thick at the springings and 9 in. at the crown. To withstand the thrust of the arch between the buttresses the arch-ring is extended behind the abutment wall to serve as a girder across the spans of about 8 ft. to 11 ft. A curtain wall is carried down about 6 in. below water level. There are two bridges, one with fourteen piles in the foundations and the other with twelve. The type may be considered as one in which reinforced concrete is so disposed that the bridge is a development of the mass masonry arch with abutment and wing walls backed by earth filling; but the nature of the stresses is greatly altered, and it should be clearly understood that a development such as this is very far from being the same thing as the construction with ferro-concrete of a bridge which *corresponds* to bridges constructed of other materials in the sense indicated in the reference to through girder bridges.

AT BOLLINGTON, SUFFOLK.

Arch rib-spandrels have been adopted as the main members of a bridge of three spans of about 36 ft. at Bollington, Suffolk (Mr. H. H. Hunt, county surveyor). The bridge provides a roadway of 30 ft., with two footways each 3 ft. 6 in. wide, the latter being carried on cantilevers, so that the three ribs are about 15 ft. apart. They are 10 in. thick and 20 in. deep at the crown, and spring from the tops of piles a little above water level. The $5\frac{1}{2}$ in. decking is carried on cross beams 6 in. by 12 in. Another feature of the bridge is the so-called half-arch, this shorter short span of about 18 ft. being constructed as if it were half one of the 36 ft. spans.

A FERRO-CONCRETE THROUGH ARCH.

A remarkable bridge of 197 ft. span has been built at La Mosela, France, to carry an electric

tramway. The rise of the arch is $28\frac{1}{2}$ ft. The roadway intersects the arches at such a level that 134 ft. of the span is suspended from the arches, the crowns of which are connected by overhead bracing. The middle segment has no diagonal bracing; this is provided, however, in the portions between the intersections and the abutments. The fascia stringers are about 16 in. square, and there are two 6 in. by 10 in. stringers under the roadway. The floor beams are about 10 in. by 12 in., the verticals about 10 in. by 12 in., and the arch ribs themselves are nearly 16 in. by 24 in.

Reference may also be made to an important viaduct across the valley of the Little Lehigh River, Pennsylvania, which includes nine spans of 120 ft., carrying a 32 ft. wheelway and two footways each 7 ft. wide. Each span consists of two arch-ribs, nearly semi-circular, spaced 26 feet apart at centres. Each rib is 8 ft. wide, about 11 ft. deep at the springings, and 4 ft. deep at the crown. The spandrel columns are connected by walls arched on the underside, forming a kind of striding pier standing on the arch-ribs. For some criticism of the design see our issue of May 23rd.

SOME GENERAL NOTES.

It would be a serious error to assume that the only important advances in the art of bridge-building are made with relatively new materials. A better knowledge of the distribution of stresses and greater care in the design of details have added considerably to our power of controlling the materials of bridge-building generally, and the various means now at our disposal for preserving from corrosion or decay the materials of which bridges are constructed tends to alter our estimates of the relative value of different materials and designs. In the case of steel bridges, for instance, we do not see nowadays so many of those struts with finicking bracing, difficult to paint and likely to corrode long before the main scantlings; nor do we see so many of the skimpy joints which disfigured many designs a few years ago. The importance of having in many cases plate and angle thicknesses considerably greater than those provided by the scantlings most economical of material is now frequently, though by no means generally, recognised, and the triangulation of main girders is bolder and better than it used to be. The fact that the painting of steelwork will be a constantly recurring expense is now more frequently given due weight as a factor in determining scantlings of bridge members. A fact which is slowly being perceived by bridge engineers is that the superior lasting qualities of wrought-iron compared with steel, or in some cases its greater toughness, justify its employment for some of the purposes for which steel would have been employed a few years ago without a second thought, and bridge engineers should pay attention to the contributions which have been made during the past year to the study of the relative durability of steel and of wrought-

iron. As regards timber bridges, no attempt is now being made to build them of the types which proved so successful in the hands of bridge-builders of the eighteenth century; the principles of such types can usually be better carried out under modern conditions, with masonry, steel, or reinforced concrete; particularly reinforced concrete. Trusses with a high proportion of depth to span provide a type of bridge which can conveniently and economically be built of timber, or of timber compression members and wrought iron or steel tension members, and the long lives of some of the timber truss bridges of the United States, and the successful construction of timber and composite bridges in Australia, show that this type of bridge, of timber, must be recognised as of leading importance in those areas in which suitable timber can be cheaply obtained.

Advances have been made, too, in the use of stone in bridge-building, especially by French engineers. The twin arch, or multiple arch rib, principles may be applied to masonry bridges generally, and the use of ferro-concrete for the decking and its supports has further extended the practical value of the masonry and plain concrete arch in some of its forms. In some cases the adoption of an unusual form of joint between the stones of an arch-rib has been an important element of the design. Further, the use of hinged arches has considerably affected the design of masonry and concrete bridges. There are not wanting examples of bridges in which reinforcement of the arch has been provided for no obvious reason, and in some cases the reinforcement of an arch which is wholly in compression has been definitely unsuitable. Other designs, however, show a grasp of the fact that a ferro-concrete arch which is wholly in compression should be so reinforced that its liability to cracking or to local disturbance is reduced by the use of a moderate amount of relatively small-sized reinforcement rather than by providing larger bars disposed as in the case of an arch which will be liable to bending stresses. In a few cases reinforcement has been buried in masses of masonry, in which it can hardly be expected to play any useful part. In other bridges, on the contrary, the facility with which a ferro-concrete bridge can be designed theoretically to resist the various stresses has led to the dimensions being too small; the bridge is strong enough in a sense, but it has not sufficient mass nor sufficient bulk.

The advances made in the design and construction of ferro-concrete bridges are mainly those which are due to better knowledge of ferro concrete construction generally, better methods of mixing and ramming, and more accurate information as to the behaviour of different mixtures; and in this connection special mention must be made of the excellent work performed by the Concrete Institute, the "Proceedings" of which furnish valuable data relating to such matters.

ELECTRICAL PROGRESS.

During the past year development has advanced along very similar lines to those followed since the epoch-making introduction of the tungsten lamp; there have been no remarkable changes in practice, but decided progress has been made in various directions. The tungsten lamp, made with real drawn tungsten wire, has continually improved in strength and durability, and is now so robust that it can be used for almost all the applications to which the carbon lamp was adapted, and can be handled without fear of fracture of the filaments, which gave so much trouble in the early days. Indeed, the longevity of the lamp, it is said, has proved somewhat embarrassing to the manufacturers. In view of the high price of the metal filament lamps compared with carbon lamps, users are very chary of discarding them until there is a marked falling-off in the candle-power, and as

this does not become noticeable until long after the lamps have burned for the proverbial one thousand hours, and in many cases for twice that period, renewals are seldom required on this account. It is true that after the lamps have been in use for a long time the filaments become brittle, but this does not matter provided that the lamps are not disturbed. Hence the demand for lamps arises largely from new users rather than from those who adopted the type a year or more ago, and as the carbon lamp becomes obsolete, the market offered by existing consumers of electricity tends to become appreciably restricted. On the other hand, the cheapening of electric light—due to the high economy of the tungsten lamps—has had the natural consequence of bringing many new consumers on the mains, and there is still a vast field for development in this direction. The price of the

lamps is also falling, and may well do so, for it bears little relation to the manufacturing costs.

III. QUESTION OF TARIFFS.

While the reduction in the current required for a given number of lamps has in many cases enabled the strengthening of the distributing network to be postponed, thus effecting an important saving in the capital cost of mains, which is a very heavy item, the central-station engineer is greatly hampered by the cost of making connections for new consumers, as well as by the low return received per connection from small installations already supplied from the mains. In spite of every effort of inventive ingenuity, it has not yet been found possible to reduce the cost of a service connection with underground mains much below £4, including a meter, or £3 where a current limiter is substituted for the meter, and the annual capital charges on the outlay, together with the cost of reading meters, and so forth, amount to about £1 per connection. To this must be added the capital charges on the plant and mains, bringing up the total to some £4 or £5 per annum, which must be covered, in the case of an installation of, say, ten 50-watt lamps, before the cost of the energy supplied is even considered.

It will be seen, therefore, that, at any rate in the case of the small consumers, the cost of giving the supply is tending to a definite minimum value, compared with which the cost of the energy is of little moment. For this reason the system of supply by contract, which has been repeatedly discussed during recent years, has attained considerable popularity, and other systems embodying a similar purpose—namely, to secure an adequate return for the fixed expenses—are being widely adopted. It is probable that this movement will continue, for it at the same time solves another very troublesome problem—namely, that of supplying electricity for cooking and heating at a low price, without necessitating the use of two meters and separate circuits for the two classes of consumption. A method which is growing in favour is that known as the "Norwich" system, it having been introduced by Mr. Loug, electrical engineer to the Corporation of Norwich. It consists in making a fixed annual charge, based on the assessment of the premises to the borough rates, and usually about 12 per cent of the rateable value, payable in quarterly instalments or otherwise. A single meter is provided, and all electrical energy, for whatever purpose it may be used, is charged for at a low rate—from 1d. to $\frac{1}{2}$ d. per unit.

From the central-station engineer's point of view this system adequately meets the requirements; but the peculiarities of the system of assessment lead in some cases to anomalous results, just as they do in the case of the water rates, for example, and such a tariff can hardly be offered without an alternative to meet these cases. The "Telephone" system developed by Mr. Seabrook, electrical engineer to the Marylebone Borough Council, embodies the same principle of a fixed charge to cover the constant expenses and a low price per unit, but in this case the first charge is arrived at by means of an inventory of the consuming devices comprised in the installation and an estimate based thereon of the consumer's probable maximum demand. Mr. Lackie, city electrical engineer to the Glasgow Corporation, has put in force a system of a somewhat similar nature, and numerous modifications are in vogue, showing that the need of a special tariff is very widely felt. We should add that whatever special system is adopted it is always necessary, in order to comply with the law, to offer a uniform price of so much per unit as an alternative, which the consumer may choose if he so desires; but the flat rate can be made uninviting by raising the price per unit to the highest limit allowed by law—usually 8d. per unit. An extremely ingenious system was introduced early in the year by Messrs. Handcock & Dykes, in conjunction with Mr. Duddell, president of the Institution of Electrical

Engineers, which renders it possible to control apparatus at all parts of a town through the distributing mains, and thus facilitates the working of a system of tariffs with differential rates depending upon the hour when the energy is consumed.

IMPROVED LAMPS.

In spite of the extraordinary advance in economy effected by the tungsten lamps which are already on the market, the limit of efficiency has by no means been reached yet. In the autumn of 1913 the announcement was made that tungsten lamps consuming only half a watt per candle-power would soon be on the market, and lamps of this efficiency were exhibited. Many of the large lamp-makers have taken up the manufacture on the lines laid down by the General Electric Company of the United States, the essential principle being that the bulb of the lamp, instead of being left in the condition of an almost perfect vacuum, is filled with nitrogen gas at atmospheric pressure, and the filament is coiled up into a very compact spiral, literally to keep it warm. The extended filament usually employed parts with its heat to the gas too rapidly; hence the coiling up. The temperature of the filament is much higher than in the ordinary lamp, as may be inferred from the high efficiency attained; but it is still very far below the melting-point of that extraordinary metal, tungsten.

Difficulties inherent to the combination preclude the possibility of making such lamps of small candle-power, and at first they will be restricted to candle-powers of 300 to 2,000, and pressures from 50 volts to 250; they will therefore not be suitable for domestic and general indoor use, but will be admirably adapted for the lighting of streets and open spaces, large halls and workshops, being equal in illuminating power and efficiency to the arc lamp, without the disadvantages of the latter, as they need no attendance once they have been installed. The fact that such lamps are about to be put on the market, and that as knowledge advances it will probably be found possible to make them in smaller candle-powers, intensifies the necessity which we have explained above for a radical change in the method of charging for electrical energy.

ELECTRIC COOKING.

The stimulus afforded to the development of other outlets for electrical energy by the diminished consumption of the lamps has had a marked effect upon the evolution of efficient and cheap cooking apparatus. The process of educating the public to realise that cooking can be done with electricity, not only as well as but much better than with gas, and at a moderate cost, is a protracted one, but is making good progress. The most important requirement for success in popularising this class of consumption is a low price for electrical energy, and this has been met in a very large number of cases by the offer of a supply for heating and cooking at 1d. per unit. At this price electric cooking can compete with gas at 2s. 1d. per 1,000 cubic feet. This is proved by the fact that it is being adopted by catering firms which have no predilections in favour of electricity and have no object to serve but that of efficiency in using it. The society, known as the "Point Fives," that was formed last year, consisting of central-station engineers who charge $\frac{1}{2}$ d. a unit for energy for cooking, is doing good work in discussing the details of construction of cooking apparatus and assisting manufacturers to improve their products, besides advertising the advantages of the system. The manufacturers, on their part, are doing their best to develop the best forms of apparatus, and, what is most important, to reduce the cost of manufacture. Hitherto electric cookers have been decidedly expensive, but there are indications that important reductions of price will be made by some firms this year, and the cost naturally decreases as the output of the factories grows.

The increasing importance of the business may

be gauged from the fact that, though it is quite in its infancy, in March last year there were 1,800 kilowatts of cooking apparatus connected to the mains of the Marylebone Borough Council, besides 2,300 kilowatts of electric radiators. Southampton had no fewer than 1,000 cooking and heating consumers, and the City of London Company, whose area is not a residential one, had 5,000 kilowatts of radiators connected. Mr. Seabrook, the Marylebone electrical engineer, reports that the highest cooking load is experienced at breakfast time, and that the effect of the cooking demand on the evening peak has been negligible—a very important fact, for many station engineers look askance at this class of business, fearing that it will increase their peak, and necessitate heavier mains. Several "all-electric" restaurants have been opened in London during the year. The business could be much more rapidly developed if the local authorities had statutory powers enabling them to purchase cooking and heating apparatus for hiring out, like the gas companies, and doubtless their disability in this respect will be remedied before very long.

GENERATING PLANT.

Excellent progress has been made during the year in cheapening the cost of turbo-generators, which are always used for extensions above 500 kilowatts; for instance, two 3,000-kilowatt sets put down at the Marylebone generating station in the autumn cost only £8,600, a sum actually less than the cost of the condensing plant, and less than that of four 1,000-kilowatt rotary converters. Unfortunately the cost of the steam generating plant is not going down in anything like the same ratio, but on the whole the cost of a generating station nowadays is far lower than it was even two or three years ago. Moreover, the efficiency of the plant is improving, and a 5,000-kilowatt turbine constructed by Dr. Ferranti to work with steam at extremely high superheat is reported to consume only 7 lb. of steam per horse-power-hour—a phenomenal figure. The progress of the Diesel engine in small stations has been checked by the high price of fuel oil, a condition which is expected to pass, but which is maintained with remarkable persistence. On the other hand, noteworthy progress has been made by the gas-engine, two 1,000 h.p. gas engines with by-product recovery plant having been installed at Accrington, with very satisfactory results. This plant is being extended on similar lines. One new water-power installation has been opened during the year—at Chester, where the city electrical engineer, Mr. Britton, has made use of the river Dee as an auxiliary to his steam station. Many of the large municipal undertakings are carrying out important extensions, and it is noteworthy that even those which have hitherto generated continuous current only have been obliged to adopt high pressure alternating current to cope with the large powers and longer distances now met with. Thus Glasgow, Birmingham and Belfast are preparing to erect new stations outside the city to transmit alternating current to sub-stations, and, in London, Marylebone and Hackney are adding three-phase plant to their existing direct current stations. The extensions contemplated by Glasgow will cost half a million sterling.

In view of the large demands now experienced and in prospect, and the higher efficiency, as well as lower cost, of large generating sets, it is a singular thing that the British municipal authorities are still very conservative in their ideas, and the largest size of turbo-generator yet at work in a municipal station is only 6,000 kilowatts, though Manchester has ordered one of 15,000 kilowatts. On the other hand, the company supplying the city of Chicago has had a set of 25,000 kilowatts built by a British company, and has ordered other sets of 30,000 kilowatts each from American makers. Precisely the same tendency hampered the development of electricity supply in this country in the early days, but with better excuse, for the extraor-

dinary development that has since taken place could not then be so well foreseen as the future load can be nowadays. The consequence was that much plant quickly became obsolete on account of its small size, and even in recent years the same thing has happened repeatedly owing to technical progress. For example, the turbo-dynamos put down at the Marylebone station in 1905 are now regarded as out of date, though they were the best obtainable at the time. Similarly, the turbines installed in the Lot's-road power station of the Underground Electric Railways in 1905 were replaced by others some time ago, and the largereciprocating engines put down in the London County Council's Greenwich power station in 1906 were broken up in 1913, their place being taken by turbines.

Evidently, therefore, not only must the greatest discrimination be used in designing the generating plant of a modern power station, but due allowance must be made in the shape of contributions to a sinking fund to enable advantage to be taken of the improvements that are likely to be effected within a decade. Many municipal stations are to-day working with wasteful plant simply because they are not permitted to discard the old plant until the debt upon it is fully paid off, and this again emphasises the folly of allocating large sums to the relief of the rates instead of accumulating substantial reserve funds to meet such contingencies. In this connection, it is interesting to note that the Corporation of Manchester has decided that the Electricity Department shall contribute only 1 per cent on the capital expenditure to aid the rates.

BULK SUPPLY AND LINKING-UP.

The early prejudice manifested by municipal authorities against co-operation with companies in the supply of electricity has died away to a marked extent during recent years, and now it is not uncommon for local authorities to take a supply in bulk from a neighbouring power company or other source. Thus the Metropolitan Boroughs of Marylebone and Woolwich are arranging for such supplies on a moderate scale as a stand-by, and there are numerous examples of small towns and villages making agreements for bulk supply, or handing over the whole undertaking to private hands. This question of co-operation, in fact, has attained to exceptional prominence during the year, and the satisfactory results recorded in Germany have frequently been quoted. In that country it is not unusual for a municipality to provide a large proportion of the capital required for the development of an electricity supply scheme on very profitable terms, or to lease the rights of supply in return for a heavy percentage on the gross income of the company. The question has arisen in connection with the future supply of London in view of the approach of the date when the London County Council will be entitled to purchase the undertakings of all the companies supplying the Metropolis. Although this will not take place until 1931 it is essential that action be taken in the near future, as otherwise it will be impossible for the companies to obtain capital for the development of their undertakings, and the result will be that electricity supply in London—which has become an absolute necessity to the public welfare—will stagnate for the last ten or fifteen years preceding the purchase date. One of the London companies, with this fact in view, is introducing into Parliament a Bill to enable the county council by agreement with the companies to postpone the date of purchase, and it is understood that negotiations are on foot for the formation of a company to amalgamate all the existing Metropolitan companies, and to reorganise the supply on up-to-date lines—a proceeding to which the assent of the county council will be indispensable. The subject has received the closest attention in electrical circles, and bids fair to become the most prominent question before the electrical world in this country in the near future.

A very important matter, which is also on the table at the moment, is the future supply of electrical energy to the railways. This will almost certainly demand the consideration of the municipal authorities adjoining the main lines, who will have to decide whether they are prepared to undertake the supply of the very large quantities of electricity required, or yield the field to others—in which event their own position as suppliers of electricity will be imperilled, owing to the cheapness with which electrical energy can be generated on the large scale. Already important schemes for railway electrification are on foot, and some of the companies are erecting large power-stations themselves, in the absence of an adequate public supply of electricity.

ADMINISTRATION.

The supply of electricity is becoming more and more a commercial matter, and the salesman is growing in importance compared with the man who is purely an engineer. Hence the controllers of the chief municipal undertakings prefer to style themselves "managers," and indeed have little time to spare for engineering work. The development of the commercial side of the business is of

the first importance, and the establishment of show-rooms, hiring-out departments and wiring departments is a valuable aid. The difficulties arising from the restrictions to which municipalities are subject with regard to such schemes hamper their activities, but some day these will be removed, as the Municipal Electrical Association is wide awake to the importance of reform in this respect. Until hiring-out becomes practicable the electric cooking business cannot be developed as it ought.

The notoriously inadequate wages of the junior staffs of municipal power-stations have led to the formation of a new society called the Association of Electrical Station Engineers, and it is probable that this will become a factor to be taken into account by Electricity Committees, as the leaders are advocating a militant policy. It is, however, questionable whether, under the conditions prevailing in the business of electricity supply, anything in the shape of a strike could be successfully carried out. None the less, this is a question which deserves the serious attention of the managing committees, for there can be no doubt that as a rule these men are paid wages far below the standard called for by their technical attainments and implied by the responsibility of the duties which they perform.

HIGHWAYS.

The year 1913 has been remarkable for the great amount of attention which has been paid to highway engineering and administration. The field of view has broadened, and problems which had previously been subject only to dogged and not always successful frontal attacks are now being attacked from several directions at once. The third International Road Congress provided a general stimulus, and a study of the large amount of comparative data which it brought to light serves, in many cases, to define the particular problems which we have to face in these islands, and to show us where we may pick up useful hints, where we may find justification for the principles which we follow and how much, or more often how little, the actual practice or administrative methods of foreign countries provide precedents or examples for ourselves.

The Road Board now fills an important place in highway administration and road engineering, and with the co-operation of the surveyors to local authorities it plays the part of a central office for roads, serves both to steady and to stimulate road finance, and is gradually collecting and recording the data and experience hitherto scattered over the country and disseminated throughout the pages of our own volumes. Sir George Gibb's wise and enlightened policy commands the respect of all who understand road problems. He will not allow the practical experience and local knowledge of the surveyors to be pushed to one side, but at the same time he insists upon the application of scientific methods and general engineering knowledge to the problems of reconstruction and improvement. On the administrative side he refuses to be a party to extravagant or untimely expenditure of Road Board funds on projects which do not properly fall into the general scheme of steady development, and he has shown himself ready to encourage developments which, while rendering road administration more efficient, will prepare us for the time when Parliament comes to some decision with regard to the extent to which central control and central finance will form a part of our system of administration. It is earnestly to be hoped that in the coming year some practical steps may be taken to weld the road authorities into a general organisation, or an effective association of organisations. Only thus can central control be kept within the limits which many of our readers would regard as desirable.

Amongst the activities of the associations of

which road surveyors are members, the most notable is the appointment by the Scottish District of the Institution of Municipal and County Engineers of a Roads Committee to collect and tabulate data, especially with regard to climatic conditions. We have often insisted on the importance of such studies, and recognise that in order to be of the greatest possible use they should be grouped in different parts of the British Isles. The results of the work of this committee will be awaited with interest by all who realise the importance of climatic conditions as influencing road making and maintenance.

The year 1914 may be expected to bring to light some of the practical results of the Road Board trials of road crusts and upper courses at Sideup, in Wandsworth and Fulham, and elsewhere. The behaviour of road crusts, new to the locality, which have been put down in several counties will also, it is hoped, provide data of importance. Main roads will be subjected to a steady increase of the more severe forms of traffic, and the development of motor-omnibus services will proceed apace, though not to the extent suggested by certain advertisements of a somewhat flamboyant character which have recently appeared.

It seems likely that during the present year attention will be given to the subject of special roads. Two kinds of projects are likely to be discussed. First, the provision of roads for heavy motor traffic between industrial and commercial centres, possibly on some of the routes now occupied by canals; and secondly, the construction of speedways for motor vehicles, including industrial traffic between London and the South Coast. Wide issues may be raised, especially as regards the control of such routes, by private companies or public authorities.

Matters of immediate interest to road engineers and surveyors received attention at the Surveyor Conference held at Olympia last April. The subjects discussed were: The organisation of highway departments; the relations between county and district surveyors; the circulation of official reports; the drainage of subsoil water; and the terms used in connection with bituminous roads (*THE SURVEYOR* of April 25th). A general paper on "Highways" was read by Mr. C. H. Cooper, borough engineer of Wimbledon, before the Society of Engineers, and was reported, with the discussion, in our issue of October 10th. Some principles of highway finance, with special reference to the position in the United Kingdom, are

discussed in an article by Mr. Reginald Ryves, *CONS.E.*, in our issue of August 8th. Highway finance was also the subject of a number of valuable reports to the Road Congress. In the article on "Highways" in our "coming-of-age" issue of January 17, we attempted to picture the development of roads in England, from the early 'thirties onwards, with special reference to the turnpike roads in counties near London and in four other counties representative of typical areas. The occupations and habits of the population as affecting the nature and extent of the traffic upon the roads were taken into consideration, and special attention was paid to the influence of topography and geology upon highway development. This article, it is hoped, may be commended to those students of the history of roads in England who wish to clothe the skeletons of dry fact which they study in various publications dealing with the history of highways. In the same connection, but from another point of view, the "Story of the King's Highway" may be recommended to the student of highway administration. The authors, Mr. and Mrs. Sidney Webb, are making a special study of local administration, and the work is the third of a series on this subject. Highway matters on the other side of the world are discussed in an article on "Australasian Road Problems," by Mr. J. M. Coane, of Melbourne, on p. 500 of our issue of October 3. The range of subjects which came within the scope of the Third International Road Congress was so great, and the treatment of those subjects so varied that no attempt will be made here to give even an outline of the proceedings. Our index will show where we have reported the proceedings and summarised main points in the reports, and some comments on the resolutions adopted will be found in our issue of August 29.

HIGHWAY ADMINISTRATION.

An important circular issued by the Road Board at the end of 1912 outlined the policy which has borne fruit during the past twelve months. In some respects, however, the practical response of local authorities to this circular has been decidedly disappointing. The chief clauses in the circular were given in our issue of December 27, 1912 (not 1913). In the following issue, January 3, 1913, there was a reference to a letter which Sir George Gibb addressed to *The Times*, pointing out that the Road Board did not express any preference for a particular method of road crust construction, but encouraged the local authorities to use many different forms of bituminous treatment. It is perhaps desirable again to direct attention to this point, since those who are not well acquainted with the facts might be led to suppose that the attention which the consulting engineer to the Road Board is at present giving to the carpeting system means more than it really signifies. It must be remembered that Colonel Crompton is not a whole-time officer of the Road Board and that his own investigations have led him to believe that the time has come to make a practical trial of the carpeting system on country main roads. In our issue of February 7 we advocated a policy of combination on the part of local authorities in order that fairly comprehensive works of road improvement near the borders of adjoining areas might be carried out with efficiency and economy. Possibly some development in this direction may take place during the next twelve months.

Criticisms of the Road Board's policy and references to its "boarded millions" have been effectually disposed of by the chairman of the Board and by official replies to questions in Parliament, and the country as a whole has not been impressed by expressions of discontent from various quarters as regards the apportionment of

the funds. We hope, however, that as regards the classes of roads towards the improvement of which the Road Board makes grants, certain kinds of rural highways of minor importance, per mile, will this year receive the attention of the Board. The sums necessary to encourage the improvement of these roads would be quite small, and it would be interesting to see what improvements could be effected, especially in regard to works which should be undertaken before any further developments take place in crust construction. Some notes from the Board's third annual report appear in our issue for August 1st.

During the past year there have been several authoritative pronouncements on the subject of the State control of main roads or State contributions to the cost of maintenance. The Select Committee on Local Legislation expressed the opinion "that the time has arrived when an authority should be constituted to decide which roads should be the main roads of the country, and that the cost of their maintenance should be taken off the rates and put on the taxes." The majority of the Committee reporting to the Road Congress on the subject of highway administration (Sir A. B. Hepburn, Bart., Messrs. Copnell, Munro Ferguson, Hodgkin, Heslop, and Jarrett) recommended the creation of four classes of roads—national, county main, county district, and local, with Exchequer grants for the first two classes. The British Committee reporting to the Congress on the subject of statistics of cost of construction and maintenance (Messrs. Ryves, Gowen, Harding, Moncur, Nichols, and Thomas) recommended that there should be four classes of roads—national roads, maintained by the counties, but the chief part of the cost defrayed by the State; county main roads, the cost defrayed by the counties, but one-half of it being a first charge upon the surplus of the Exchequer grants after meeting the prime charges set forth in the Act, 1888 (this being also a recommendation of the Joint Select Committee of August, 1911); and two classes of district roads, the counties making grants towards the cost of the first class, and the second class being maintained wholly by the districts (see *THE SURVEYOR* of December 5th). More drastic were the recommendations of the British Committee reporting on the Qualifications of Engineers and Surveyors (Messrs. Boulnois, Cowan, Sheldon, and J. W. Smith). They recommend the creation of a central department with the same powers as those now exercised by the Local Government Board with respect to public health and Poor-law administration, and by the Board of Trade in other matters. A department of roads is, they consider, urgently needed, and it should have a responsibility for the *personnel* of the local officers and a veto on their appointment or dismissal. "The nucleus of a central road authority," it is pointed out, "now exists in the Road Board" (see *THE SURVEYOR* of November 21st, p. 795).

Our issues for the past year contain several references to the primary data which must be taken into account in comparing the highway systems of different countries, especially with reference to the cost of maintenance. Traffic censuses will go some way towards indicating the true significance of comparisons of cost of maintenance, but for more general comparisons these are not usually available, and we must fall back upon statistics of mileage, population, and area. A short article on this subject appeared in our issue of June 20 (supplement page 47). It will be seen that in mileage of roads per square mile of area England, with 2.571 miles, ranks by far the highest of fifteen countries, the next being Ireland, 1.755 miles, while France has 1.750 miles per square mile. Scotland, 0.745, comes

between the United States and Italy in this list. An element of comparison of even more importance in most cases is the population per mile of road. Here the figure for Ireland is only 77.13, against 108 for France, 210 for Scotland, and 239 for England and Wales. Italy, we find, has the much higher figure of 371 and Spain 504. The United States has a population of only 41.8 per square mile. In both lists France comes next to Ireland.

The administration of highways in Ireland continues to improve, and there is an increasing desire on the part of county and rural district councils to bring the roads up to a higher standard. In all cases in which the period allotted to schemes for the maintenance of roads by direct labour had expired steps have been taken for making fresh schemes.

Reference to the sign-posting of roads will be found in our issues of October 31 and November 7. The former contains our summaries of reports to the Road Congress on this subject and our comments on the recommendations of the British committee, and in the issue of November 7 we referred to the proposal that the Motor Union should take a place as one of our highway authorities and undertake the sign-posting of the roads. The proposal has met, we believe, with scant support, and may be left, perhaps, to die a natural death. The surveyors to local authorities are quite able to erect sign and distance posts in a suitable manner, and will, no doubt, willingly carry out these duties in conformity with general principles to be agreed upon. Sign-posting is road improvement, and even if the Road Board does not see its way to provide funds for the purpose, we have no doubt that it would undertake the task of drawing up directions as to the general principles to be observed. It may be suggested that the various bodies which now provide warning signs for the roads might do well to pool the funds which they devote to this purpose and place them in the hands of a small committee nominated by a suitable authority or authorities. The placing of warning signals by clubs and private individuals should be under proper control if it is to continue. Many of the signs now displayed are misleading and even dangerous, both directly and in the general effects which they produce on the minds of the travelling public. It may also be pointed out that it is a dangerous practice to paint the words that matter most in red paint which rapidly fades. A diagram showing a method of sign-posting at cross-roads, adopted by Mr. C. H. Cooper, M.I.N.S.T.C.E., was reproduced on p. 813 of our issue of November 28. A criticism of Captain Deasy's proposals will be found in the issue of August 29.

ROAD SYSTEMS.

The past year has been remarkable for a general overhauling of ideas about roads. The Third International Road Congress provided an opportunity for collecting data and statistics relating to road administration and road engineering in many different countries, and the various papers submitted contained a good deal of information which will enable the student of road administration to realise how the systems of different countries have been formed and how they are developing. We have ourselves been at considerable pains to dig out the really significant facts relating to road maintenance and management in different countries, and to present them in such a manner that they are comparable. Amongst the prime elements of comparative studies none are more important than those relating to the areas which are under the charge of the different authorities concerned, and it is especially necessary to distinguish between national and provincial authorities, and to realise that the same words have not always the same significance in different countries

(see p. 351, February 21). We have, therefore, specially directed attention to the areas of small American States and small German States, as compared with English counties or with the main divisions of the United Kingdom, and on the other hand we have made comparisons of the larger American States and the largest of the German kingdoms with countries such as Italy and France. We have pointed out that the terms "State" and "State highway" have quite different meanings in different cases, and that State, provincial, or county road systems may in some cases be comparable. The national roads of France are not comparable with the State roads of Schleswig-Holstein, nor with those of Maryland and Massachusetts; not comparable, that is, as regards their extent or their relation to a national Government. The reader who is interested in the subject will find the following references useful, and they are also to be recommended to those who desire to obtain information as to the actual conditions with regard to highway engineering and road maintenance in the different countries mentioned. The Road Congress reports on the subject of highway finance to a considerable extent supplement those on highway administration, and in some cases give better information. Some of the most important points in these reports are noted in our issues of August 15 (administration), August 8 (finance), and December 5 (statistics), the countries represented being Germany, Belgium, Bulgaria, Canada, the United States, France, Italy, Hungary, Russia, and the United Kingdom. Our own comments on these reports will be found in the issues of August 8 and 22. On the subject of administration the several German States are treated separately, and in our summary we have devoted separate notes to the more important of these.

The German Empire.—Early in the year (p. 351, February 21) we drew attention to the real position of affairs in Germany, and the information contained in the Road Congress reports may be supplemented by reference to our article in that issue, showing the nature of the changes that are taking place, partly towards centralisation and partly towards decentralisation. Of the Road Congress reports relating to Germany, by far the most interesting in the present connection is that on Communication 9 (see p. 855, December 5).

France.—An interesting paper on highway administration in France, by M. de Pulligny, is reproduced in our issue of December 27, 1912 (not 1913), and some important facts and figures relating to the French road system are given on p. 551 of our issue of March 28.

Ireland.—A reference to the dual system of control in Ireland was made in our issue of April 18, p. 620, and other references to highway administration in that country will be found in the Road Congress reports. In some respects the Irish system compares favourably with that of England and Wales, but it needs development and some radical changes, in the interests of efficiency and economy.

Scotland.—The Scottish system is undoubtedly one which suits the conditions of Scotland and the genius of the people. Scotland has very nearly the multiple unit system, and the units seem to be about the right size. It is probable that such changes as may occur will be a development of the present system, which has produced results ranking amongst the best obtained in any country in the world, and these results seem to be reached with a minimum of friction. The subject of highway administration in England and Wales may be considered as covered under the present main heading, and no separate reference need be made to it.

Ontario.—Some indication of the part played

by the provincial authority in the road administration of Ontario will be found in our issue of September 12, p. 385, in a reference to a report by Mr. W. A. MacLean, provincial engineer of highways. It may be remarked that there were in Mr. MacLean's paper some very interesting passages relating to technical matters.

Victoria.—Information respecting highway administration in Victoria, Australia, has been conspicuously before our readers during the past year. The composition of the Country Roads Board and some indication of the procedure to be adopted will be found on p. 559 of our issue of April 4, and later, April 25, we gave a fuller account of the work to be undertaken by the Board and of its powers. This development in highway administration, obviously inspired by the establishment of a Road Board in London, is of unusual interest and, we believe, of very great importance not only in itself, but as a precedent which may be followed by other Australian States. Further information as to the nature of some of the districts in Victoria, and the character of the roads, is given in the issue of October 21, from a paper by Mr. W. Calder, who has already stamped with success his indefatigable work as chairman of the Board, and further details with a sketch of a part of the proposed main road system appeared in our issue of January 2, 1914.

United States.—A very carefully and intelligently compiled bulletin of the engineering experimental station at Iowa furnished matter which we placed before our readers in a concentrated form in our issues of February 28 and March 7, and we believe that the information there given cannot conveniently be found elsewhere by British readers. There are descriptions of State departments and State boards, and references to the arrangements which are made between these authorities and the smaller local authorities, and it will be seen that in many cases there is a considerable resemblance between the American system and that of England and Wales as it is at the present day.

Russia.—By far the best and most interesting information in the Road Congress reports with respect to highway administration in Russia is contained in the report for Communication 9 (statistics). This information is given largely in the form of tables, and as the lengths are in versts, the areas in square versts, and the costs in roubles, most of our readers will find it convenient to make use of our summary on p. 858 of the issue of December 5, in which we have made the necessary conversions to British units—no small task.

Other Countries.—Interesting information concerning other countries will be found in the Road Congress reports, and the main features of importance are noticed in our summaries (August 8th and 15th). Attention may specially be directed to the notes on Austria, Italy, Bulgaria, and Hungary. As regards Austria, see also page 856, December 5th.

ROAD PLANNING AND ROAD MAKING.

In the British Isles it is seldom that an important road has to be planned mainly as a matter of engineering alignment and with a view to adapting it to the topographical and geological features of the country which it traverses. The difficulties of alignment, in our case, are those which arise from the existence of densely built areas on or near the new route, and from the need for planning the road so that it will be the most economical and useful in the long run, and, for the time being, not unduly expensive in proportion to the advantages which it offers. Thus a project for a new road has usually to be considered in relation to the probable changes which will take place in the neighbourhood, the conversion of rural into urban areas, or the clearing away of slum property, and

sometimes an actual town-planning scheme. With respect both to the approach roads of great cities and relief roads passing towns, the particular work may have to be considered as part of a general plan, and it should also in some cases be studied in its relation to the main road network of the open country. Among the numerous articles and papers of the past year in which town planning has been discussed, one of the most generally useful is that by Mr. J. L. Jack, town clerk of Dunfermline, "Legal Aspects of Town Planning," August 22nd. Some of the chief passages in a Local Government Board report on housing and town planning are quoted in our issue of August 29th, and this report shows that up to March, 1913, authority had been given by the Board for the preparation or adoption of 33 schemes by 27 local authorities, embracing a total area of more than 50,000 acres; and it is evident that important main roads must traverse or skirt some of the areas affected by these schemes. A paper on the preparation of town-planning schemes, read before the Institution of Municipal and County Engineers, by Mr. J. E. Wilkes, will be found in our issue of August 15th.

The general principles which should govern the alignment and construction of by-pass roads were discussed in an article by Mr. Ryves in our issue of May 30, with special reference to the character of such roads and their width. A paper on Birmingham town planning schemes, read before the Institution of Municipal and County Engineers, by Mr. H. E. Stilgoe, M.I.N.S.T.C.E., city engineer, was reproduced in our issue of August 29. The diagrams of cross-sections of streets show that excellent and liberal designs have been adopted, including the extension of the strength crust beneath and well beyond the kerbs. As regards particular roads, the most conspicuous schemes are the western approach road to London and the Croydon relief or by-pass road. Both of these may be regarded not only as important in themselves, but also as precedents. In connection with the western approach road scheme, the question of the engineers' remuneration was discussed at a meeting of the Middlesex County Council (issue of December 5), and in commenting on this matter we expressed the view that while the proposed remuneration of the county engineer (Mr. H. T. Wakelam) is by no means excessive, a further expenditure on the salaries of specially engaged and fully qualified assistants should be contemplated as necessary for this important work. The Croydon project, prepared by Mr. E. F. Morgan, highway surveyor to the county borough, gave rise to an exceedingly interesting fight between the party desiring the construction of the by-pass road, and consisting of a majority of the town council and certain motorists' organisations, and the party opposing it, consisting of a minority of the town council, backed up by owners of shops fronting the main street and representatives of the Croydon Rural District Council. It was a very pretty fight, ably controlled by the Local Government Board inspector, Mr. Malet. The Road Board approved of the scheme, and were prepared to contribute considerable sums towards the cost. An indication of some of the engineering features of the proposed road, with a plan and some of the cross-sections, will be found in our issue of November 28.

The extent to which the principles of road-making proper enter into schemes for road improvement makes it necessary to consider those principles in connection with road improvement generally. The improvement of a road which is a good one except as regards the crust may be a matter of crust reconstruction only; but we have very few of such roads. It is, therefore, necessary to take into account matters such as those which are discussed in an article on "Road-making

Developments," which appeared in our issue of June 13, and deals with the road as an earth-work, hydraulic considerations, and other matters which should be taken into account in well-considered schemes of road reconstruction.

COUNTY MAIN ROADS: ADMINISTRATION.

Cornwall.—Early in the year the Roads and Bridges Committee of the county council considered the report of their surveyor, Mr. A. E. Brookes, on the subject of maining and dismaining roads, and decided not to entertain the principle of recognising secondary or subsidised roads. The maining and dismaining recommended in Mr. Brookes' second or alternative report was decided upon, and the council accepted the principle of forming a class of main roads of the second order. Our own comment on the proposals will be found on page 125 of the issue of January 24th.

Cumberland.—The county surveyor suggests in his annual report that the payment of an annual sum for main roads maintained by urban authorities is not a satisfactory system; and he considers that it would be better to make an annual payment for ordinary maintenance only, and to pay, in addition, the actual cost of remetalling and repairing the roads when they need it.

Southampton.—The year under review in the annual report of the county surveyor was the first year in which the main roads of the county of Southampton, 542 miles, were generally under the direct management of the county council. There are now four divisional surveyors, and roads are divided amongst 130 lengthmen, each of whom has about 4 1-6th miles of road in his care. Mr. Taylor lays stress upon the importance of training the lengthmen. One foreman and two sub-foremen or gangers were allotted to each division.

Herefordshire.—Special attention has been given in our pages to the difficult position of Herefordshire in the matter of highway finance, and the considerations which we have put forward need not be repeated here. It may be urged, however, that the case of this county is eminently one in which the propriety of assisting its main road maintenance out of general funds should be recognised. In his annual report for 1912-13 the county surveyor, Mr. G. H. Jack, points out that the rates have risen very sharply, and he defends, in very reasonable terms, his reluctance to recommend the adoption of new and expensive resurfacing material, in view of the lack of suitable foundations; but he points out that if such foundations could be provided the longer life of the road should more than compensate for the extra cost of the improved methods of maintenance. "It is quite useless," he remarks, "to enlarge upon the benefits derivable from tar washing or the application of thin carpets of bituminous compounds to such roads until the real difficulty of finding sufficient money to reconstruct the roads from the bottom has been tackled and overcome. This task would be impossible without substantial Government aid." Excluding the city of Hereford, the population of the county is only 91,700, or one person to about 5·8 acres (not 5·8 persons per acre, as stated on page 155 of issue July 25, 1913).

Worcestershire.—In December, 1912, the Road Board agreed to contribute towards the cost of a scheme for the improvement of about 53½ miles of trunk roads, at an estimated expenditure of £127,000. It was expected that the work would be completed in five years.

Middlesex.—The work of coating five miles of the Bath Road with asphaltic materials has been in hand, and a description of the methods adopted on 2½ miles of this length will be found in our issue of December 19th. In the same issue we suggested that a trial of asphalt-macadam proper, as the wearing crust, might be made. The county

surveyor, Mr. H. T. Wakelam, has also in hand the first stages of the work in connection with the western approach road to London. (See *THE SURVEYOR* of December 5th.)

Essex.—A scheme for the reconstruction of about 150 miles of road, and involving an expenditure of about £300,000, has been approved by the Road Board (see our issue of January 9, 1914).

COUNTY MAIN ROADS: TECHNICAL.

Somersetshire.—Mr. H. T. Chapman, county surveyor, points out that the cost of first-class road materials has recently risen very considerably, and he is turning his attention to the use of cheaper local stones with bituminous binders. During the year an area of 83,000 sq. yds., or 7·8 miles, was re-surfaced with granite and basalt, water bound and surface tarred, and a length of about 1,100 yards was re-surfaced with "tar-mac."

Surrey.—Mr. A. Dryland, county surveyor, has continued the use of asphalt macadam, and has found tar slag macadam suitable for the condition tar-slag macadam suitable for the conditions of his county. He has used pitch-grouted was needed.

Cornwall.—The probable cost of carrying out the works necessary on seventy miles of district roads in order that they might be fitted to be included in the main road mileage of the county of Cornwall was estimated as about 500 per mile by Mr. H. E. Brookes, county surveyor, who submitted a report on the subject in January, 1913.

Wiltshire.—In February we announced the decision of the Wiltshire County Council to expend a sum of £74,700 upon the reconstruction and maintenance for nine years of the London-Bath Road, thirty-five miles of which lie in the county. Extracts from the report of the county surveyor, Mr. J. G. Powell, are given on page 403 in our issue of February 28, and include passages describing the physical character of the route and the nature of the proposed improvements.

Cumberland.—Tar macadam is being put down in the villages at an average cost of 2s. 4d. per sq. yard, or about twice that of the clay-bound macadam which it replaces. The county surveyor, Mr. W. Finch, considers that with the aid of Road Board grants the better surface and increased life will compensate for the greater cost. It is pointed out in Mr. Finch's annual report that there is a considerable mileage of roads which may now be surfaced with granite or whinstone, instead of the inferior limestones and broken pebbles which have hitherto proved serviceable on these roads. Reference is also made to the necessity for strengthening foundations and for making sure that the outlets for the road drainage are in working order. Many of the main roads are narrow and suffer from tracking, especially by motor wagons and traction engines. The main roads maintained by the urban authorities under agreement cost £95 2s. 8d. per mile in 1912-13.

Southampton.—The county surveyor recommended a gradual change to bituminous-bound crusts on the parts of the main road which are subjected to the heaviest traffic. The mileages under different crusts were:—Granite, basalt, &c., 236·3; tar macadam, 2·15; flint, 183·1; gravel, 120·3; total, 542·2.

Forfar, Dundee County District.—A paper on the maintenance of county roads in the Dundee county district was presented to the Dundee meeting of the Institution of Municipal and County Engineers by Mr. J. B. Robertson, county road surveyor (see June 13, page 902). For roads carrying heavy traction engine traffic Mr. Robertson recommends the use of stones set on edge and wedged, on the Telford principle, but usually it is more convenient and quite satisfactory to provide a 6-in. crust with the metalling proper on the top. The Dundee-Perth road crust was re-

made with 6 ins. of 3-in. hand-broken stone, with a finishing coat of $2\frac{1}{2}$ ins. machine-broken road metal, the cost being 1s. 4 $\frac{1}{2}$ d. per sq. yard. To make another road capable of carrying heavy motor traffic in the spring months 2s. 2d. per sq. yard was spent on re-making the crust.

Northamptonshire.—The cost of maintenance of the county main roads was nearly £80 a mile. The county surveyor reported that some of the roads showed evidence of damage by heavy motor traffic, and he considers that the widening of the carriageways on some of the roads will have to be undertaken before long. Tar grouting, adopted on half the mileage, had given very good results, and Mr. Morris recommended the extension of the system to the whole mileage, in spite of the necessary increase in the number of steam rollers and metalling gangs.

Herefordshire.—The county surveyor points out that it is sometimes advisable to metal the sides of the road crust with limestone treated with bituminous material. Expensive Cleehill stone is, he points out, often wasted on weak sides. The principle involved is that when funds are limited, or as a matter of economy when there is no difficulty in furnishing such funds as may be necessary, it is often desirable to make sure that sufficient bulk is provided as well as a sufficient quantity of wear-resisting material. In this county ninety-three miles of roads are recognised as first-class roads.

Herefordshire.—In his annual report the county surveyor, Mr. C. F. Gettings, stated that good progress had been made with the work of improvement of trunk roads under the scheme approved by the Road Board in December, 1912. The cost of improvement, which is estimated as about £2,373 per mile, is fairly high on account of the necessity for dealing with clay subsoils, and, for a considerable portion of the fifty-three miles, providing foundations. For small repair work a patching roller has been employed with good results. Tar painting had recently been carried out for the first time, and, in spite of the unfavourable season, the results were satisfactory.

THE ROAD CRUST.

Several of the Road Congress reports were devoted to the road crust, and the SURVEYOR summaries of the papers contain a considerable amount of useful information. See issues of August 1 for bituminous-bound crusts; October 3, for comparisons of types; and August 22, for causes of wear and deterioration.

Since the subject of giving adequate strength to the edges of road crusts was brought forward at the second Irish Road Congress by Mr. Arthur Gladwell and Mr. Reginald Ryves, this matter has received a good deal of attention in different parts of the country (see issue of August 15, p. 247). On page 275 of the same issue Mr. H. W. Bowen, county surveyor of West Sussex, described methods which he has employed.

Notes from the Engineering Advisory Committee's report on the Road Board trials at Sidcup (January 31, p. 250) are followed by a review of the report (Feb. 7, p. 281). The trials in Wandsworth and Fulham are similarly dealt with on p. 322, February 14. Special attention is directed to the trials arranged as a series in Fulham.

Notes from a paper by Mr. T. R. Agg, of Illinois State Highway Commission (May 2, p. 701), are the subject of comment on p. 689 of the same issue; and the notes and comments, taken together, may be specially recommended to the attention of surveyors who are reviewing the subject of crust construction generally.

Mr. T. Aitken's valuable paper on tar spraying and tar macadam (issues of June 20 and 27) is of wider interest than might be supposed by the title,

and should be taken into consideration under the present head.

The part played by water in macadam road construction is the subject of a suggestive paper by Professor W. G. Fearnside, F.G.S., which is reproduced in our issue of November 28, Professor Fearnside's reply to the discussion which took place being given in our issue of December 19. The paper is somewhat unsatisfactory from the point of view of highway engineering, but read together with our comment on page 805, our report of the discussion, and Professor Fearnside's reply, it furnishes useful material for the study of the physics of the road crust.

A method of resurfacing main roads, which is being developed as a result of the particular manner in which motor traffic affects certain kinds of road crust, is referred to in last year's special annual issue, page 173; and some hints as to the manner in which the problems of surface preservation are being tackled will be found on page 495 of our issue of March 21.

In papers which he read last December at Manchester and before the Institution of Mechanical Engineers, Col. R. E. Crompton, M.INST.C.E., consulting engineer to the Road Board, developed the theory of rhythmic traffic effects upon the road crust, and described a method of applying the carpeting principle to country roads. Abstracts of the papers, with important passages quoted in full, appear in our issues of December 26, 1913, and January 2, 1914, and our own comments appeared in the same issues.

The expression "Road Carpets" is used by Major W. W. Crosby, chief engineer to the Maryland Highway Commission, to designate thin films of protective material as well as the somewhat thicker layers which are more usually regarded as coming within the scope of the term. (See pages 597 and 591, April 11.) The connection of ideas is of some importance, since various processes coming under the head of road tarring tend to produce a distinct layer as well as, or instead of, a clinging film or a permeated surface layer of the crust itself. An asphaltic carpet proper on a concrete crust has been adopted for an important State highway in California, the method of construction being described in our issue of June 27, p. 987. For British conditions, the main restriction of a general character limiting the use of such carpets is the small range of gradients for which they are suitable. It is further to be remarked that their suitability for the conditions of a main road which is not a street depends largely upon the amount of horse-drawn traffic upon the road. They are necessarily much more slippery than most kinds of paving under weather conditions which frequently recur in the winter and spring, and may be more slippery under autumn conditions. Col. Crompton estimates the life of such paving, under certain conditions, as twelve years, an estimate which Mr. A. Dryland, county surveyor of Surrey, received with "grave doubts."

The subject of "Road Drainage and Foundations" was discussed at a meeting of the American Society of Civil Engineers, and extracts from the report, together with notes and comments by Mr. Reginald Ryves, M.CON.S.E., appeared on p. 907 of our issue of December 27, 1912 (not 1913).

ROAD METAL.

A very practical paper on mining and quarrying for road materials was read before the Institution of Municipal and County Engineers, South-Western District, by Mr. C. O. Baines (Paignton). It is reproduced, with a report of the discussion, in our issue of December 26, 1913.

The results of tests of road metal, made at University College, Cork, are given in an article by Prof. C. W. L. Alexander, ASSOC.M.INST.C.E.

(see pp. 318 and 316, February 14). In his tables Prof. Alexander gives the separate figures for the percentages of different sizes of material formed in the attrition tests.

An account of the work done by the Engineering Standards Committee on Road Materials is given in our issue of August 1, with a preliminary list of the chief roadstone rocks classified under different heads. We pointed out at the time that some of the words which occur in the primary list of trade terms are also to be found in the secondary list, and we suggested that it would be well to make such alterations as may be necessary in order to prevent confusion from arising out of the identity of words which do not always carry the same meaning. That the subject has by now advanced so far is due in no small measure to the pioneer work of a metropolitan borough engineer, Mr. E. J. Lovegrove, and to his collaboration in 1905 and onwards with Dr. J. S. Flett, of the Geological Survey; Mr. J. Allen Howe, of the Geological Museum, and the editor of *THE SURVEYOR*. The subject was further advanced, in 1908, by collaboration between *THE SURVEYOR*, Mr. Lovegrove, and Dr. L. W. Page, of the United States Office of Public Roads. Dr. Page carried out a series of tests of stones collected in this country, and thus established important data on exactly the same basis as those obtained with American rocks. These tests provide, therefore, a useful link between British and American records, the results appearing in our issue of April 10, 1910.

As regards the best shape for stones forming a broken-stone or macadam road crust opinion is divided. Some engineers prefer stones which are as cubical as possible, but others regard a proportion of longer-shaped stones as of value on account of the better bond in a crust containing them compared with that in a crust consisting wholly of nearly cubical stones. It is sometimes considered that although a proportion of the longer stones is of value in the main body of the crust, it is desirable that those nearer the surface should be as nearly cubical as possible. The subject was raised at the Second Irish Road Congress by Mr. Reginald Ryves, who regards the superior bond afforded by stones of mixed shape and length as a matter of importance, and does not favour any considerable departure from this principle near the surface of the crust. This view is now to some extent supported by the considerations recently put forward by Colonel Crompton as regards the extent to which and the manner in which wave action occurs on roads. If the shifting of the stones takes place, even to a small extent, in the manner described by Colonel Crompton the disadvantage of making a crust with nearly cubical stones, and these alone, is at once obvious. The crust as a whole is not effectively bonded against the action described, and individual stones are, on the average, more likely to be pushed over into new positions. On facts supplied to us by Mr. Ryves, as one of the results of special studies of country roads which he has recently made, and extending over a number of years, we have pointed to the tendency of surface-tarred roads to become bumpy; that is, to be worked into short waves by the traffic. The roads in question were compared with similar roads in the neighbourhood, which were not tarred, or had only recently been tarred. If the tar is effective in preventing the access of water to the crust, it is clear that a tendency to too dry a condition of the binding material in the body of the crust would favour such a shifting action as that alluded to by Colonel Crompton; and the tar film does, as we pointed out, prevent the wearing down of humps by attrition, and to a considerable extent prevents the rolling out of the road crust under certain traffic and weather conditions. These considerations may be held to

give support to our views as to the importance of the principle of seasonal tarring, with rests for recuperation under attrition and rolling out.

BITUMINOUS SUBSTANCES.

The cost of tarring roads and of making tar macadam depends very much upon the cost of the tar itself, and the simplicity of the operation of preparing and placing the material does not give promise of any considerable reduction of cost under this head. In an article specially written for *THE SURVEYOR* by Mr. W. J. A. Butterfield, M.A., F.I.C. (February 28th), the various sources of coal tar, tar oils, and pitch in the United Kingdom are reviewed, and some of the other demands for these materials are referred to. A useful paper on "The Consistency of Bituminous Materials," by W. W. Crosby, chief engineer of the Maryland State Road Commission, will be found in our issues of March 7th and 14th. The paper on "Tar Spraying and Tar Macadam In Situ," by T. Aitken, M.INST.C.E., county surveyor, Cupar Fife, gives results of practical experience, and is well worth study in preparation for the work of the approaching season (issues of June 20th and 27th). The nomenclature of bituminous substances has received much attention during the past twelve months, but no decision was come to by any authoritative body as regards the use of the terms "asphalt" and "bitumen." This part of the subject was not tackled by the British Committee reporting to the third Road Congress on terms used in highway work. In a *SURVEYOR* article (March 21st) the subject is referred to, and Mr. Prevost Hubbard's definitions are given. Correspondence on the subject will be found in our issues of December, 1912, and January, 1913.

SURFACE TARRING.

In Surrey the cost of surface tarring for 1912-13 was 1'69d. per sq. yard, comparing with 1'60d. in the previous year. The length of county roads tarred, exclusive of "claimed" urban district roads, was 167 miles, and the area nearly 1,700,000 sq. yards.

In Warwickshire (Mr. John Willmot, county surveyor) the area tarred was 492,710 sq. yards at a cost of about 1'76d. per sq. yard. The season was unfavourable for surface tarring.

In the county of Southampton (Mr. W. J. Taylor, M.INST.C.E.) the tar was chiefly applied by means of machines of the Weekes and Waithman type, and one spraying machine was also used. The area tarred was equivalent to about 121 miles of 16-ft. road, and the cost was 1'20d. per sq. yard. The area covered per gallon was about 4'76 sq. yards.

In Northamptonshire (Mr. C. S. Morris) special attention was paid to expeditious tarring of roads passing through villages. Stretches of road which became slippery in autumn were covered with slag clippings. Mr. Morris considers that surface tarring does not increase the life of a road to a paying extent except on roads costing more than £100 a mile per annum.

In Somersetshire (Mr. H. T. Chapman) surface tarring on main roads costs 1'2d. per sq. yard. Mr. Chapman considers it advisable to tar all newly surfaced lengths as soon as the weather permits.

Mr. O. Claude Robson, M.INST.C.E. (Willesden), considers that tar surfacing "might fairly be applied to all newly macadamised roads, the experiments already carried out with this particular treatment having been sufficient to justify expenditure in this direction upon all important macadamised carriage ways."

In the Uxbridge rural district (Mr. J. W. Harrison) tar painting has been carried out on a larger scale than before, the area covered having

amounted to 65,000 sq. yards. With tar at 2½d. per gallon the cost was 1½d. per sq. yard.

Some idea of the extent to which different methods of road tarring are employed may be gathered from the British report to the Road Congress on "Road Machinery," and the gist of the replies to questions addressed to surveyors on this subject is given on page 448 (September 1914).

TOWN PAVING.

Town paving received a considerable amount of attention in the reports and proceedings of the Third Road Congress. The reports on stone paving are summarised in our issue of October 17 and those on wood paving in that of July 25. The advocacy of Algarrobo as a first-class paving material is specially interesting (see Dr. Dassen's report, summarised on page 166).

While wood pavement holds its own well, and, when provided with a sufficiently deep foundation, gives good results under the heavy traffic of our towns, the conditions in Camberwell are such that the borough engineer, Mr. W. Oxtoby, M.INST.C.E., has had under consideration the question of a reversion to granite in the form of specially dressed Norway setts four inches deep. In Newcastle the wood paving is jarrah, and the sett paving Aberdeen granite, but on gradients exceeding 1 in 10 sandstone setts are used. This paving is found to be safer than bituminous-bound macadam, while water-bound macadam is difficult to keep in place. A large proportion of the surface of Newcastle highways is paved with a kind of pitching made of granite or whinstone chips, and as funds permit these streets are being surfaced over the chip paving with tarred slag. Turning to another industrial area, we find that in Sheffield tar-macadam is giving satisfaction, and thirty-nine miles of streets were already paved with this material some twelve months ago. It is interesting to note, in comparison with Camberwell, that Mr. Hadfield believes that, under certain conditions where the traffic is especially destructive to sett paving, wood will prove as economical as granite. By taking special measures to improve the foothold, tar-macadam has in this town been made applicable to fairly steep gradients, and when the road is too steep to give good foothold on tar-macadam a width of nine to twelve feet of it is laid in the middle of the road, leaving room at the side for horse traffic. In this connection it may be noted that where the width of the road is ample a special flagway is sometimes provided on the uphill side, with sett paving between the two lines of stone blocks. The reduction in tractive effort amounts to the same thing as an improvement in foothold. For a description of trials of various kinds of paving in Sheffield, with notes of the cost, the reader may be referred to page 667, issue of October 31; and further information, with a very useful table giving particulars of the traffic on different roads and costs of maintenance, will be found in a paper read by Mr. Hadfield before the Institution of Municipal and County Engineers (*THE SURVEYOR* of August 1st).

A summary of main features of the Metropolitan Paving Committee's tenth annual report was given in our issue of February 21. The report shows that there had been no important change in the situation generally. Creosoted soft wood maintained its position, and was the material chiefly employed, though other kinds of paving predominated in some districts, and much tar-macadam was put down in residential and business streets with comparatively light traffic. There was a continued tendency to increase the thickness of concrete foundations. Tar-spraying of macadam roads led to economies in scavenging, watering, and maintenance taken together.

Heavy Motor Traffic in London.—The effect of

motor-omnibus and heavy motor-vehicle traffic had been to increase the cost of maintenance of macadam roads generally. The cost of paved roads was reported to have increased in areas in which the strengthening of foundations had not proceeded very far, but elsewhere this traffic had not increased the cost of maintenance. In Fulham the cost of maintaining wood-block pavements had decreased, and it had not increased in Finsbury, where the foundations are usually 9 ins. or more in thickness. A slight decrease in costs, on 8-in. and 9-in. foundations, is expected in Hammersmith, and there seems to have been no increase in cost in Marylebone, where the foundations now provided are usually 8 ins. or 10 ins. thick. The maintenance cost of wood paving in Westminster has not increased, but the cost of asphalt is perhaps somewhat greater. Reports of higher maintenance costs are usually accompanied by the statement that deeper foundations will be provided in future. Taking into consideration the increase in the passenger mileage and ton mileage of traffic, the cost of reconstruction and the costs of maintenance, there does not seem to be any cause for alarm as regards the paving of main routes in the London area. The extra expense of cutting through the deeper foundations has to be considered. It is not really necessary, however, to make these foundations of tough concrete throughout, since the greater depth very much reduces the tension on the under-side when the foundation acts as a beam or slab, and very greatly increases the area of road bed over which a wheel load is distributed. As a beam, a 10-in. slab has two and a-half times the strength of a 6-in. slab, and a relatively poor concrete for the lower 4 ins. or 5 ins. would in most cases be of ample strength. At the same time, the increased thickness of foundation would still be a factor to be reckoned with in making excavations, and the more severe the traffic the more difficult it is to make good the excavations so that they are fit to bear the wheel loads within a reasonable time. This points to the subway for pipes and conduits as an eventual economy in a great many thoroughfares. The present situation as regards street paving in Belfast is described, and anticipations of future developments discussed, in a paper presented to the Great Yarmouth meeting of the Institution of Municipal and County Engineers by Mr. H. F. Gullan. Attention may specially be directed to Mr. Gullan's tables of comparative costs, on pages 149-150 of our issue of July 25. In these tables the real cost is considered, all the necessary factors for a true comparison being included. In Manchester it is considered desirable to substitute asphalt paving for stone setts in some of the narrow streets of the more densely populated part of the city, but so far little has been done in this direction on account of the cost of making the change.

Brick Pavements.—While brick pavements have hardly been used at all in the United Kingdom except for footways, the possibility that they may be suitable and economical in various parts of the Empire must not be overlooked, and it is therefore desirable to watch closely the trend of opinion as regards brick paving in the United States, where it is largely employed, not only in towns, but also on country roads. One of the most interesting of the reports which have been made on this subject is that by Mr. J. E. Howard on "Thermal Effects on Brick Pavements," a summary of which was prepared for our issue of March 28. (See also under "The Road Crust" in this article.)

LONDON TRAFFIC.

A good many arguments used in the so-called "Bus *versus* tram controversy" fail to take

account of the fact that the Londoner has a strong attachment to the type of vehicle employed in the London omnibus services. This is no new development, but probably dates from the old coaching days, and in its present form from the time when the horse-omnibus was the Londoner's favourite means of traversing the metropolis. With many persons the omnibus is usually entered as a matter of choice, and other vehicles as a matter of necessity. The type of omnibus used in London needs modification, and there should be a place for other types, some of which have important advantages in certain kinds of weather, but it would be exceedingly difficult to do away with the normal type of omnibus, and it would be a mistake to assume that the Londoner will be content with a vehicle which did not give him the ride on the roof, which is preferred to the inside of the vehicle by nearly all passengers in summer and by not a few in fair and mild weather in winter. As regards accidents, it seems that, in the London area at any rate, the tram is safer for its own passengers than is the bus, but with respect to accidents to other persons, it is less easy to come to a definite conclusion, since the tramcar is often the cause of collisions in which it does not actually take part. Comparisons apart, however, it must be recognised that a real and serious drawback to the advantages of omnibus traffic is involved in the total of serious and fatal accidents which are directly due to that vehicle.

In some cases the wear and tear due to motor omnibuses would be considerably less if there were no tramways. Mr. Oxtoby, borough engineer of Camberwell, recently expressed the opinion that in that borough no saving results in consequence of the maintenance of the tramway tracks by the County Council, but that, on the contrary, the borough suffers loss from the lack of a continuous cross foundation—which is prevented by the presence of the conduits, constant opening of the tramway margins, the vibration of the heavy cars, and the concentration of the other traffic on the sides of the road. The object of these remarks is to suggest that in regard to the reconstruction and maintenance of streets and roads the highway surveyors of the metropolis and surrounding areas will have to reckon with a steady increase of motor omnibus traffic, not only on new routes specially favourable to such developments, but also on routes on which the London County Council would like to place extensions of their tramway system. The motor omnibus, all things considered, is going to be cheaper to work than the tram. Important developments at present outside the range of the tramway and omnibus system as now operated may, however, be confidently expected. The planning of streets and roads in the metropolitan area is an important matter in connection with London traffic problems, and a conference convened by the President of the Local Government Board last November has doubtless carried matters a step forward in the direction of achievement of common action by the various authorities concerned. Mr. Burns' view as to the manner in which decisions should be come to with respect to road-planning schemes gave rise, however, to some unfavourable comments, our own among the number, and we believe that a more definite means of coming to decisions in specific cases will have to be devised. (See THE SURVEYOR of November 28th.) Some interesting statistics of traffic in Gray's Inn-road and Rosebery-avenue, London, will be found on page 403, February 28th, and the effects of motor omnibus traffic on the costs of maintenance of roads in Middlesex are given in a noteworthy paper read by Mr. H. T. Wakelam before the Institution of Municipal and County Engineers (issue of August 8th).

TRAFFIC GENERALLY.

Traffic enumeration is now becoming an important element in the design of road crusts, or, at

any rate, in the studies which have an influence on the choice of methods and materials. The Road Board's traffic forms are now being used to a considerable extent, and in many cases the results are published in the Board's annual report. It is easy to attach too much importance to traffic statistics. The significance of each total, taking the vehicles class by class, depends very much on the nature of the crust, and the significance of a general total expressed as a tonnage is necessarily doubtful until it has been analysed into its component parts. It may be suggested that what is now needed is to do away with the weights except for purposes of comparison within the limits of each class in itself, and to assign to each distinct kind of vehicle a "severity factor." This severity factor will be arrived at by combining two factors, one for the class of vehicle and one for the actual weight; thus, if a motor delivery van belongs to a class with a factor of 6, and the individual vehicle has a weight unladen of 3 tons, and a weight laden of 6 tons, the severity factor for that vehicle would, for general purposes, be 27, being based on a gross load of 4½ tons. Where it is clear that the vehicle is usually fully laden when passing the census station on its outward journey, and is usually empty on the homeward journey, the proper factors, 36 and 18 respectively, could be applied.

Considering the cost and trouble involved in taking the census over a period of sufficient length, it is obviously worth while to spend the very small additional amount of time necessary to apply to each class of vehicle in that census a factor representing the effect of the particular class of vehicle upon the road crust which is the type being studied, and another factor which is the average or actual estimated weight of the locally predominating vehicle of the class. It is here definitely recommended, then, that in making up the totals representing the severity of the traffic, a range of values appropriate to each of the road crusts over which the traffic passes shall be separately used in combination with the weight factors of the sub-classes. Thus, while delivery vans on rubber tyres would have one class factor, the weight factor assigned to a particular vehicle, and afterwards, in the result, to a total of such vehicles, would depend upon whether the observer reckoned the vehicle as being in the light or heavy sub-division of the class.

A list of factors suitable for a main road with a bituminous bound crust is not at all suitable for limestone or sandstone crusts on secondary and by roads in country districts. If, for example, we compare the ordinary motor omnibus with a slow-moving, iron-tyred motor wagon on wood pavements, the severity factors might be about the same, or that of the motor wagon somewhat the greater; but on a good, strong, water-bound macadam road the motor omnibus would be twice or three times as severe as the motor wagon. The relations between width and traffic must be carefully studied as a part of the study of highway economies. During the past twelve months there has been a considerable advance as regards a general appreciation of the fact that there is such a thing as the most economic width of a carriage-way, while it is now being understood that the provision of a very wide road may be attended by serious drawbacks. There is, however, little or no exact information as to the relative cost of maintaining roads of different widths under the same traffic. If surveyors would select a few stretches of road, the carriage-way of which varies considerably in width, and would separately keep account of renewals and repairs for these lengths of road, we should soon have most valuable data as regards the economic width of carriage-way for different kinds and amounts of traffic. The total severity of the traffic on a road is not the sum total of the separate effects of the different elements forming

that traffic. It may be that in a few cases different forms of traffic accentuate each other's ill-effects, but it is more often the case that different classes of traffic mitigate each other's punishment of the road. It is not easy to express quantitatively such influences as these; we can only take them into account by way of comment on our numerical results.

Another elusive factor is the distribution of the different classes of traffic over the seven days of the week and the twenty-four hours of the day; and the mere fact that the whole of the traffic occurs during the same week does not necessarily imply that it may be regarded as mixed traffic in its effects on the road. The manner in which motor vehicles, for instance, wear a road depends very much upon the amount of other traffic which is present on the same day, and in some cases a large number of vehicles may pass a given spot without deviating more than a very little from the centre of the road. Mr. R. J. Thomas, county surveyor of Buckinghamshire, recently made some interesting observations on the subject of the width of the road actually used by the traffic, and these are noticed in a report to the Road Congress (*THE SURVEYOR*, p. 857, December 5th). A traffic census taken on the main roads of Warwickshire is reproduced on p. 288 of our issue of February 7, and on the preceding page is a map specially drawn for *THE SURVEYOR*, showing the roads of the county, the connections with other roads, and the census stations. Motor traffic in Middlesex, and the relation between highway rates and the costs and maintenance of main roads were recently the subjects of a discussion in the correspondence columns of the *Times* between Mr. H. T. Wakelam and Mr. E. S. Shrapnell-Smith. Our own view on the subject was expressed in a "Minute" on page 533, October 10, and another on page 573, October 17. The subject of super-elevation at bends and curves was discussed in a *SURVEYOR* article contributed by Mr. R. Ryves, M. CONS. E., to our issue of May 23.

As regards one of the latest traffic developments, the "Wire-Bus," there is but little to record. Experience with these vehicles seems to give satisfaction, and there are several projects on foot for the establishment of wire-bus routes. The contributory principle has been recognised in the decision of Parliament with respect to the Bills of the Chesterfield Corporation and the Rhondda Valleys Tramways Corporation. In the former case the undertaking will have to pay to the Derbyshire County Council the whole of the extra cost incurred in making and maintaining the route, but the Rhondda Company only a third of such cost, and in any case not more than three-eighths of a penny per bus mile. Further developments of the position as regards the relation of wire-bus enterprises to road-maintaining authorities may perhaps be expected during the current year.

As regards the best width for roads, some very timely remarks were made by the Chairman of the Road Board at a meeting of the London Society last November. Sir George Gibb clearly perceives that it is neither necessary nor desirable to provide roads of the great widths which in some quarters are regarded as suitable, or are even urged as a necessity. (See *THE SURVEYOR*, September 7th, page 703.)

TERMINOLOGY.

During last year a number of highway engineers and others expressed opinions concerning the meanings to be attached to various words used in highway work, and the words and phrases to be employed in describing things or processes. During this period we have tried to do two things. First, we have published the suggestions or definite opinions of those who have paid attention to the subject generally or within defined limits; and, secondly, we have attempted to steady and direct discussion by drawing attention to the prin-

ciples which underlie the preparation of glossaries and lists of definitions. This has been very necessary. Some writers, for instance, do not distinguish between definition amounting to specification, definition consisting in the writing of a synonym in words the meaning of which is plain, and definition by a synonym which contains words themselves requiring definition. Lists of terms with specification-definitions fall into two classes—those in which the specification is qualitative only, such as Mr. Prévost Hubbard's definitions of asphalt and bitumen (p. 505, March 21st) and Mr. Dussek's on p. 663, April 25th; and those the definitions of which are more or less quantitative, including, for example, limits of melting points or amounts of residue on distillation between certain temperatures. Such lists are exceedingly useful—they are, in fact, necessary—but they do not form a part of a general glossary, which should resemble a dictionary as regards both brevity and method.

In the preparation of a glossary it is essential that the terms used in defining a word "A" shall be such as are either unmistakable in meaning or can themselves be defined after being pursued through a chain of other definitions not involving the use of the term "A." Another principle is that, although in a group of words relating to similar things we may use one term to help us by limitation of meaning to define the others, we must have at least as many distinct words as there are things to define. We explained this in our issue of March 21. As regards the manner in which glossaries of road terms should be compiled, it is clear that the best practical way is for individuals to put forward their own lists and suggestions, and for one of them, or some other person, to draw up a final and consistent list on some definite plan. A committee, though necessary for the compilation of an international glossary, is usually unable to produce a practical and consistent list for one language, and those features of the glossary prepared by the British Committee reporting to the third Road Congress, which called for adverse criticisms by *THE SURVEYOR*, would not have been likely to occur in a list prepared by any of the individuals composing that committee. We recently observed that no glossary should be accepted until it has passed under the rigorous scrutiny of a person with literary qualifications, who realises the significance of word roots and, from a fair acquaintance with the component parts of the English language and the allied European languages, can realise whether a proposed word is likely to stay in its place or whether, by force of other associations, it will wander from it. The last consideration applies more especially to the deliberate choice of a word to convey a particular meaning.

The recommendation of words to be preferred when there are several which are now used to convey the same meaning should be a feature of any glossary of road terms. It might, for instance, be recommended that the word "camber," when quantitative, should signify a proportion, rise to width, and that "cross-fall" should be the term applied to a measurement of the actual slope at a given part of the cross-section. Again, the word "road-bed" might be preferred to "sub-grade," which is ugly, and less expressive, and to "subsoil," which is required to convey another idea. Distinctions might also be made between "foundation," "foundation course," and "bottoming." Some subtleties in wording are needed when we are referring to subtleties in fact. It is also important that we should remember that only a few of the words in a road glossary are such that we may decide and can establish their meaning. There are two other classes—those with respect to which we must take account

of the views of chemists, geologists, and specialists in other sciences, and those which are the common property of the nation, and for our treatment of which we are accountable to the public and to philologists. In his report to the Road Congress on this subject, Mr. Limasset, the French reporter, said:—"The terminology of the road is as much part and parcel of our current language as it is of our technical language," and this may be read as a timely warning to those of us who are concerned practically with the subject of highway terminology.

A short list which must be reckoned with is one drawn up by Major Crosby and reproduced in our issue of May 30. A consideration of Mr. Boulnois' glossary, the first instalment of which will be found in our issue of October 24, is deferred until we shall have been able to collect and analyse the correspondence to which it has given rise and to make our own suggestions with regard to it. Mr. Boulnois has invited all who are interested in the subject to express their views, and a number of useful suggestions have already been received by the editor of *THE SURVEYOR*, and published in our correspondence columns. For summaries of the Road Congress reports the reader may turn up page 811 of our issue of December 12.

ROAD MACHINERY.

Some very good descriptions of road machinery are to be found in the reports of the third Road Congress, Communication 1, and references to the most important of these descriptions are grouped under different heads in our issue of September 19, with notes of the leading features of the machines and indications of the trend of developments in the countries represented. Attention may specially be directed to the horse rollers in use in the Netherlands and to an ingenious hand roller described by the German reporter. By a very simple but effective device this machine can be readily changed from a high-pressure to a low-pressure roller, and contrariwise, without adding or taking away ballast. Pavement ramming machines are being tried in Germany and in France, and in the latter country a machine of this kind has been used for ramming patches in the repair of motor pot-holes. The exhibits in *THE SURVEYOR* section of the Building Trades Exhibition were described in our issues of April 11 and 18, and those of the Road Congress Exhibition in that of June 20. Some very precise information as to the costs of motor haulage was given in a paper read before a Northern District meeting of the Institution of Municipal and County Engineers by Mr. J. Robinson, who furnished particulars of experience with the vehicles of the Darlington Rural District Council and details of costs.

Road Cleansing Machines.—There have been few developments in road cleansing machinery, and we still see too many water-carts of an ineffective and wasteful type; but in many cases better methods of spraying the water have been adopted, and a recognition of the importance of distinguishing between spraying proper and swilling proper has led to the giving up of half-and-half methods which neither effectively laid the dust nor removed it. Descriptions of the performances of Messrs. J. and P. Hills' road cleansing machine were given in our issues of January 24 and May 2, and illustrations of the vehicle in the supplement of our issue of April 11.

Wagons.—A 30-horse-power, 3-ton tipping wagon, by the Laere Motor Car Company, Limited, is illustrated on p. 291, February 7, this being a vehicle purchased by the Glasgow Corporation. A "Clayton" 3-ton steam motor engine is described on page 43 of our supplement of June 20, and a macadam distributing wagon, the invention of Mr. A. Hogg, county road surveyor, Elgin, on

page 774, May 16. This vehicle carries six tons of road metal, which can be distributed in about ten minutes, the two wagons in use being drawn by a tractor.

Rollers.—Rollers of ten to twelve tons weight continue to be largely employed, but the widths of the rollers are so seldom mentioned in reports that it is impossible to compare one case with another. Surveyors may be reminded that the load in pounds or hundredweights per inch width of front and hind rollers should be given in all cases when rolling operations are being described. Messrs. Thomas Green and Sons are building compound steam rollers of twelve tons, and Messrs. Ruston, Procter & Co. a superheated steam roller of the same weight, the working pressure being 180 lb. per square inch. In the same class, ten to twelve tons, is Messrs. Aveling and Porter's compound roller of ten tons, empty. Lighter steam rollers of six to eight tons, readily convertible into tractors, are being built by Messrs. Marshall, Sons & Co., and these machines were illustrated on page 48 of the supplement, June 20. The rollers built by such firms include, of course, a large range of weights and sizes, and the above examples are merely selected as typical of the practice of 1913.

The motor rollers now being used are mostly of about seven or eight tons weight, the loads per unit width being seldom mentioned in reports of works carried out. Messrs. Green and Sons have recently exhibited a motor roller of 7½ tons, which may be regarded as typical of this class, and Messrs. Aveling and Porter one of about seven tons. A water-ballast motor roller, the water being contained in the rollers themselves, is illustrated in our issue of March 28, page 552. This machine, by Messrs. Barford and Perkins, gives a range of weights from 6¾ tons empty to 8½ tons full. A heavier machine, by the same firm, has a weight of about ten tons when empty and eleven tons when full.

A useful vehicle, which may be employed as a roller, a steam wagon, or a 1,000-gallon watering wagon, is described in our issue of April 18, page 22 of the supplement, the illustration showing it as Mann's patent steam patching roller.

The most interesting development of the year is the 3-axle roller designed by Colonel Crompton and Mr. Tapp, illustrated and described in our issue of January 2, 1914. This roller is designed to give pressures ranging from 160 to 500 lb. per inch width of roller: and even if its performance in producing crusts without initial waving do not fulfil the expectations of its designers, it should be able to do work that cannot be otherwise performed except by two or three rollers, or, within a much smaller range, by changing the rear rollers or adding and taking away ballast. Without ballast the range of pressures of the 3-axle roller is from 1 to 2½, centre axle, and more on the front axle, and the change is made by means of hand wheels, or automatically, as the road crust hardens under the roller. The performances of this machine should be carefully watched by road engineers.

Road Tarring Machinery.—A hand-tarring machine, by the Phoenix Engineering Company, is illustrated on page 785, May 16, this being a smearing machine, on the same principle as that sometimes employed with tarring wagons. Illustrations of the tar-heaters made by the same firm will be found in the supplement of April 11, page 8, and diagrams showing the construction of Messrs. Llewelyn & James' tar-spraying machine on page 11 of the same supplement. Another tar-spraying machine, by Messrs. John Gates & Co., is illustrated on page 25 of the supplement of April 18. These examples are typical of apparatus now largely used by surveyors.

Thermometers.—A very important part of a tarring equipment is the thermometer for registering the temperature of the tar in the heater. The old clumsy method of dipping a thermometer into the tar, with considerable risk of breaking the instrument by sudden temperature changes or blows, is now superseded in well-managed work by the fixed thermometer, so mounted that the temperature of the tar can be read at any moment. The most recent pattern, made by Mr. John Hutchinson, and illustrated in our issue of May 23rd, has a bent tube which is carried through the air space into the tar. In heating bituminous materials for road work it is often important that a certain temperature shall not be exceeded lest the nature of the material be changed for the worse. The risk of tar seething over by too rapid a rise

of temperature, or the attainment of too high a temperature, has also to be considered. Accidents do sometimes occur, and might easily be serious.

Machinery for preparing the materials for the construction of bituminous-bound crusts or road carpets was described in a paper read before the Institution of Mechanical Engineers by Colonel R. E. Crompton, M. INST. C. E., and machinery of this class was shown at the Road Congress Exhibition (pages 42-44, supplement, June 20th) by the Ransome-verMehrs Machinery Company, Messrs. Stothert and Pitt, and Messrs. Murphy, Stedman & Co. Messrs. J. and P. Hill's tarmacadam plant is described in our issue of April 11. A small portable plant for patching work on bituminous road crusts (Messrs. Johnston Bros.) is illustrated in our issue of December 12th.

MUNICIPAL AND PUBLIC BUILDINGS.

The most notable feature of the past twelve months under this head has been the interest taken in the housing of the working classes. Very useful papers on the subject have been read, and important memoranda have been issued by the Local Government Board. The plans that have been published during the past year show that on the one hand the efforts to produce cheap houses at economic rents are being maintained, while, on the other hand, the nature of the accommodation which is necessary is better understood, and the importance of certain principles of construction is beginning to be realised. In providing cheaper substitutes for the ordinary brick-and-mortar wall with internal plastering there are perhaps two directions in which design might be encouraged, or two main ideas which should be recognised. The new houses would thus fall into two classes. In one class, mainly suitable for urban conditions, the reduction in rents would be small but worth having, the efficiency of walls, roofs, and floors being equal to that of the type which we may call normal; and in the other class, mainly suitable for rural conditions, the cost of building would be very low and the dwelling itself in some respects less effective as a cold and heat-resisting shelter. The rents, however, would be so low that the occupant would be compensated for these drawbacks. The low rent all the year round would go a long way towards balancing the extra cost of fuel and warm clothing.

There is in this country a class of poor people, regarded as improvident and seldom looked upon as "deserving cases," but possessing certain important qualities tending to self-preservation. In this class the women aim at increasing the family income in various ways, out of doors, often in petty hawking, rather than at economising the spending of the man's wages by attention to domestic details. An expenditure on household conveniences to an extent amply justified in the case of the house-proud class is to a large extent thrown away in houses provided for the other class. A class considered more respectable, and paying much higher rents per family, may be distinguished by the neat and clean, but often inadequate, clothing of the children. Now, a class which despises appearances but feeds well and is warmly clad can be accommodated in houses of a comparatively cheap and unsubstantial character, and very good cottages of this kind, one to each family, would not cost more than the rents which are now paid for a part of a more substantial house. In the towns the rents per house paid by this class are often higher than those paid by the other class, which receives much more attention from the clergy and from charitable parish workers. When this latter or house-proud class is the object of a housing scheme it is worth while to make efforts so to design the houses that their occupants may take a pride in them, and the suggestion that it is neces-

sary to recognise a class of persons who take a pride in themselves but not in their houses is nowise at variance with the opinion that where pride in the house itself is a factor it should be duly recognised. These remarks may be considered by some to be out of place here, but housing questions need to be studied in the light of a knowledge of racial elements and class instincts of the people for whom improved housing accommodation is desired. Designers should, therefore, be very careful lest they produce types of dwellings which, being intermediate in character, between the really solid and costly house and the very low-rented cottage, do not adequately meet the needs of any important class.

As regards town planning, the references to the subject in the present article may be read in conjunction with those under the head of "Road Planning" on another page. Considerable progress has been made with actual schemes, and other projects are under consideration. Something has been done towards bringing conflicting ideas into accord, but traffic developments and the facility with which manufacturing firms shift their works from one place to another make it very difficult to gauge the relative advantages of different principles in the matter of the choice of sites for large building schemes. It may be suggested, however, that the main idea underlying the creation of Letchworth is one of the most important in this connection, and that the enormous value to the worker of a home within a few minutes of his work is greatly under-estimated, and the saving in time, money, and nerve tissue not sufficiently considered. It may be contended that in its effects upon the nervous organisation, and therefore upon the whole body, reading in the train is one of the worst of the vices of the present day.

To those municipal architects and surveyors who will be concerned with the design of public buildings, the following recommendations may be made. Aim at making your buildings much simpler in outward appearance than most of the public buildings erected for similar purposes for many years past. Many public buildings are too ornate to be permanently pleasing. It should be remembered that features which may please the educated public at the time the building is erected may fail to please their descendants. It should be the aim of the designer to express what is eternal or, at least, what will for many generations be in harmony with the instincts of the race. A local note in architecture is, moreover, not to be despised.

Many public buildings have this serious defect: the secondary features are so developed as to be better proportioned to a surface of twice or three times the area. The main features of the building are crushed into insignificance by the predominance of detail. In some cases there is a superabundance of detail, and in other cases, amongst

which are a number of buildings recently erected, it is rather the size of the details than their number which leads to the suppression of essential features. Some architects seem to consider that their chief function is to make a building as unlike as possible what it would have been if erected purely on a utilitarian basis. Accordingly, they are at great pains to prevent a corner from looking like a corner, a surface like a surface, or a column like a column. An appearance of height, width, or mass, and all the larger effects of light and shade are crushed into insignificance by the piling on of monstrous and incompatible details. The "Rodney" public-house on the southern approach of Westminster Bridge exemplifies far better architecture than that of some public buildings erected at great cost, including near neighbours. Lodging-houses in Gower Street have some excellent features when compared with other buildings which could be named. Now that the new county hall of Middlesex has been built, exhibiting between the windows perfectly plain areas of stone, and suppressing all details which would interfere with the two or three leading features, it will become necessary to demolish, and we doubtless shall demolish within the next 100 years, at any rate, a much larger building which lies to the right hand on the way from Westminster to Charing Cross.

There are some details of design which are essentially bad. For instance, a column divided up into series of short columns and very wide blocks, one upon the other, expresses nothing that is structurally real. Another bad feature of many designs is the dividing up of surfaces amongst different materials, and the alternation of stone and brick—different kinds of stone, or different kinds of brick—around windows has in many cases been carried out with far too much emphasis, and to an extent not justified by the employment of the materials in that manner for structural purposes. A further defect of many public buildings results from the adoption, in the design of a large building, of features made up of small scale elements and suitable only for small buildings. The result is that the structure looks like an overgrown model almshouse. As regards the adoption of Classic features in the design of modern buildings, it must, of course, be admitted that the Anglo-Saxon, whose instincts bear with wonderful precision on things which move, has not the building instinct. The Normans had it in them, however, to build with inspiration, and the Norman style of architecture, it may be suggested, would often be more appropriate to certain situations than are certain kinds of pseudo-Grecian buildings which are too often to be seen in England. This applies especially to places where tall trees are an important feature of the surroundings.

As regards the design of small buildings, the styles favoured at present are in several respects better than those of a few years ago, but there is a tendency to the over-development of certain features, and designers may be recommended to compare some of the modern houses, in which the chalet element is in evidence, with much older houses of a very plain type, considerable numbers of which may be seen in the suburbs of country towns. The special interest which attaches to these houses lies in the fact that they seem to provide a basis for the development of quite striking architectural forms, although the house itself is in most cases an exceedingly plain building.

MUNICIPAL HOUSING.

Steady progress has been made with municipal housing schemes in many parts of the country. At Taunton a block of workmen's houses has been built on three-quarters of an acre of land, the cost of each house being under £144, including sewers,

streets, and fencing, or at a rate of 4d. per cubic foot. The rent, inclusive of rates and taxes, water, and one electric light in the living room, is 4s. per week. Each house contains a living room and scullery on the ground floor and three bedrooms above. A design for a cottage with similar accommodation, having walls of reinforced brickwork, and estimated to cost £159, is illustrated on page 88, July 18, the design being that of Mr. F. H. Heaven, F.R.I.B.A. The internal cement plastering is perhaps an unfavourable feature of the design, but it is obviously not essential. Designers of cheap cottages, it is to be feared, too often fail to realise the value of thickness in itself in the walls, and overlook the principles which have led to the adoption of thick plastering of low heat conductivity for the inside of the walls. We have to consider not only heat conductivity, but also heat capacity, and materials with small heat capacities per unit of volume, not per unit of weight, are to be preferred to those which have higher heat capacities. When it is impossible to devise something equivalent to brick with good inside plastering, it may be well to consider the merits of weather boarding and of wattled and plastered walls. A weatherproof house with very thin walls may be better than a solid dwelling resembling a dungeon in some of its features. In answer to a question as to the healthiness of some wooden cottages from which it was proposed to remove the inhabitants, a medical officer of health recently said that there was the difficulty: the people insisted upon enjoying robust health in spite of outside opinion as to their dwellings. In this county, where a considerable proportion of the rural population live in wooden cottages or in houses with walls of wattling and plaster, the death rate is very low indeed.

Some interesting statistics relating to housing in Liverpool were given in a paper read by Mr. H. R. Aldridge, secretary to the National Housing and Town Planning Council, at the Exeter Congress of the Royal Sanitary Institute. Liverpool has now a population of more than 8,000 persons, every one of whom has been turned out of an insanitary house, a cellar, or an overcrowded house. The corporation pays £22,000 a year for this increase in civic efficiency and improvement in the welfare of the poor, or 1½d. in the £ on the rates. The older people cannot readily be persuaded to change their habits, but the children respond readily to the improved conditions. In this matter what the country is thinking of doing to-morrow Liverpool has already done.

An important memorandum was issued last spring by the Local Government Board on the subject of "the provision and arrangement of working-class dwellings." The report is accompanied by a number of plans of houses of different types, reproduced in our issue of April 4. Attention may be drawn to the recommendation that walls of habitable rooms should be finished internally with plaster, and it may be suggested that a definite minimum thickness might be specified, since the adequate internal plastering of a house is a very important item affecting the health and comfort of the occupants. Five types of houses are shown in the plans annexed to the memorandum, and these are reproduced in our issue of April 4 (see pp. 565 to 567, the numbers of adults and children for which each type is intended being given on p. 568). An expert in domestic requirements comments upon the report and plans as follows:—

"Height is quite as important in small houses as in large ones, and sometimes more important. The larger the number of persons in a room, in proportion to the cubic contents, the more necessary is it that a large part of the space should be above the heads of the occupants, allowing room for a collection of foul, hot air: and, even in small rooms, it may be worth sacrificing floor space to

gain height without increase of cost. A sufficiency of light is very necessary, and high windows for the same pane area may be preferred to wide ones. In any case, the proportion of the window which can be opened should be large, to allow of rapid cooling on hot summer evenings. A wide frontage can hardly be necessary for the sake of light, if the windows be carried high enough. The floors of sculleries should not be of concrete. In order that it may not wear slippery, the concrete provided must be somewhat soft and fairly rough, and it can never be swept clean of dust, which is created by the sweeping itself. The presence of this dust is very objectionable in the house. Tiles are much to be preferred, unless the cost is prohibitive; and it cannot be impossible to provide something better than concrete at a reasonable cost. Type C is to be preferred to type B, and generally every effort should be made to provide a parlour, however small. [This was recommended by a speaker at one of the discussions reported in *THE SURVEYOR* last year.] A parlour is a very great stimulus to the woman's pride in her house, and reacts favourably upon the domestic economy of a household and upon their courage in facing the problems of life. Physically, it is a strain which would not be worth while if it were not for the moral effect. Type C is to be commended for the position of the staircase, which allows of two bedrooms in front, usually an advantage, since the air of the street is, as a rule, better than that at the back. The position of the water closet right outside the house, as in types A and D, is to be preferred to the position inside the house, though with an outside entrance. The coal-hole should not be inside, as in type E; the arrangement is messy, and tends to lower the tone of the scullery. The passage in the report relating to back streets is not wholly approved. It is necessary not only to consider, as pointed out in the report, that back streets, if not properly looked after and lighted, may be a nuisance, but also that some of the classes for which these houses are being provided cannot be trusted to use a back entrance. If the house refuse is removed from the back various kinds of rubbish are placed in positions where they are more or less ready to be taken away, but in actual practice are forgotten and left. It is better to face the inconvenience of traffic through the living room than, when building for this class, to provide them with opportunities for accumulating rubbish or throwing refuse into a back street or alley."

OTHER BUILDINGS.

Forty-four years ago the City of Belfast was provided with an abattoir on what was considered the best design of those days, and this building was enlarged in 1883. A new abattoir, with separate departments for the three classes of animals, has now been built, and is equipped with modern appliances. The report of the Admiralty Committee on Humane Slaughtering was taken into account in designing the arrangements in the slaughter hall, and the plans show that the city is to be congratulated upon the completion of a work which is in line with modern views, both humanitarian and sanitary.

An important fire station, described in our issue of March 14, is in course of erection at East Ham. The work is being done directly, under the supervision of the borough engineer, Mr. J. Birch.

A large tramcar shed at Rochdale, described in our issue of June 20, is so arranged that cars can enter at one end and leave at the other, thus saving considerable interference with traffic. The depot is provided with a repairing shop and other workshops, and with accommodation for the men.

A very good site was obtained for the Staines Joint Isolation Hospital, which was opened last May. This hospital is arranged on the modern

plan, separate buildings being provided for diphtheria patients, scarlet fever patients, and cases under observation. The buildings stand well apart in an area of about four acres, but are so placed that additional blocks can be erected if necessary. All the buildings are connected by telephone. The provision of soakaways for most of the down-spouts of roofs might seem to be an undesirable feature of the design were it not for the fact that there is a bed of sand and gravel under the site, so that the level of the subsoil water in winter is at about 7 or 8 ft. below the surface.

Though not a municipal building, the home of the Institution of Civil Engineers is one with which many of our readers will soon be familiar. The interior arrangements seem to be excellent, and the architect has succeeded in expressing in the outward form of the façade some of the inspirations and, possibly, some of the limitations, of the "parent institution."

Amongst the small buildings noticed in last year's issues, the pavilion at Haslam Park, Preston (January 10, 1913), is conspicuous for the appropriateness of Mr. H. Mawson's very simple and yet attractive design. The attention of municipal architects and surveyors may be directed to Mr. Mawson's remark that "nothing gives a cheaper appearance to a park than a bandstand of spidery, ornamental cast-iron . . ." His further suggestion, that the design of a bandstand should be based on a classic model is, however, one which leaves one somewhat chilled. For most situations a much more primitive type, based on the forest hut or the tropical "pandal," is, surely, to be preferred. Where a classic design seems to be appropriate it might be best to go the whole hog and to adopt a fully classical design, such as the simplest form of circular temple with tall pillars.

BATHS.

A fine open-air bath which has been constructed at Wimbledon is intended for the use of children in a thickly peopled district of low-rated houses. There is a water supply from a stream and an additional supply from the gravel beds beneath Wandale Park. At Leek it is proposed to provide new baths for a population which is so addicted to swimming that "there are clubs in connection with almost every church and society," an unusual feature perhaps in the social life of a typically moorland town. Plans of the existing and the proposed baths are reproduced in our issue of July 18.

Though not one of the works carried out or finished last year, the open-air swimming bath at Southampton may be mentioned here, since a description of it, with illustrations, appears in *THE SURVEYOR*, February 28, from a paper read by Mr. J. A. Crowther, A.M. INST. C.E. This bath is interesting as a work carried out with a view to making the best of the existing bath and site at a moderate cost, this object being attained by employing ferro-concrete pile foundations and 4½-in. ferro-concrete for the sides and floor of the baths. This construction also effects the purpose of resisting stresses due to the rising and falling tide.

LITERATURE.

A considerable number of books on building and related subjects have been reviewed in our pages during the past year, and for the convenience of readers specially interested in the subjects dealt with in the present article the following references are given:—"The Clerk of Works," by G. Metson; "Building Supervision," by G. W. Gray; "The Law Relating to Town Planning," by H. Barlow (all three briefly reviewed in the issue of October 10); "The Law and Practice of Town Planning," by R. A. Glen;

"Fire Prevention and Fire Protection as Applied to Building Construction," by J. K. Freitag (both in the issue of February 28); "Our Village Homes," by H. Aronson; "Building Stones and Clay Products," by H. Ries; "Spon's Builders' Pocket Book" and "Spon's Architects and Builders' Pocket Price Book and Diary." For some "Hints" of the Local Government Board of Scotland on the provision of houses by local authorities see p. 513 of our issue of October 3, and a memorandum of the English Local Government Board on the provision of institutions for the treatment of tuberculosis will be found in our issue of March 7. A series of three lectures on "Practical Problems of Housing Reform" was recently delivered at Glasgow University by Mr. W. E. Riley, superintending architect to the London County Council (see issue of October 17).

Amongst technical papers of interest to those responsible for public buildings mention may be made of two which have been noticed in *THE SURVEYOR*. "The Protection of Buildings from Lightning" was the subject of a paper read by Mr. E. J. Berg, in Illinois, an abstract of which appeared in our issue of May 16th. A report on the surface treatment of concrete was recently submitted to the Concrete Institute by Mr. C. G. Workman, secretary of the Standing Committee on reinforced concrete practice. Nearly two pages of our issue of May 2 were devoted to this useful report, the subject of which concerns almost everyone who is interested in building work.

A paper on "Factors Causing Unsatisfactory Housing and their Prevention" was read by Mr. B. Hartfree, F.S.I., at the Yarmouth meeting of the Institution of Municipal and County Engineers (see *THE SURVEYOR* of September 19). The author's views on administrative and practical points are worth attention, and it may be noted that he is not in favour of the erection of State-aided cottages. In referring to by-laws and their relaxation, he pointed out that 9 ins. wall thickness may be considered necessary to afford privacy and to prevent the spread of fire. Mr. Hartfree's remarks on the distribution of trades and industries supports the view expressed in the preamble of this article, namely that housing questions need to

be studied in connection with other matters affecting the habits and customs of the people. He considers that centralisation of industries is the sole cause of the excessive cost of building in rural areas at the present day as compared with half a century ago, "when every village had its local sawyers, small brick-burning undertakings, stone cleavers or dressers, according to the materials at hand, which, under these conditions, were obtained and prepared at home. Modern progress has led to the establishment of large industries that have practically extinguished the smaller. If home-grown timber is felled in the country, it is hauled to the towns, sawn up and carted back." Possibly these results are in part due to the very conditions which they tend to perpetuate, the scarcity of houses. An energetic housing policy might tend to the re-establishment of village industries. A technical matter referred to by Mr. Hartfree is worth attention in this connection. He points out that in the southern counties strongly built chalk houses of past years still exist, but their building seems to be a lost art.

A paper relating to the further improvement of Dundee was read at the Scottish annual meeting of the Institution of Municipal and County Engineers last June by Mr. A. H. Miller. A sum of half a million has already been expended in transforming the centre of Dundee, and the City Engineer, Mr. J. Thomson, has in hand a project involving the spending of another half million. The nature of some of the changes proposed may be judged from the views reproduced in our issue of June 13th. This project, the actual cost of which reckoned as a pecuniary loss would be about £200,000, has been conceived in a liberal spirit, but, as Mr. J. Walker Smith, Chief Engineering Inspector of the Local Government Board of Scotland, remarked in the course of the discussion on Mr. Thomson's paper, it is not more ambitious than is justified by the beautiful situation of the city.

The subject of "Steel Frame Buildings in London" was discussed in a very practical manner in a paper read before the Concrete Institute by Mr. S. Bylander, the nature and scope of the paper being indicated by the extracts given on page 402 of our issue of February 28th.

REFUSE DESTRUCTION AND DISPOSAL.

Judging from the reports received from manufacturers, the method of disposal by burning would appear to be on the increase, and, with the exception of a few places with unusual local conditions, it is probably the most efficient and most sanitary method that can be adopted. Where the resultant heat can be utilised in the form of steam to provide power for operating pumps for sewage or water, or for driving electric lighting or power plants, it is naturally very economical. Modern developments for increasing the efficiency of the furnaces in securing more perfect combustion, eliminating smoke and dust, increasing the power available and utilising by-products, are being introduced, and all tend to facilitate the adoption of this method of disposal by local authorities who have the double duty of dealing with house and other refuse in a sanitary manner and at the same time at the least possible cost to the ratepayers whose interests they serve.

METHODS OF FEEDING AND OTHER DETAILS.

This is an important factor in the design of refuse destructors, and while some contractors appear to favour one method alone, others adopt either top, back or front feed according to the requirements in each case. On the other hand, we find that Mr. William Jones, Assoc. M. Inst. C.E., engineer and surveyor to the Colwyn Bay Urban District Council, in an admirable report to his

council upon the whole subject, brings forward a number of arguments against the adoption of the top-feed system. He adds that "the front or back feed enables the stoker to apply the refuse more evenly and with more discretion, and although the method of charging with the shovel may be considered as putting it on by the spoonful, yet, to obtain the highest efficiency, this method of stoking in small quantities at a time obtains the best results in the cremation of refuse," and, we may add, in the burning of any fuel when properly done.

Mr. Jones in his report, a copy of which was forwarded to us, also deals at some length with the advantages of the continuous grate type of destructor, and, as a result of exhaustive inquiries among municipal engineers, confirmed by his own personal observations, he recommended his council to adopt the continuous grate system with back feed. With regard to the question of grate area, it is pointed out in the same report that "refuse destructors burn the refuse at varying rates according to the grate area, quality of refuse, and other conditions connected with the refuse itself, as it is found that the higher the calorific value of the refuse, the longer it takes to incinerate." Thus it is obvious that, given the same grate area, the amount of refuse burnt by different destructors in different places must

vary with the character of the refuse, and for this reason the figures giving the amount of refuse burnt per square foot of grate area in the results of official tests do not always afford trustworthy comparisons between the several types of destructors. The same thing applies with equal force to the figures relating to the amount of water evaporated per lb. of refuse. It is, therefore, apparent that the results obtained by a particular type of destructor in one place with refuse of a certain character will not be obtained with the same type of destructor in another place where the refuse is of a different character.

We may possibly be accused of stating truisms in the foregoing observations, but we have in mind the competition which exists among the patentees of various details in the construction of destructors, each of which may have its value under certain conditions, but is not necessarily suitable for all sorts of conditions.

In a certain town in a foreign country the refuse consisted mainly of tin cans, waste paper, or fruit refuse, and in other places nearer home the refuse contains a considerable quantity of fresh vegetable matter. The net result of these considerations is that it is not upon the ingenuity of any particular device that the efficiency of a destructor plant will depend, but that the most satisfactory results will be obtained where the scheme and all its details are designed upon the basis of prolonged practical experience with different types under the greatest variation of conditions. For this reason we have much sympathy with Mr. Jones in the appeal which he made in the above-mentioned report to his council not to be led away by specious proposals on the part of the various contractors to depart from the specification and adopt some special contrivances without very careful consideration. At the same time the contractors undoubtedly have a very wide experience in the incineration of refuse and their suggestions and recommendations should not be ignored. Probably the best course to adopt is to insist on tenders being submitted in strict conformity with the specification, with alternative tenders for any modifications which the contractors may desire to submit for consideration. In this way the local authority will have tenders based upon uniform conditions to enable them to make a fair comparison of cost, and, in addition, they will have the opportunity of considering suggestions for modifications separately, and without interference with the original proposals in the specification.

Although the risk of nuisance from the chimney stack of a refuse destructor is much less than it used to be, now that modern design includes properly proportioned combustion chambers, flues and dust catchers, there are doubtless cases where the position of the works necessitates special consideration of the height to which the chimney stack should be constructed. This point was dealt with carefully by Mr. Jones in his report, and his observations may well serve as a guide to other engineers in preparing similar schemes. It is also satisfactory to note that the conditions under which the men work were taken into consideration, and that special attention was devoted to the provision of a proper system of ventilation of the destructor buildings.

METHOD OF COLLECTION.

The question as to whether collection by direct labour or by contract is the most satisfactory and economical has been discussed on many occasions and the latest information comes from Southampton, where the contract system has now been in operation for some time with success. It appears that the saving in cost up to the time of the last report was £1,300 over the direct labour method, and it was stated that the number of

complaints received was not more than under the previously existing system. It should be noted that under the present arrangement the contractor is paid a certain sum per ton for the refuse collected, instead of a lump sum per annum, and it is claimed that this method of payment is the cause of the saving in cost, a point worthy of consideration.

The question of collection by motor vans is receiving attention, and there are several points in connection which need careful consideration. On the one hand, there is the difficulty of speeding up the present rate of loading in order to take full advantage of the greater speed of the vehicles. On the other hand, this same factor of greater speed in transit by means of the motor van should allow of a wider choice of site for the destructor works. Instead of having to regulate the choice of site to suit the area which can be efficiently covered by the slower method of horse-drawn vehicles, it should be possible by the use of motor vans to disregard the factor of distance to a large extent, to place the destructor in the most suitable position from the point of view of utilisation of the waste heat and by-products, and to select the site which is least likely to cause a nuisance, either from the sentimental or practical standpoint.

Another point in connection with methods of collection is the manner in which the refuse is taken through the streets. This was discussed in these columns in a "minute" on September 19 last, when we referred to a comparison which had been made between the ordinary types of van and bin in use in this country and those adopted in Zurich. The latter would certainly appear to possess considerable advantages over the former, and we pointed out that in order to ensure the adoption of the best methods the local authorities must provide vans of the most up-to-date type, and the householders must also be compelled to store refuse in a sanitary bin of proper construction. This can only be secured by the enactment of suitable by-laws, and, as we observed at the time, in our opinion, while it would be unfortunate if this procedure were to result in the creation of quasi monopolies in favour of certain articles, it does appear to be desirable that standards should be set up with which such sanitary appliances, of whatever make, must comply. Further, although it is obvious that it would be a great advantage to have the sanitary bins of uniform type throughout each town or district, there may be difficulties in requiring that one particular type should be used by all householders, where suitable by-laws do not exist. In such cases the local authority would be well advised to take the earliest opportunity to secure such by-laws.

OTHER METHODS OF REFUSE DISPOSAL.

While the destruction of refuse by burning is usually the most satisfactory, especially from the sanitary point of view, there are other methods which may be adopted in certain cases. One of these is at Leek, and was described in a paper read at a meeting of the Institution of Municipal and County Engineers, held in that town last July, by Mr. W. E. Beacham, the town engineer and surveyor to the Leek Urban District Council. It appears that the use of an area of some 14 acres of clay and peat land at the sewage farm for broad irrigation had been abandoned because it was found to be unsuitable for the purpose, and, instead of proceeding to carry out a proposal for the erection of a destructor, it was decided to improve the character of this area by depositing the house refuse upon it to a depth of about 5 ft., after first removing the top soil and laying land drains. Subsequently the top soil was replaced over the refuse, carriers cut, and the sewage distributed in the ordinary manner. It was stated that the sewage

treated in this manner was satisfactorily purified, and this will be understood when it is recognised that this method of refuse disposal actually results in the provision of what is known as "suitable" land in place of the previously utilised "unsuitable" clay and peat subsoil. Meanwhile, until the whole area of the unsuitable portion of the sewage farm has been covered with the refuse, there will apparently be no need for the council to incur expenditure upon a refuse destructor, and all the time they will be improving the value of the land available for sewage disposal.

Another method of disposal is to add the house refuse to sewage sludge, the mixture forming a suitable manure. This method, however, can only be adopted in a limited number of places, and to a limited extent, governed by the quantity of sewage sludge produced. There is also the risk of nuisance from smell, and from this point of view the method of incineration in a destructor of modern design is much more satisfactory.

There is, however, a method of direct conversion of refuse into manure without the addition of sewage sludge, and this is done by the use of the Patent Lightning Crusher. This system has been in operation in the borough of Southwark for some years, and we understand it has, during the whole of that time, given every satisfaction. Further particulars with regard to this system appear later among the reports from manufacturers.

UTILISATION OF HEAT FROM DESTRUCTORS.

Greater attention is being devoted to the utilisation of the heat generated in destructor furnaces so as to conserve what would otherwise be a waste of power. There are many purposes for which this heat may be utilised in addition to its use for the power required in connection with the destructor itself. One of the most important is that of pumping sewage, where this is necessary. Another is the driving of the plant for the conversion of the clinker into mortar, paving slabs, and other useful materials. In all these, however, considerable foresight must be exercised in the preparation of the scheme if the most satisfactory results are to be secured. In this connection it may be of interest and value to describe a case of "how not to do it." A certain council discussed for some time a proposal to erect a destructor at its sewage works and to make arrangements for the waste steam to be used for pumping sewage. Much time was spent in discussing the scheme, but eventually, for some reason or other, it was decided not to proceed with the destructor. Meanwhile, the provision of additional sewage pumping plant had become urgent and could not be delayed and a suitable oil engine was ordered and installed for this purpose. In due course the destructor scheme was again brought forward and has now been approved, with the result that before many months have elapsed this council will have a considerable amount of heat going to waste and no means of utilising it, unless they include a much larger boiler and steam engine and leave the recently installed oil engine to act as reserve power for pumping when required. It should be noted that the advisers of the council recommended the utilisation of the destructor for sewage pumping and it was the council itself which lacked the necessary foresight in this case.

REFUSE DISPOSAL ABROAD.

It is generally recognised that, up to the present at any rate, this country is in advance of other countries in refuse destruction, and this is apparent from the reports given below, in which it appears that manufacturers in this country have secured important contracts for the erection of destructors in a number of foreign countries, so far apart as Russia, Burnah, New Zealand,

Australia, Argentina, Holland, France, Italy, United States, and Canada.

As might be anticipated, the greatest number of destructors outside the United Kingdom is to be found in North America. Since the first municipal refuse destructor was installed in 1906 at Westmount, Quebec, the number in the United States and Canada has grown to twenty-seven, including in each case three which are "pending awards." In the United States there are seventeen cities with nineteen separate plants of 115 grates and a daily capacity of 1,767 tons; in Canada ten cities with eleven separate plants of thirty-three grates and a daily capacity of 570 tons. Two of the cities employ the surplus power for pumping water for the city supply, or for fire protection, one furnishes auxiliary power for electric lighting, and another develops power for pumping sewage. In one large industrial works the destructor boiler is an auxiliary to the steam plant and in another city the destructor furnishes steam for the operation of a reduction plant. At four of the installations additional equipment is being installed for utilising the power from destructor boilers for pumping water and municipal electric lighting. In seven of those under construction and pending award it is proposed to use the power for several forms of municipal and private service.

Messrs. Manlove, Alliott & Co., Limited, of Nottingham, have, during the year 1913, completed a number of refuse destructors, the most important of these being plants for Margate, Bristol, and Stroud. The Margate plant consists of eight "cells" or furnaces arranged in two units, each of four cells on the continuous hearth principle. Each unit is complete with water-tube boiler and combustion chamber, and the cells are all provided with drying hearths and are arranged for back hand feed. The two boilers—one for each unit—are of the Babcock and Wilcox type and have a large heating surface. Two large direct steam-driven fans provide forced draught, and as an auxiliary means steam-jet blowers have also been provided. The destructor at Bristol, which was completed in December, consists of eight cells, arranged in two units each of four cells, combustion chamber and water-tube boiler. This plant is somewhat similar to the Margate destructor referred to above, but in this case the boilers are slightly larger. Forced draught is provided by two large electrically driven fans. The surplus steam generated by the destructor is employed for driving a clinker crushing and screening plant, together with a mortar mill, both of which have been supplied by Messrs. Manlove, Alliott & Co., Limited. At Stroud this firm have just completed a two-cell plant. The two cells are built side by side on the continuous hearth principle and are arranged for back hand feed. The plant also comprises a suitable combustion chamber and a Babcock and Wilcox water-tube boiler. Forced draught is provided by means of a direct steam-driven fan, also by steam-jet blowers. Messrs. Manlove, Alliott & Co., Limited, have also been recently notified that their tender for the erection of a destructor plant for Kirkby-in-Ashfield has been accepted. Several smaller destructor plants have been erected by this firm during the year, among which may be mentioned a one-cell plant for the Devon County Asylum, Exeter. Special furnaces have also been supplied during the year to the Crown Agents for the Colonies, the War Office, Metropolitan Asylums Board, and the Harwich Port Sanitary Authority, in addition to various institutions including infirmaries and asylums.

During the past year Messrs. Meldrums, Limited, have completed new destructors or remodelled existing ones at Littlehampton, Dartford, Longton,

Hunstanton, Bolton, Rangoon, Buenos Aires, and Monte Video, and have work in hand ready for shipment for Sydney. The plant at Littlehampton is one of their standard two-cell front-fed type with Cornish boiler and regenerator. The Rangoon destructor is of the steered-cased type specially arranged for burning carcasses. They have also completed large numbers of destructors for hospitals, asylums, factories, and similar institutions, and have fitted their forced-draught furnaces for burning towns' refuse at Stoke, Bolton, and Aberdare among other places.

The following is a brief *résumé* of the work carried out during the past year by Messrs. Heenan and Froude, Limited:—

City of Rotterdam.—This plant consists of forty Heenan grates, arranged in five units of eight grates each, large Babcock and Wilcox boilers, with Foster superheater, Heenan air heaters with motor-driven Heenan fans, monorail transporters, for lifting the collection skips from the barges, transporting and discharging their contents into the containers placed immediately over the furnace charging openings, a complete hydraulic installation with ram cylinders to control the charging doors between the containers and the furnace proper, overhead runways for the transport of the clinker to a Heenan clinker crushing and grading installation. The steam generated by three of the destructor units alone serves to drive a 1,250kw. generating set, which supplies current for the electric traction of the city. The guaranteed total capacity of the plant was 460 tons per day, but it is found that in average working well over 500 tons can be easily dealt with.

City of Paris.—(a) *St. Ouen.*—This installation was erected for the Société Anonyme des Engrais Complets, one of the concessionnaires for the disposal of the refuse collected in the city of Paris. The installation consists of twenty-four grates of the firm's latest improved trough mechanical clinking type, arranged in four units of six grates each, a water-tube boiler with a Foster superheater, Heenan air heater with motor-driven Heenan fans being adapted to each unit. Each destructor unit supplies steam for driving a 750kw. turbo-generating set, and the complete plant has a capacity of over 500 tons of refuse per twenty-four hours.

(b) *Issy.*—Another installation for the Société Anonyme des Engrais Complets, in another of the Paris arrondissements, consists of a three-grate trough type mechanical clinking Heenan unit with water-tube boiler, Foster superheater, Heenan air heater with Heenan fans, and motor for the forced-draught supply.

(c) *Nancy.*—This installation consists of three four-grate trough type mechanical clinking Heenan units, with special arrangement for dealing with the clinker, and other modern features. The refuse of the city of Nancy is collected in electrically propelled vehicles.

(d) *Rouen.*—The last of the official tests on this plant has been carried out during the past year. It consists of three units, each comprising three grates with water-tube boiler, Heenan air heater, Heenan fan, motor for forced-draught supply, and all the usual accessories.

St. Petersburg.—An extension unit to the plant installed some two years ago is in course of erection.

Other installations upon which this firm have been engaged are in Canada, at Ottawa, Calgary, Saskatoon and Strathcona; in the United States, at San Francisco, Atlanta, and other places; in South America at San Paulo, also at home at Rhondda, Rotherham, and elsewhere.

During 1913 Messrs. Hughes and Stirling have completed the following destructor installations:—

Abertillery (Mon.) Urban District Council.—60-

ton front-fed destructor in two units, with boilers, chimney, foundation, and buildings.

Napier, New Zealand.—Two-cell back-fed plant, complete, in connection with a new sewage pumping station.

Halifax, Nova Scotia, Canada.—Three-cell patent container-charged top-fed destructor, complete with water-tube boiler, chimney, foundations, buildings and accessories.

Pittsburg, Pennsylvania, U.S.A.—Three-cell top-fed destructor, complete with water-tube boiler and chimney.

Corporation of Bath.—Six-cell back-fed destructor, 90 tons daily capacity, with water-tube boiler, foundations, buildings, and flue connections to existing chimney.

Corporation of Weymouth.—Two-cell back-fed destructor, with water-tube boiler and accessories, erected in conjunction with the corporation electricity works.

The Salvation Army, Loudon.—Two special destructor furnaces for waste paper, with two Cornish boilers, chimney and accessories.

Destructor for the Royal Hospital for Sick Children, Glasgow, and also other small destructors both at home and abroad.

This firm have in hand at present the following contracts:—

Yeovil Corporation.—Destructor, extra work, comprising the installation of electric generating plant and pumps.

Horsforth Urban District Council.—Two-cell back-fed destructor, complete with boiler and accessories.

City of Columbus, Ohio, U.S.A.—Two-cell top-fed destructor, water-tube boiler, &c., in connection with city electricity works.

Teddington Urban District Council.—Two two-cell front-fed destructors, with Lancashire boilers, and all accessories in connection with the new sewage pumping station.

Farnborough Urban District Council.—Two-cell front-fed destructor, Cornish boiler, and accessories in connection with sewage pumping station.

City of Berkeley (California), U.S.A.—Three-cell patent container-charged top-fed destructor, complete with boiler and accessories.

Pembroke (Dublin) Urban District Council.—Three-cell back-fed destructor with water-tube boiler and all accessories in conjunction with the council's electricity works.

City of Turin, Italy.—Twenty-four cell top-fed destructor, with six water-tube boilers, buildings, approaches, two chimney shafts, and all accessory machinery. The steam will be fully utilised.

A new development introduced by Messrs. Hughes and Stirling is a patent self-clinking grate, designed with the express object of keeping the clinker in the ash-pit after it is discharged from the grate. By this means there is never any hot clinker either in the destructor building or in the yard. This apparatus is fully patented in Great Britain, Germany, France, Italy, Belgium, United States, and Canada. The idea of the grate is a distinctly novel one, inasmuch as the grate itself is in the form of two troughs, these troughs being made up in three sections, the centre section forms the centre ridge between the two troughs and has two curved surfaces forming one side of each trough. The two side sections form the other side of the two troughs, and likewise have curved surfaces. Upon the rotation of this grate by mechanical means the extremities of each section clean the grate surfaces of the adjoining section, thus the clinker operation is carried out mechanically, and the whole of the clinker is discharged into the ash-pit, where it is received in

buckets and cooled by the forced draught. A complete description of this patent would be too lengthy, but, judging from the design, it has many interesting and novel features.

The Patent Lightning Crusher Company, Limited, report that the system of disposing of house refuse by converting it into manure seems to meet with increased favour at the hands of municipal councils.

The Metropolitan Borough of Southwark is no longer the only corporation that has adopted this process, which seems to meet with general satisfaction. The county borough of Halifax, Yorks, followed the initiative of Southwark over three years ago. Next came Bispham, Blackpool, in Lancashire, and last year the Corporation of Hove, in Sussex, followed suit. Scotland has now taken the matter up, as we understand that the Corporation of Glasgow have decided to erect a double plant of patent Lightning Dust Manipulators at their Partick works, and several other municipal councils, both in England and Scotland, have the question under consideration.

The natural fertiliser produced from house refuse by this process seems also to meet with increased favour among farmers and kitchen gardeners, if we are to judge from the ever increasing consumption of this article wherever it has been placed on the market. From Halifax, Bispham, and Hove the reports are that the crushed refuse manure is sold as fast as it is manufactured, while in Kent the sales of the Southwark fertiliser, which in 1907 amounted to 2,206 tons, rose in the following year to 8,611 tons; in 1912 they had reached 15,440 tons, and during the current financial year are likely to exceed the figure of 20,000 tons. The special features of this process are stated to be the low cost of the plant, the simplicity of the apparatus and of the working, the absence of any nuisance, and the facility with which the output is disposed of to farmers.

NEW YORK AND CHICAGO.

Interesting developments took place in New York during the past year in connection with the disposal of refuse. From a brief review in the *Engineering Record* we learn that the previously existing contract for disposal of the city's refuse by the reduction process came up for renewal. Under the old agreement the city paid a sum of £10,000 per annum to a contractor for dealing with the refuse. For the next five years, how-

ever, another contractor has undertaken to pay to the city a total sum of £100,000, equal to £20,000 per annum, for the privilege of taking the refuse. There is a very great advantage to the city in the difference between these two arrangements, and it is apparent that considerable profit can be made from refuse by this process. On the other hand there appears to have been trouble with reduction plants in the past, due to the emission of obnoxious odours, but improvements are being devised to remedy these defects. In some cases reduction plants are being considered in combination with incineration furnaces.

From another source—*Municipal Engineering*—we find that the question of garbage disposal in Chicago has reached an acute stage. The city authorities have been unable to decide upon the method of disposal to adopt for the future. Meanwhile, the existing contract for this work has expired, and they are now begging the property owners to dispose of their garbage as far as possible upon their own premises, while the amount of garbage which they are bound to collect is being treated with chemicals, and then dumped into abandoned clay holes. In the course of recent investigations by the city authorities some interesting information has been collected, from which it appears that a combined reduction and incinerating scheme would cost about £268,000. The cost of the operation of this plant is not stated, but it is estimated that there will be a total gross income from fertiliser and power available of £106,000. This estimate was made by a French expert, and it is stated that even after deducting a sum of, say, 4s. per ton of refuse burnt as cost of operation, a handsome profit would remain from the adoption of this combined system.

In the review mentioned above, comment is made upon the fact that municipal authorities fail to appreciate the engineering element in refuse disposal work, and endeavour to solve their own local problems without competent engineering assistance as well as limiting their engineers to inadequate funds. Mention is made of a contractor who made it a rule to include in his tenders an item for contingencies equal to his estimate of the actual construction cost, in order to provide against the uncertainty of the specification. This is not likely to occur in many cases in this country, but it is not out of place to draw attention to this result of loosely worded specifications.

SEWERAGE AND SEWAGE DISPOSAL.

While it may not appear at first sight to those regularly engaged in connection with works of sewerage and sewage disposal that any event of outstanding importance has occurred during the past year, a review of the back numbers of this and other technical journals shows that many interesting reports, papers, and descriptions of works carried out and projected have been published, and deserve notice on this occasion. The issue of the appendix to the eighth report of the Royal Commission on Sewage Disposal in itself was an event of high importance, and a number of papers have been written upon the problem of sludge disposal, which still awaits final solution. As on previous occasions, we are indebted to our American contemporaries for particulars of new ideas and results of investigations made into matters relating to these subjects, which are at present occupying engineers in that country to a greater extent than at any time in the past.

SEWERAGE.

Commencing with matters relating to house drainage, it is worthy of note that the Chadwick lectures this year were devoted to "House Drain-

age Law." They were delivered by Mr. W. Addington Willis, LL.B., and dealt with the rights and responsibilities of councils and citizens, bye-laws and regulations, and the combined drainage problem. Earlier in the year an interesting paper on "House Drainage Regulations on the Continent" was read by Mr. Frank R. Durham, A.M.Inst.C.E., before the Institute of Sanitary Engineers (*THE SURVEYOR*, May 2, 1913), in which full details were given of the regulations in force chiefly in Germany. It was pointed out that the chief characteristics may be briefly summarised as (a) standardisation of regulations and materials, (b) departmental system of approval of plans and work, (c) direct connection to the sewer system without intercepting traps, (d) ventilation of the sewerage and drainage system, (e) necessity of placing all pipes within the houses, with the exception of rain pipes. The author observed that it is an exception in Germany to find cases such as occur in this country where a property may be developed and sewered privately, quite regardless of a general and uniform system for the whole area of the town and neighbouring districts, and in his opinion the development of

rational town planning has to a great extent arisen out of this system of planning of the drainage of the towns and cities in Germany.

This system of designing for the future and considering large areas, especially those in the same watershed, instead of allowing each separate small district council to carry out its own small scheme regardless of its neighbours, is one that should have been adopted here long ago. We should then have avoided the enormous waste of money, both in capital outlay and annual expenditure, referred to by Mr. F. W. Cable, ASSOC. M. INST. C. E., in his paper before the Institute of Sanitary Engineers on November 17 last. We dealt with this matter at some length in a "Minute" on December 5.

THE INTERCEPTING TRAP.

While dealing with house drainage reference may be made to some further discussion which took place during the past autumn with reference to the intercepting trap. At a meeting of the Institution of Municipal Engineers on October 18 last at Crowborough a paper upon the "Advantages and Disadvantages of Intercepting Traps" was read by Mr. W. E. Woollam, Surveyor to the East Grinstead Urban District Council, in which town these traps do not exist. The information given by Mr. Woollam has previously been published to a large extent in this journal, but it is interesting to note that when he first took up his present position he was "imbued with the importance of intercepting house drains," but after ten years' experience his views have been considerably modified. Further, in the course of the discussion, a neighbouring surveyor confessed himself a convert to Mr. Woollam's views. On the other hand, Mr. Arthur Palmer, P. A. S. I., in a paper upon "Drainage Details," read at the annual general meeting of the same institution, favoured the retention of the intercepting trap, and recommended the adoption of a standard type of trap on the lines of a pattern described and illustrated in his paper. His method of dealing with the problem of the fresh air inlet is, however, not very convincing. This detail is arranged more strikingly and more definitely in the special device with the imposing name of "Cuncta in unum," recently brought out by Mr. Isaac Shone.

This apparatus has been specially devised to meet the objections raised in many quarters to the ordinary intercepting trap. It is somewhat difficult to gather from the published descriptions of this appliance exactly how it works, but we believe we are correct in stating that it consists primarily of a receiving chamber or cylinder to which the various waste liquids flow by gravitation. When full the contents are automatically discharged by syphonic action, and fresh air is thereby drawn into the soil and other waste pipes connected to it. The plumbing system adopted in connection with this apparatus differs from the usual method, in that all the wastes appear to be connected to one down-pipe (soil-pipe) which is apparently provided with air-inlets and, although the published diagrams do not show this clearly, we assume that some arrangement is provided whereby these fresh-air inlets are prevented from acting as outlets. In any case the drain appears to be completely disconnected from the sewer, but whether the use of what to us at present seems to be a complicated apparatus will prove to be as efficient as the simple omission of the intercepting trap now generally adopted, remains to be seen. Mr. Shone's new apparatus has received the approbation of two municipal engineers, Mr. P. Dodd, borough engineer of Wandsworth, and Mr. S. H. Chambers, surveyor to the Urban District Council of Hampton-on-Thames, and the results of its operation elsewhere in due course will be awaited with much interest.

STORM-WATER SEWER CONSTRUCTION.

Various articles dealing with the construction of sewers have been published during the past year, notably in our American contemporaries. Among these is a description of some large storm-relief sewers which have been carried out in Toronto, the cost amounting to some £85,000. The details of construction given in the *Canadian Engineer* of March 20 last are interesting, and useful for reference. In making the calculations it was found necessary to provide for a rainfall of $1\frac{1}{2}$ inches per hour, allowance being made for absorption varying between 30 and 50 per cent, according to the character of the surface in different areas. This question of impermeability of surface was referred to at some length in the valuable series of articles upon "Storm-water Discharge," by Messrs. R. O. Wynne-Roberts, M. INST. C. E., and T. Brockmann, of Regina, which appeared in these pages on March 28 last and following issues. In those articles the whole question of storm-water discharge was dealt with in detail, including a number of different formulæ which have been deduced at different times, and the effect of rainfall intensity, impermeability of the surface of the drainage area, and retardation which depends on the shape, extent, and configuration of the drainage area, and also on the velocity of flow in the sewers. A number of useful diagrams and tables were also given.

The question whether sewers should be constructed on the "combined" or on the "separate" system, or partly on both, is a problem which frequently has to be considered by engineers, and in many cases it cannot be satisfactorily solved without careful study of the numerous factors which bear upon the subject. Two factors of the greatest importance are the questions of cost and of sewage disposal, and the latter was discussed in an article by Mr. John H. Gregory, consulting engineer of New York, entitled:—

SEPARATE AND COMBINED SEWERS IN THEIR RELATIONS TO THE DISPOSAL OF SEWAGE.

Extracts from this article appeared in our issue of October 24, and, although it was admitted that no hard and fast rules can be given for the adoption of either system, the author believed that, other things being equal, the separate system seemed to offer greater advantages, especially as more and more attention was being given to the question of sewage disposal. He rightly added that, with either system, to secure satisfactory results too much stress could not be laid on the necessity not only for proper design, but for satisfactory maintenance and operation. The subject of storm-overflows was discussed in the same article and also in a paper on "The Sewering of Towns," by Mr. F. W. Cable, ASSOC. M. INST. C. E., before the Institute of Sanitary Engineers (THE SURVEYOR, Nov. 21, pages 773, 777, and 793). So long as the combined system of sewerage is in use there will always be many difficulties and much controversy in connection with this matter. It is a great advantage in the separate system that no overflows need be provided, and that all the sewage which reaches the outfall can be subjected to proper treatment.

In the same paper Mr. Cable made some useful observations upon several other matters relating to the construction of sewers. Reference has already been made to his remarks upon the necessity for greater combination among adjoining councils, and it would be a good thing if his statements upon the relations between the engineer and the contractor, and upon the importance of providing competent, and consequently well paid, supervision, could be read and thoroughly digested by the members of all local authorities who have sewers to construct, and also by those engineers

who do not appear to understand their exact position as between their clients and the contractor. As Mr. Cable said, it is absolutely essential that public works should be carried out as far as possible as a business undertaking, and not as a speculation.

IMPORTANT NEW SCHEMES OF SEWERAGE.

It is now a rare occurrence for large and entirely new schemes of sewerage to be considered in this country, and it is therefore interesting to note that after many years of discussion and negotiation the town councils of Rochester and Chatham have at last entered into an agreement for the carrying out of a joint scheme of main drainage for the two towns. Mr. W. H. Radford, of Nottingham, has been appointed engineer, and the estimated cost is £300,000. This is a case where the value of combination between two adjoining towns has happily been appreciated, and others have recently occurred abroad. The *Engineering Record* of October 25 gives particulars, with maps and diagrams, of the results of an investigation into the organising and financing of a joint sewerage scheme for Greater Vancouver. In this case there are five drainage areas, and provision is to be made for dealing with the sewage from an ultimate population of 1,400,000. A very much larger scheme is that of Greater New York. Details of the work of investigation which has been in progress during the last few years have appeared in these pages from time to time, but it will be some years before a final decision can be reached. The area in question includes over 100 cities and towns with a present population of about 6,000,000, and a future population of about twice this figure. The volume of sewage from this area is 765,000,000 gallons per day, and it is estimated that within thirty years it will have increased to 1,500,000,000 gallons. The additional works of sewerage required to cope with such enormous volumes will be of gigantic proportions, and it will need great patience, foresight, and engineering skill to design a scheme which will be satisfactory.

Apart from the articles and papers which have appeared in our own columns, a number of interesting and useful descriptions of sewer work have been published by our contemporaries. The *Engineering Record* of March 15 contained a valuable article upon the methods adopted in the town of West Liberty, Iowa, in constructing sewers under unfavourable conditions. The subsoil was described by different people as "quick-sand, floating clay, sea mud, boiling sand," and it was stated to vary from a fine silty sand to a molasses-like mud in which men frequently sank up to their hips and had to be pulled out with ropes. All the various ordinary expedients of sewer construction were tried without success. Eventually, however, by adopting the special methods outlined in the article, the whole of the work was satisfactorily completed, and great credit is due to the contractor for the courage with which he stuck to the work and finished it at a great loss to himself. Another interesting article in the same journal of February 22 describes a scheme for making good existing defective sewers under abnormal conditions, and *Municipal Engineering* of May contained a useful description of a number of inverted syphons constructed under the subways in Brooklyn with satisfactory results in every case.

The question of the strength of drain and sewer pipes has been the subject of investigation by the engineering experiment station of Iowa State College, at Ames, Iowa, and the results were given in the *Engineering Record* of July 12. A study was made of the causes and prevention of pipe failures, and conclusions were arrived at upon the basis of experiments of loads in trenches. This

report is well worthy of careful study by all sewerage engineers.

SEWAGE DISPOSAL.

A general review of the progress which has taken place during the past year in the science of sewage disposal shows that the most prominent subject of discussion and investigation was disposal by dilution in fresh or salt water, while the questions of sludge disposal, as well as preliminary treatment in tanks, also received some attention.

ROYAL COMMISSION ON SEWAGE DISPOSAL: APPENDIX TO EIGHTH REPORT.

In a "Minute" on August 22 we briefly referred to the publication of this appendix, and we expressed the opinion that it would probably prove to be one of the most important of the many publications issued by the Royal Commission. Further study of its contents has produced no reason to alter that opinion, and while it is quite correct that the conclusions arrived at by the officers of the Commission suggest that in judging a sewage effluent the stream into which it is discharged should be the ultimate arbiter in the matter, the Commissioners did not take this view, as is explained in the eighth report itself, but decided to fix a normal standard suitable for the majority of places and make provision for fixing one or two higher or lower standards to meet cases in which a different standard could be justified.

The appendix is so full of valuable information and records of investigations of a practical character that it can only be properly appreciated by careful study of the whole of its contents. This would, however, necessitate close application for a much longer period than most busy engineers and surveyors are able to devote to this subject, and we therefore had much pleasure in printing in our issues of October 17 and 24 a carefully prepared article by Messrs. H. C. H. Shenton and W. S. Easdale, consisting of numerous extracts from the appendix interpolated with notes bearing upon the chief points in the record of investigations and conclusions set forth. The most interesting and most valuable part of this volume, which is entitled "Report to the Commission on the Results of Streams Observations carried out during the Years 1909 to 1912," is naturally the actual results observed in the twenty-seven rivers under observation, and these should be studied in detail by all who can spare the time required. On the other hand, Sections 4 and 5 of Part II., in which the results of the observations upon the discharge of sewage liquors and effluents into streams are brought together and discussed, conclusions being given at the end of each as to the "limiting dilutions" indicated for liquors and effluents of given strength, provide extremely interesting reading, forming, as they do, a brief but complete treatise upon the whole subject of the effect of the discharge of polluting liquids of different degrees of impurity upon the water, itself of varying degrees of purity, into which they are discharged.

The table in Section 6 of Part II. giving a classification of the various reaches of river with their respective general visible conditions will also be found invaluable for reference. It deals with the condition of the water as regards suspended matter, opalescence, smell, appearance, delicate and coarse fish life, stones in shallows and pools, water weeds, green and grey algae and insects, and classifies the different qualities of water under the headings of "very clean," "clean," "fairly clean," "moderate," "doubtful," and "bad." With this table in his hand any surveyor should be able to form a fairly accurate opinion as to the class in which any river or stream in his district would be placed, and the information in

Sections 4 and 5 should enable him to decide what steps should be taken to maintain its condition if good, or improve it if bad.

In the past we have deplored the lack of scientific investigation in connection with sewage disposal in this country compared with what had been done elsewhere. The streams investigations in the appendix to the eighth report were, however, carried out in a thoroughly scientific manner, and the officers of the Royal Commission who were engaged upon this work deserve great credit both for the work done and for the manner in which the results have been recorded and placed at the disposal of the public. A characteristic opinion upon the value of the eighth report of the Royal Commission is contained in an article which appeared in our American contemporary, *Engineering News*, as follows: "The proposed standards exhibit a rare use of practical 'horse sense' reinforced by scientific facts."

Other countries are realising the importance of having streams investigations carried out in order that remedial measures may be instituted to remove existing, and prevent future, contamination of their watercourses. In fact, one of the papers read at the Third Congress of the Canadian Public Health Association dealt with this subject under the title "Sanitary Surveys of Rivers," and after referring to some surveys which have already been completed details are given of the general lines upon which such work should be performed. These details were designed primarily for use in Canada, but they agree closely with the methods adopted by the officers of our own Royal Commission.

DISPOSAL BY DILUTION.

Although it might be assumed from the eighth report of the Royal Commission that under certain conditions—i.e., a dilution of 500 to 1—crude sewage may be discharged into a river, there is very little probability of such a method being adopted with success in this country, unless the velocity and direction of the flow of water are extremely favourable and the point of discharge is very carefully arranged. On the other hand, the ratios of dilution recommended as the chief factor to be considered in dealing with settled sewage appear to be perfectly safe. These observations are based upon the records of experience in America, where crude sewage has been discharged into large bodies of water where the volume, as in the Great Lakes or in New York Harbour, has been ample, but the lack of suitable currents has had the effect of causing the deposition of the heavier solids in large quantities or the drifting of the lighter floating solids into positions where they have created a nuisance. Even in otherwise well-regulated streams the unavoidable slackness of flow at the sides, or in weir-pools and in very dry seasons, has also caused the suspended solids to be deposited in such quantities as to form large accumulations of putrefying organic matter, which has inevitably given rise to serious nuisance in the form of objectionable smells, as well as exhausting the dissolved oxygen in the water and thus rendering it unfit to support fish life. It will be understood that when the bulk of the solids in suspension in the sewage have been removed by preliminary settlement, the above-mentioned objectionable results are less likely to occur. Indeed, an eminent American authority, Mr. G. W. Fuller, M.A.M.SOC.C.E., considers that a dilution of from 45-1 to 90-1, depending upon the manufacturing wastes in the sewage and the dissolved oxygen content of the diluting water, would be sufficient to prevent nuisance to sight or smell. Complications, so far as disease germs are concerned, in the case of a water used for drinking purposes should be obviated by filtration of the water.

Even if allowance is made for the more

dilute character of American sewage, these ratios of dilution are much lower than those recommended by the Royal Commission, and indicate, as stated above, that the standards in the eighth report are very safe. It is, however, important to remember that other factors have considerable effect upon the efficiency of this method of disposal. The point at which the sewage effluent is discharged needs careful selection, and arrangements must be made to ensure thorough mixing and dispersion of the sewage in the water. On these points all are in agreement, but differences of opinion exist with regard to the requisite amount of dissolved oxygen in the diluting water. Mr. Fuller has stated that he knows of no reason for departing from the teachings of the early experiments carried out by the Massachusetts State Board of Health by which it was established that a little oxygen—say, 1 to 3 per cent. of that necessary for saturation—would allow oxidation and nitrification to take place as satisfactorily, or nearly so, as if the water were saturated with oxygen. The experts engaged in the investigations into the conditions of New York Harbour also differed in their opinions. Some advocated that the dissolved oxygen content of the water ought not to be reduced below 70 per cent. of saturation, while others were prepared to allow it to be reduced to 50 per cent. In the eighth report our Royal Commission state that their "observations show that when the oxygen of the river is reduced to about 4.0 c.c. per litre (about 60 per cent of saturation) the water is usually in a doubtful condition, and is on the verge of producing nuisance; when the oxygen is reduced still lower nuisance may be expected to arise and become increasingly apparent to the senses." The Commissioners then proceed to point out that "under natural conditions the river water, while yielding oxygen to the unstable organic matters which are discharged into and mixed with it, is concurrently absorbing a fresh supply of oxygen from the atmosphere (and at certain seasons from plants) at a rate which depends on various conditions, but more particularly on the depth and velocity of the stream. The degree of de-oxygenation depends upon the amount of oxygen available in the water. By increasing the amount of oxygenated water with which the sewage is mixed the loss of oxygen can be reduced to such small proportions that it is counteracted by the natural process of re-oxygenation." (This whole process of de-oxygenation and re-oxygenation by natural process is well illustrated by the case of the river Thames as described by Mr. W. J. Dibdin, F.I.C., in one of his books.) There may be something in the contention of Mr. Fuller that these high estimates are due to exceptional allowances for the consumption of oxygen by existing accumulations of sludge, and that if suspended solids had been kept out of the streams from the beginning a very much smaller content of dissolved oxygen would be sufficient to prevent putrefactive decomposition; but it is satisfactory to find that the recommendations of our Royal Commission are, in this respect also, based upon figures which apparently allow a considerable margin of safety.

ARTIFICIAL AERATION OF FILTERS.

Ever since Mr. S. R. Lowcock, at Malvern, in 1892, and Colonel Waring, at Newport, R.I., in 1894, used forced aeration as an aid to the filtration of sewage numerous other attempts have been made to utilise this artificial method of increasing the efficiency of sewage filters. As a rule, the results have not been entirely satisfactory. According to Dr. S. Rideal, D.Sc., experiments of this kind were begun at Lawrence, Mass., in 1892, with coarse gravel filters, but the results indicated that while artificial aeration was beneficial to a certain degree, the benefit derived was

not in proportion to its cost. We have always felt that the chief difficulty in supplying an additional quantity of oxygen to a filter by forcing air through the material was to cause the air to permeate the whole of the material, and not to pass up or down through a few well-defined channels, without affecting the bulk of the filter. Whether the air be delivered to the filter from one or from twenty nozzles per square yard, the air immediately it leaves the nozzles is out of control, and will naturally follow the line of least resistance, which will usually be found in those portions of the filter which are least choked, and thus least in need of the artificial assistance. In a "Minute" on July 18 we referred to some recent experiments carried out in 1912 at the Lawrence experiment station by the chemists to the Massachusetts State Board of Health, in which the sewage itself was aerated before it was applied to the filters. The method of aeration adopted was to force or draw a current of air through the sewage while standing in a tank containing slabs of slate placed about 1 in. apart. It was not stated whether these slabs were placed horizontally, as in a Dibdin slate bed, or vertically, as the colloidors in the Travis hydrolytic tank, but in either case it is obvious that the air must have been well mixed with the sewage—much more efficiently than in a filter. The results of these experiments indicated that a very material increase in the rates at which sewage may be applied to filters can be obtained by preliminary aeration of the sewage, but, unfortunately, no information was given as to the cost of the aeration. It would be interesting to know how this annual outlay for aeration, when capitalised, compares with the initial expenditure for the additional filters which without aeration would be required to treat the extra volume of sewage treated with aeration.

PRELIMINARY TREATMENT.

There is still much diversity of opinion as to the best methods of treatment for the removal of the solids in suspension in sewage, and an even greater variety of tanks designed for this purpose. The efforts made to secure the removal of a greater percentage of the suspended solids is largely due to the desire in many quarters to use fine-grade material for the filters. Mr. W. H. Makepeace, borough sewage engineer of Stoke-on-Trent, in a paper read at the annual summer conference of the Association of Managers of Sewage Disposal Works last July, stated that the tank treatment of sewage is not by any means perfect, that better results can be obtained by increasing the number of tanks rather than increasing their capacity, and that in his experience rectangular tanks give more uniform results than any other type. He believes that much improvement could be effected by further treatment of the tank effluent before it is applied to the filters, either by chemicals, or by upward flow filters, cellular chambers, or by centrifugal action. It is obvious that all this additional tank treatment for the removal of the suspended solids is bound to increase the amount of sludge to be dealt with, and it is therefore not surprising to learn that Mr. Makepeace believes that "much more will be heard of this in the next few years." Fortunately, in other quarters much good work is being done in the direction of reducing the amount of sludge produced in the preliminary treatment of sewage.

An extremely interesting and valuable paper upon this subject was recently read before the League of Pacific North-West Municipalities by Mr. C. G. Hyde, Professor of Sanitary Engineering at the University of California. This paper was published in the *Canadian Engineer* of November 27 last, and dealt with ordinary septic tanks, Imhoff tanks, and a special system in which

the sludge is delivered to separate tanks for digestion. It also dealt with the question of smell from the various types of tanks, and the use of screens. It was pointed out that the question of smell is the most important consideration in determining the satisfactory use of an ordinary septic tank, but that apart from this it should be noted that septic sewage is more difficult to treat on filters than fresh sewage containing an equivalent load of organic matter, while in no case within his experience was the removal of suspended matter greater than 50 per cent. and was often much less. On the other hand, Mr. Hyde observed that experience with Imhoff tanks in Germany, and to a less extent in America, shows that, when they have been properly designed and maintained, these tanks have been satisfactory from the standpoint of the production of odours, they should remove from 90 to 95 per cent of the "capable-of-settling" suspended matters and from 50 to 70 per cent of the total weight of suspended matter in the sewage, while at the same time the sewage passes from them in a fresh condition, free from the disagreeable odours so commonly associated with the ordinary septic tank mentioned above.

The rapidity with which the Imhoff tank has come into use in America is remarkable. It is already in operation in several places, and is proposed for a large number of new schemes. Many interesting papers and articles dealing with the design and construction of these tanks have appeared in the technical journals in Canada and the United States. In one case even a special article was printed suggesting a method of constructing Imhoff tanks, which are usually of considerable depth and cylindrical in form, by sinking them as caissons. It is exceptional to find one particular type of sewage tank adopted so largely and almost universally in a whole continent, as in the present instance, and it is curious that there is hardly a single instance of a tank of this type in operation in this country, although it is certainly well known to some at least of our sewage-disposal experts.

It is generally recognised now that it is undesirable to allow the process of septic action to proceed too far, and that it is much better to arrange the preliminary treatment on such lines that the tank effluent will reach the filters in as fresh a condition as possible. This is one of the aims of the Imhoff tank, and Dr. Bostock Hill, in his presidential address to the Association of Managers of Sewage Disposal Works recently, stated that he had definitely come to the conclusion that, in the majority of cases at least, it was desirable to reduce the period of septic action to twelve or fourteen hours. It is not clear whether this is to be the actual capacity of the tanks or whether they should be constructed in such a manner that the sewage would take twelve to fourteen hours to pass through them. This is an important point, as very much depends upon the design, especially in the case of the outlets, as to the period occupied by the sewage in its passage through the tanks.

FILTERS.

No developments of any importance have taken place during the past year in connection with filters. Dr. Bostock Hill, in the address mentioned above, however, expressed definite opinions in favour of percolating filters, circular in form, with a standard depth of 5 ft., and material about 1 in. in size, with a little finer material on the top. This grade of material, while not so fine as that adopted in some places, notably in Staffordshire, is still much finer than many engineers would adopt, and in our opinion it is a much better method to have filters with medium-grade material, as near as possible of uniform grade, say, 1½ in., and to provide effluent settling tanks, properly designed, to intercept the suspended solids in the form of humus after they have passed through the filter.

The influence which the many living organisms found in filters have upon the purification of the sewage has been discussed on many occasions, but definite investigations into the relative importance of the different organisms have been few and far between. It is, therefore, encouraging to find that Mr. H. D. Bell, manager and chemist at the sewage works of Stratford-upon-Avon, has continued his investigations with regard to the effect of *podura* in his filters. Particulars of the results obtained up to the end of March last are given in his annual report, extracts from which were printed in our issue of September 5 last, and we commented upon them in a "Minute" on September 12th. Further experiments on the lines we then suggested would provide valuable information. In this connection we believe it has been suggested that in the soil there is a group of organisms detrimental to bacteria, and that the efficiency of the latter may be reduced by a preponderance of the former. It has also been observed that this may take place in artificial filters, and that it may be possible by a temporary sterilisation of the filter material to destroy the inimical organisms. The bacteria would, of course, be destroyed at the same time, but a new supply would rapidly develop as soon as the effect of the sterilising agent had passed away, and possibly without any corresponding development of the inimical organisms, in which case the efficiency of the filter should be increased. It might be well worth while for experiments in this direction to be carried out under ordinary working conditions and over a suitable period.

POLLUTION OF RIVERS.

The extent to which small rivers are polluted by the discharge of sewage into them is well known, but it was not anticipated that such ill effects would result in the case of large and rapid rivers. Recent investigations into the condition of the Niagara river, however, show that even in such cases the effect is serious. Below the Falls the waters of the river are uniformly and dangerously polluted from bank to bank, and the municipalities on both sides of the river are thereby affected. Above the Falls the waters at varying distances from the American bank are polluted by the raw sewage of several towns with a total population of about 500,000, and the public water supplies of each of them, when taken from the river without purification, are in varying degrees and at varying times injuriously, if not dangerously, affected by the sewage pollution from the towns farther up the river. In a preliminary report by the small committee which has been making investigations on behalf of the International Joint Commission it is stated that two things appear to be necessary—viz., suitable treatment of the sewage and purification of the water taken from the river, in order to secure a safe water supply for the towns on the Niagara river. It is believed that the further investigations to be undertaken will be devoted to ascertaining to what extent the sewage should be treated before discharge into the river, and what degree of purification will then be necessary to render the river water safe for drinking purposes.

THE SOLUTION OF THE SEWAGE PROBLEM.

Recently (on December 26th last) we discussed this subject in connection with the very interesting presidential address of Dr. Bostock Hill to the Association of Managers of Sewage Disposal Works, and we do not propose to repeat all we said on that occasion. We may, however, be permitted to state that in our opinion the solution of this problem will be found, as stated by Dr. Bostock Hill near the end of his address, in the close co-operation of the chemist and the biologist with the engineer, so that their combined skill and science may be directed to elucidate the

problem in each particular case and to lay down those conditions for treatment which experience has evolved.

The general principles which govern the prevention of rivers pollution are extremely well set-out in a series of conclusions drawn from a large number of replies to questions sent out to sanitary engineers, chemists, bacteriologists, and others by Mr. Paul Hansen, engineer, State Water Survey, Illinois, U.S.A. Although these conclusions have already appeared in these pages we believe they deserve greater prominence, and we therefore repeat them here.

"(1) No stream (unless the entire watershed is owned or controlled) can be maintained in its original and natural purity.

"(2) Streams may be, and should be, maintained free from danger to the public health, inoffensive to a proper public sense of decency, and beyond this they should be controlled so as to contribute the greatest serviceableness to the people at large. Within these limits it is permissible to discharge any liquid wastes into streams, local conditions to control in every instance.

"(3) Public water supplies may be drawn from moderately polluted streams, provided the supply is adequately purified to prevent danger to health, the extent of pollution permissible under these conditions to be determined by the limitations imposed by the art of water purification, and to some extent by purely æsthetic considerations.

"(4) The desirability of maintaining fish life in streams is largely an economic problem. In the case of streams along which fishing industries are established, prior right should be considered a basis for preventing pollution dangerous to fish life or for awarding damages. The presence or absence and character of fish life may, under some circumstances, serve as an index of the extent of pollution.

"(5) Stream pollution is primarily a menace to human health through domestic water supplies which may be drawn from polluted streams; but there are various other avenues of danger to health, prominent among which are danger to bathers and pollution of shellfish, which should be duly recognised in considering any specific problem.

"(6) While the determination of permissible stream pollution must depend primarily on public health considerations, and secondarily on economic considerations, æsthetic considerations and civic decency must always be factors, and many times the controlling factors.

"(7) Control of stream pollution by laws defining specifically the extent to which streams may be polluted and enforced by the ordinary police power is unwieldy, unwise, and unjust. Instead, the laws should be made very general, and their enforcement placed in the hands of central expert authority as interpreter of the laws in the light of local conditions. To guard against abuse, it should be made easy to appeal from decisions of the central authority to an impartial commission of experts, and finally to the courts.

"(8) Since, from an economic and engineering point of view, control by drainage boards over complete drainage areas is the logical and efficient form of control, it should be adopted wherever conditions permit."

SLUDGE DISPOSAL.

Numerous attempts are being made in various quarters to solve this difficult problem. Several companies are making arrangements to take over the total output of sludge from selected sewage works for the purpose of utilising it in various ways, but up to the present no definite records of the results obtained have reached us. From the point of view of the municipality or local

authority this method of getting rid of the sludge, if guaranteed for a number of years, should be perfectly satisfactory.

Two interesting articles by Dr. J. Grossmann, of Manchester, appeared during the past year. In the one (*THE SURVEYOR*, October 21, 1913) he describes a method of concentrating sludge by adding to it a small amount of acid and allowing it to stand for a few days. At the end of that time the sludge accumulates at the top and the liquid separates out underneath. The liquid can be drawn off, leaving a sludge containing about 20 per cent. of solid matter. He recommended that this sludge should then be mixed into cinders, and he claimed that the resultant mass is equal to the average filter-pressed sludge-cake at about one-third the cost. His second paper was read before a North-western District meeting of the Institution of Municipal Engineers, and dealt chiefly with the process in operation at the Oldham sewage works. In the paper the author stated that he did not claim that large profits could be made, but if the sludge could be got rid of for nothing it would be a boon to the community at large. This is quite true if getting rid of sludge "for nothing" means that the cost of sludge disposal would be *nil*. Later on, in replying to the discussion, Dr. Grossmann said that he would be prepared to undertake that it should not cost more to get rid of the sludge altogether by turning it into manure than the present cost of producing the pressed sludge-cake alone. While this represents in some cases a distinct advantage in favour of conversion into manure, it is still a long way from getting rid of the sludge for nothing.

Other papers dealing with the sludge problem appeared in the *Engineering Record* of September 20th and October 18th last. The latter deals with the best methods of construction to adopt in order to ensure uniform distribution of sludge in settling tanks. The former describes the differences between fresh and decomposed sludge as ascertained by experiments carried out at several sewage works in the district of the Emscher Drainage Board in Germany, where Imhoff tanks are in use. The conclusions arrived at are to the effect that the examples quoted illustrate the general truth that within certain limits the question of sludge utilisation does not depend so much upon the quantities of valuable elements contained as upon the amount of moisture and the physical character of the sludge. It is also stated that in most cases the cost of recovery for fresh sludge will be so great as to place the whole question of utilisation beyond economic limits, whereas it may be possible in some of these cases with decomposed sludge to derive at least some profit.

THE EFFECT OF SEWAGE POLLUTION UPON FISH LIFE IN STREAMS.

This question has been the subject of investigation at the Lawrence experiment station of the Massachusetts State Board of Health, and some results were given in a "Minute" in our issue of June 6th last. From these it appears that fish could survive indefinitely even under stagnant conditions when sewage was diluted with nine times its volume of water. This may explain the facts mentioned in our issue of July 11th in connection with the breeding of fish in Germany in ponds supplied with sewage, where the results are stated to be so satisfactory that this method of sewage disposal is apparently accepted as a possible alternative to land treatment, especially from the financial point of view. The American experiments mentioned above also showed that a dilution of 3 to 1 in the case of the best filter effluents, or of 1 to 1 in the case of contact-bed effluents, was sufficient to maintain fish life. It is evident from these results that a good sewage effluent discharged into

a clean stream which gives a dilution of 2 or 3 to 1 will cause no injury to fish life.

LITERATURE.

While several books of minor importance have appeared during the past year, the only one which deserves special notice was the volume entitled "Trade Waste Waters: Their Nature and Disposal," by Drs. H. Maclean Wilson and H. T. Calvert, the chief inspector and chief chemical assistant respectively of the West Riding of Yorkshire Rivers Board. We printed a lengthy review of this book in the form of a "Minute" on June 13 last. The authors are particularly well qualified by their experience for the compilation of such a work, and it should be studied not only by engineers, but also by manufacturers, who will find that in many cases the cost of a purification process may be to a great extent counterbalanced, and in some cases even made profitable, by the value of by-products recovered.

OPERATION OF EXISTING SEWAGE WORKS.

Particulars of the results of the operation of existing sewage works have appeared from time to time in the form of extracts from reports issued by their respective managers. While not of general interest, they are useful for reference, and are worth keeping for that purpose. Among the sewage works described were the following, the dates quoted referring to the issue of this journal in which the extracts appeared:—Nuneaton (March 14th), Manchester (August 29th and October 10th), Stratford-on-Avon (September 5th), Lincoln (September 19th), Cheltenham (October 10th), Harrogate (October 10th), Bolton (December 12th).

In connection with the Cheltenham sewage works it is interesting to note from the report quoted above that a definite application was made to the Local Government Board to ascertain whether a scheme of land treatment would be acceptable to the Board, provided the necessary land could be obtained. The Board stated that, having regard to the report of the Royal Commission on the subject of broad irrigation, they were not prepared to entertain the proposal.

NEW WORKS.

Among a number of new sewage works completed or in course of progress during the past year the following may be mentioned:—

Linthwaite and Golcar: Engineers, Messrs. Abbey and Hanson, of Huddersfield.—The interesting features of this scheme are nine precipitation tanks, each 96 ft. by 20 ft. by 11 ft. average depth; two humus tanks, each 65 ft. 6 ins. by 18 ft. by 11 ft. 6 ins.; and an underground sump, 40 ft. by 30 ft. by 12 ft., with its roof 11 ft. below ground level, the whole of these tanks being constructed of reinforced concrete on the indented bar system.

Gerrard's Cross: Engineer, Mr. Arthur Gladwell, surveyor to the Eton Rural District Council.—These works were designed to deal with a dry weather flow of 125,000 gallons per day, and consist of screening and detritus chambers, storm-water stand-by tanks, continuous flow liquefying tanks, dosing tanks, percolating filters, humus tanks, and final purification on land, which is of such a porous nature that the effluent will readily be absorbed.

Hulifar: Engineer, Mr. Jas. Lord, M. INST. C. E., borough surveyor.—These works deal with a dry-weather flow of about 4,000,000 gallons per day, of which about 45 per cent is traders' effluents. The sewage is treated in detritus tanks, followed by precipitation tanks and final purification in fourteen pairs of contact beds and thirty-six percolating filters. The effluent from the percolating filters further passes through humus tanks, and contact beds are provided for dealing with the top water from the precipitation tanks, while sludge draining beds were constructed for drying

the humus removed from the effluent from the percolating filters.

Sarbiton: Engineer, Mr. H. T. Mather, surveyor to the Urban District Council; consulting engineer, Mr. A. P. I. Cotterill, M.INST.C.E.—There are four sets of pumps, two capable of raising 370 gallons per minute each, and two capable of raising 1,000 gallons per minute each. The whole of the steam required by the pumps and for other purposes is provided by two two-cell Heenan & Froude refuse destructors. The sewage is treated by chemical precipitation in six settling tanks, followed by five primary and five secondary percolating filters. In times of storm the whole of the filters act as primary filters, the necessary diversion of the respective effluents and supply being performed automatically by a special apparatus. The works are designed to deal with an ultimate daily volume of sewage of 1,050,000 gallons.

Wakefield: Mr. J. P. Wakeford, borough engineer.—Additions to and re-modelling of old works, including two electrically driven pumps with a total capacity of 16,500,000 gallons per day, chemical plant, recorders, increase of tank capacity to about eighteen hours' dry-weather flow, 3½ acres of percolating filters, with humus tanks and storm beds, the daily dry-weather flow being 2,000,000 gallons.

STREET LIGHTING.

Comparative quiet has reigned in this department of the public service during the past year; nothing very exciting has happened in connection with the actual work of street lighting, though there has been a good deal of discussion regarding it. The Joint Committee which was appointed in 1911 to prepare a draft specification for street lighting arrived at the conclusion, by a majority, that the specification should be based upon illumination and not upon candle-power, the standard of comparison recommended being the minimum horizontal illumination at a height of 3 feet 3 inches above the ground level. But the representatives of the gas interests opposed this recommendation, and as unanimity was regarded as a very important desideratum—without which, indeed, the specification would probably be a dead letter—an attempt was made to arrive at a satisfactory agreement by open discussion on the neutral platform of the Illuminating Engineering Society in April. The case for the majority was stated by Mr. A. P. Trotter, whose paper proved a valuable contribution to the literature of the subject; and the remarkable fact was brought out that when a large number of streets were classified as regarded their illumination by direct measurement, and again (by the representatives of the Institution of Municipal and County Engineers) by eye, the two classifications agreed absolutely. It was contended, however, that this result did not afford any ground for believing that the same result would have been arrived at if the lighting of those streets had been planned and carried out by contractors working to the specification, which opened the door to "freak" lighting in which every consideration but that of securing a fixed minimum illumination was ignored, and it cannot be denied that there is great force in this argument. Two evenings were devoted to the discussion, without reaching a solution to the problem, and eventually the draft report was taken back by the Committee for further consideration. No new proposals have yet been put forward, but it is generally agreed that a satisfactory specification is greatly to be desired, and no doubt every effort will be made to find a way out of the present *impasse*.

GAS LIGHTING.

Development has been normal and uneventful

Lepton: Mr. E. H. Essex, engineer and surveyor to the Urban District Council.—Additional tank capacity to provide increased storage in times of storm. A circular concrete tank is proposed 82 ft. 6 in. in diameter, with a depth of 24 ft. and a capacity of 500,000 gallons.

Sheffield: Mr. C. F. Wike, M.INST.C.E., city engineer and surveyor.—The scheme submitted to the Local Government Board in 1904 has made considerable progress, and will probably be completed within the next few months. The total cost works out at a little over 11s. per head of the present population, and it is claimed that this is lower in cost than any other scheme for a similar community. The scheme includes, among other works, new catchpits with mechanical screens and an electrically driven travelling bucket dredger, nine new settling tanks, and the conversion of the lime precipitation tanks into additional tanks having a total capacity of 15,000,000 gallons, sixty contact beds, each ½ acre in area, sixteen storm beds, each about one acre in area, a bridge, four 4 ft. diameter syphon tubes, roads, railways, and other works. The average daily volume of sewage treated in the contact beds or on land during the year ending March 31, 1913, was 19,205,000 gallons, and a further average volume of 2,300,000 gallons of storm water received treatment in tanks.

during the year, but real progress has been made. The possibilities of low-pressure gas lamps have not been exhausted yet, and such lamps, for which a candle-power of 1,500 and an efficiency of 40 candles per cubic foot per hour are claimed, have been brought out. It is certainly a great advantage to be able to obtain such results without increasing the pressure of the supply, for there are circumstances under which it is not convenient to install the necessary apparatus, and in which it is better to sacrifice a little in efficiency in order to keep down the cost of plant and maintenance. A high-power single-mantle inverted lamp has been developed in the United States, which has the advantage that the reflectors can be designed more accurately to produce a given result than with multiple mantles. A high-pressure lamp rated at 500 or 1,100 c.p. according to size, with gas at a pressure of 55 inches, and giving 50 c.p. per cubic foot with mantles of artificial silk, hails from the same quarter.

A more important innovation introduced on this side is the adoption of a fused silica cup to protect the inverted mantle, instead of the large glass globe rendered necessary by the great heat of the high-pressure lamp. The silica cup is about the size of a tumbler, and completely encloses the mantle, excluding the secondary air supply altogether, and reducing the size of the lamp. It is stated that there is an increase of 10 per cent. in efficiency with this device, after allowing for the slight absorption of light, and it is made for lamps of 60-1,500 c.p. Owing to the remarkably small coefficient of expansion of silica, the cup does not crack even if it is splashed with water whilst red-hot, so that it can be used without any protection from the weather; and it does not break if the mantle fails and allows the flame to strike the cup, so that the breakage of a mantle does not involve the total extinction of the light, parts of the mantle being kept in contact with the flame by the cup.

DISTANT CONTROL.

The use of distant control for gas lamps makes steady progress, several towns having the whole of their street lamps actuated in this way: in Newcastle, for instance, the whole of the public lighting gas lamps, amounting to some 10,000 lanterns, of which many are of high candle-power, are thus controlled from the works. One

maker of controlling apparatus reports that he has 175,000 in use. Two new controllers on the pressure-wave system have been brought out. The construction of pilot lights has been improved by the adoption of the Bunsen system and better protection for the jets. The various systems of distant control now available formed a special feature of the street-lighting section at the National Gas Exhibition in October.

In the case of electric lighting also there has been devised a new system, which enables any desired switching operation to be performed from a central position. The essence of this system is the superposition of an alternating current of special frequency upon the ordinary supply current in the mains, which, without affecting the supply to consumers in any way, actuates suitable relays at the points where a switching operation is to be effected. This invention is of a very elastic nature, enabling any number of different operations to be performed as desired, such as switching out a number of the lamps at suitable hours, whilst leaving others alight until a later period, and it should prove of great value in various applications. There is no doubt that the use of automatic appliances is capable of effecting marked economies as compared with lighting by hand; at Newcastle, for example, a saving of £784 per annum was reported, as the result of adopting the automatic system.

ELECTRIC LIGHTING.

Undoubtedly the most noteworthy feature of

the past year in connection with electric lighting was the introduction of the nitrogen-filled half watt tungsten lamp, which cannot fail to make its influence felt in the near future—although, as a matter of fact, it has only just come on the market. This lamp is made in sizes from 600 to no less than 4,000 c.p. in a single bulb. The smaller sizes require a low voltage—50 or 60 volts—but the larger ones take 100 or 200 volts, and they can readily be substituted for arc lamps, over which they have the advantage that, once installed, they require no further attention, except occasional cleaning of the bulbs. The filaments run at this high efficiency have a very high intrinsic brilliancy—about eight times that of the ordinary tungsten lamp—and therefore must be screened from direct vision, like the arc lamp. The light is, of course, much whiter than that of any other type of electric glow lamp. The useful life of the new lamp is stated to be about 1,000 hours. In spite of the high efficiency attained, the annual cost of the half-watt tungsten lamp is not less than that of the yellow flame arc lamp, so that the latter is still unbeaten.

In March an interesting paper on the comparative trials of high-pressure gas and flame-arc lighting carried out by order of the Manchester Corporation was read before the Institution of Electrical Engineers. This gave valuable information as to the best types of reflectors and globes to be used in connection with the arc lamps, the outcome of an extended investigation.

TRAMWAY PROGRESS.

During the past year the most prominent question in tramway circles has been the competition of the motor omnibus in the London area, and the deductions to be drawn therefrom as to the future trend of urban and suburban transit in general. There have not been wanting those who maintain that the day of the tramway is over, and that the self-propelled vehicle will at no distant date drive it from the public roadways; and this view has received powerful support in the columns of the daily Press. But those who are familiar with the technicalities of the subject, and are not deceived by superficial arguments based upon inadequate premises, know well that there is plenty of life in the tramway system still, and that, under equal conditions, the motor omnibus cannot possibly compete with the car on rails. Whether the supply of motive power from a central source, as in the electric tramway system, is necessarily superior to the generation of power on the tramcar is less certain, and experiments have been and are being made to settle this question. Were the tramway not handicapped with the heavy burdens of rates, road maintenance, workmen's fares and other restrictive conditions, the motor omnibus would not be able to enter into competition with it at all; and as regards the question of congestion of the roads, the fact that at least twice as many buses as tramcars would necessarily be required to deal with the same traffic is a sufficient answer. There can be little doubt that before long the omnibus companies will be compelled to make some contribution to the upkeep of the roads which they destroy so quickly, and already there is a proposition on foot that they shall be obliged, like railways and tramways, to carry workmen at reduced fares—burdens which will very materially modify the keenness of their competition with their elder brethren.

THE POSITION IN LONDON.

The metropolis differs fundamentally from provincial towns in that the local authorities have no power at all to control the number of omnibuses placed on the streets, or the routes which they shall follow, powers which are possessed by the

provincial municipalities and frequently exercised. Thus the London County Council tramways are open to the severest competition, and in addition the omnibuses are able not only to reach all parts of the suburbs within a wide range with facility, but also to make use of the busiest thoroughfares, such as the Strand and Fleet Street, and to traverse the City itself, where tramways are taboo. The ready communication thus obtained between north and south, and between east and west, is another great advantage in favour of the omnibus traffic. Thanks to these and other considerations, throughout the first half of 1913 the London County Council tramways lost ground at an alarming rate, while the omnibus receipts rose with corresponding rapidity, the situation giving rise to the popular impression referred to above—that the omnibus was going to supersede the tramway. It proved, however, that appearances were deceptive, and that the set-back to the tramways was but a temporary one. The turn-over of traffic to the omnibuses was largely due to a great increase in the number of these vehicles in service, and the rate of the increase in their receipts was not maintained; the omnibus traffic showed signs of having reached the limit of its expansion, and tended towards a steadier value. On the other hand, the management of the tramways was stimulated by the severity of the attack and introduced into the service a number of improvements, which quickly exerted a salutary influence upon the receipts. At the commencement of the year the tramways were losing about £2,000 a week to the omnibuses, and by the end of March the receipts showed a total decrease of over £100,000; but the rate of decrease diminished and reversed, and steady improvement was maintained during the latter part of the year. The recovery was due mainly to numerous reductions in the fares, and the issue of cheap return tickets, as well as to minor changes in the conditions, which resulted in a greatly increased volume of traffic.

The Council's experiment with eight trailer cars has proved very successful, and as soon as the sanction of the Board of Trade can be obtained to the

extended adoption of this system a large number of trailers will be put into commission. The Council have also experimented with petrol-electric cars, but the result has turned out unsatisfactory.

PROGRESS IN THE PROVINCES.

Not only in London, but also in provincial towns the spirit of progress has been in the air, and whereas many believed that a stage had been reached at which the tramway was near the limit of its usefulness, there has been abundant proof that plenty of scope remains for invention and improvement in tramway methods. For one thing, the necessity for increasing the speed of the cars has been impressed upon the attention of local authorities by the continuous acceleration of other means of transit, and many of them have obtained the sanction of the Board of Trade for this purpose.

Five municipal authorities have inaugurated experimental trials of petrol-electric tramcars, and on the Stirling-Bridge of Allan tramway the company has put in service a petrol-driven car. It is of interest to note that on the Karachi tramways, in India, petrol-driven cars have proved extremely successful, converting a losing business into a thriving concern; in this case the line was too short and the traffic too small to justify electrification. The cars run satisfactorily on the old horse tramway tracks, and weigh only $3\frac{1}{2}$ tons each, carrying forty-six passengers. The use of vestibules on cars to protect the drivers is extending, and marked improvements have been made in the construction of radial trucks, which enable a long wheel-base to be secured, with resulting benefit to the comfort of the passengers and the life of the cars, whilst retaining all the advantages of the four-wheel truck with a motor on each axle. The use of boxes on the cars for used tickets has been found advantageous, reducing litter, while the sale of waste paper pays for the cost of the boxes. Collapsible wind screens have been devised, in place of vestibules, and have the advantage that they do not impede the view of the driver. The Bradford Corporation have commenced building vestibule cars, with pneumatic brakes. At Aberdeen and York the use of trailer cars has been sanctioned by the Board of Trade, and several other municipalities are seeking powers. Sheffield Corporation have experimented with an ingenious device for counting the number of passengers on the top deck, without requiring the conductor to ascend the staircase. In Huddersfield has been adopted an improved double-deck car, which enables passengers to leave at the driver's end on the near side, saving time and preventing accidents. All-night cars are under trial at Manchester, but the results have not been very satisfactory. Sheffield Corporation decided to link up the tramway power-station on Kelham Island with the electricity supply station at Neepsend, for the sake of economy in capital and running costs. A new trolley wire has been introduced, giving perfectly smooth running at the points of suspension.

RAILLESS TROLLEY SYSTEMS.

The progress of the railless electric trolley car has, of course, been a noteworthy feature of the past year. A new installation was put in operation by the Keighley Urban District Council in June, and was of especial interest in that, unlike those previously installed in this country, the cars were not fitted with trolley poles to collect the current from the overhead wires, but were equipped on the Cedes-Stoll system with collectors hanging on the overhead conductors, and towed after the cars with flexible cables. On this system, too, there is no gearing, the motors being built into the wheels and thus driving them directly. The tram-

way manager, Mr. H. Webber, reports that the installation has given every satisfaction, although the vehicles were not specially designed to suit the local conditions, and the system has proved very popular; he has had four years' experience with motor omnibuses on the same route, where they proved a failure, and he is thus in a unique position to compare the respective costs and other performance of the two types of vehicle.

Mr. Webber states that the motor omnibuses cost 15d. per bus-mile to run, while the receipts were only 11½d. The railless car, on the other hand, costs about 10d. per mile (inclusive of capital charges), and the revenue is 12d. per car-mile. Moreover, a careful watch kept on the road surface indicates that the wear due to the railless car is about one-fourth of that caused by the omnibus, and the wear on the tyres is less in about the same proportion. The experience of the Tramways Committee with the trial length of 1¼ miles has been so favourable that in all probability the remaining routes will be equipped on the same system.

The first combined tramway and railless omnibus system to be carried out *ab initio* was opened at Aberdare in October; it comprises 2¼ miles of tramway and 3½ miles of railless route, the latter consisting of four branches, acting as feeders to the main tramway line. The gradients on the railless routes in this district are hilly, the steepest being 1 in 9, but the cars surmount them without difficulty. Here also the Cedes-Stoll system was employed. The railless trolley system is also in use at Leeds, Bradford, Dundee, Rotherham and Ramsgate, and a number of other installations are under way. In the case of the Brighton-Hove system, a double-deck railless car has been approved by the Board of Trade, the first of its kind in this or any country. Other installations that may be mentioned are those at Chesterfield, Rhondda and Mexborough.

THE MOTOR OMNIBUS.

To the tramway manager the motor omnibus has two distinct aspects: that of a competitor, and that of an auxiliary. As mentioned above, the provincial authorities are in a position to prevent competition from private motor-omnibus ventures in their areas; the main question, therefore, from their point of view, is whether the motor-omnibus or the railless car is the more profitable type of auxiliary vehicle to employ in conjunction with their tramway systems, and this subject was dealt with at the Conference of the Managers' Section of the Municipal Tramways Association at Sunderland in June, when Mr. C. J. Spencer, of Bradford, read a paper on the respective merits of the rival types. He regarded the addition of a large number of petrol omnibuses to an extensive tramway system as sound, but considered that the use of a small number of omnibuses was inadvisable, on account of the relatively high cost of the special skilled labour necessary to keep them in repair. In his view the total cost of the omnibus worked out at 10d. per mile, against slightly over 7d. for the railless car.

Another question was exhaustively discussed at the Conference of the Association at Sheffield in September, in a paper by Mr. J. B. Hamilton, of Leeds; unfortunately there was little time for general discussion of the figures which were put forward by the author of the paper, but on the face of it, he made out an overwhelming case for the tramway.

When all the important factors are taken into account, including the maintenance of the roads by the tramway authorities, and the return in rates on the undertakings, the total monetary benefit derived by the twenty-seven British towns of more than 150,000 inhabitants works out at over 1½ millions sterling, whereas if motor omnibuses

were substituted for the tramcars, even when favourable costs were taken, the result would be a loss of over 2½ millions—a total difference of more than 4 millions. Apart from the working costs, Mr. Hamilton pointed out that the motor omnibus had seven times as many fatal accidents per vehicle, and twice as many injuries per million passengers, per annum, as the tramcar; that the cost of providing transport by motor omnibuses was twice as great per seat as in the case of tramways; and that in fine weather two, in wet weather four, omnibuses would be necessary in place of each tramcar. As an auxiliary, however, the motor omnibus has been found decidedly serviceable, and numerous municipalities have acquired a number of them, in addition to some twenty authorities which are about to purchase them or to obtain powers to do so. Sheffield Corporation propose to obtain authority to send their omnibuses into the adjoining districts. Edinburgh is going to experiment with petrol-electric omnibuses in conjunction with the Tramway Company.

THE PAY-AS-YOU-ENTER CAR.

Although the conditions prevailing in this country differ materially from those in America, where the "P.A.Y.E." system came from, it has proved very successful in the few instances in which it has been tried on this side of the water. The main difficulty is the rare occurrence of a uniform fare for any distance, which was held to be a fundamental feature of the system, but this has been demonstrated to be a mistaken view. At Aberdeen, after twenty-one weeks' operation, it was reported that the passengers had taken kindly to the system, and had their fares ready before boarding the cars. The system, according to the manager, Mr. R. S. Pileher, was much safer for the passengers, as the conductor was always on the rear platform; a longer time was taken to load up the car at a busy terminus, but time was saved en route, as passengers could leave at both ends of the car. Moreover, all the fares could be collected. In June a partial prepayment system was adopted in Bradford, the fares of the top-deck passengers being collected by the conductor on the platform. Mr. Spencer reported that the number of accidents to passengers when alighting had been halved, and the number of cases of passengers having no tickets or over-riding their destination had been very considerably reduced. Very good results were obtained also at Leicester, although a great variety of fares and tickets was in use there. On the other hand, at Liverpool the experiment gave unsatisfactory results.

LEGAL AND PARLIAMENTARY.

A serious blow was struck at the tramway by the House of Lords in July, when the judgment of the Appeal Court in the famous case of *Tottenham Urban District Council v. the Metropolitan Electric Tramways, Limited*, with regard to the rating of Light Railways was reversed. Although the Board of Trade, in introducing the Light Railways Bill in 1896, stated that it would cover the construction of tramways, and the Bill was also introduced into the House of Lords with the same statement, Lord Moulton declared that such construction was an abuse of the Act, and the judgment of the House required all tramways thus constructed to pay the full rates, instead of one-fourth of that amount. The chief sufferers from this decision, however, will be tramway companies, as the municipalities that own such tramways will only have to transfer the money from one account to another, and those which do not own the tramways will, of course, benefit by the increased payment of rates.

A movement has been set on foot, at the initiative of Mr. T. B. Goodyer, of the Croydon Corpora-

tion Tramways, to urge the Government to legislate upon the lines of the report of the Select Committee on Motor Traffic with regard to motor omnibuses, having in view the advantages derived by the latter from their free use of the public roads, and their exemption from the payment of rates and carrying workmen at cheap fares, and the matter received attention at the Municipal Tramways Association Conference, the obligation imposed upon the tramways to pay for the maintenance of a portion of the roadway which they do not wear out, as in the days of horse tramways, being regarded as a particularly sore point. The payment of bonuses to tramway employees was objected to by the auditor at Belfast, who surcharged the members of the Committee responsible for drawing the cheques; the matter will, of course, be the subject of appeal.

GOODS TRAFFIC BY TRAMCAR.

The possibility of utilising the street tramways for the conveyance of goods has frequently been the subject of discussion and experiment—even of litigation; last year it was brought to the front again by proposals to follow this course in South Lancashire. The late Mr. Bellamy, when manager of the Liverpool Corporation Tramways, put forward a scheme, which, however, fell through owing to his death. His successor, Mr. C. W. Mallins, has been advocating a similar project, with the object of relieving the increasing congestion of traffic in the streets, due to the volume of goods traffic to and from the docks having doubled in amount without corresponding improvements being made in facilities for transport on land. Much of the work is still done by horse haulage in a primitive fashion, and at high rates. The passenger traffic is too dense to permit of the use of the existing tramways for the transport of goods, but it is thought that storage-battery vehicles would serve for traffic between the docks and the stations and warehouses, while new lines, or a railless system, would have to be laid down for the service of the mills and transport to other towns. The scheme outlined by Mr. Mallins deals with the matter broadly, for the benefit of South Lancashire and Yorkshire, and the South Lancashire Tramways Company is prepared to co-operate with the Liverpool Corporation in carrying it out. Goods wagons are in use at Burnley and elsewhere.

THE BATTERY VEHICLE.

It seems appropriate to mention here the movement which is now on foot, under the auspices of the Municipal Electrical Association, to promote the development of the commercial electric battery vehicle in this country. In America some 20,000 electric automobiles are in service, and the charging of their batteries affords a most useful and profitable load for the central stations. Up to last year little progress had been made in this country, but an energetic committee representing all interests was formed by the Municipal Electrical Association in September, and outlined a propaganda with the object of urging supply authorities to provide charging facilities, to standardise the arrangements for charging and other details connected with the business, to offer energy for this purpose at a low price, and generally to assist in popularising the electric vehicle in every possible way. Some of the station managers have already taken active steps in this direction, and a fair number of vans and other vehicles were put into service in London during the year.

GENERAL DATA.

The annual return of the Board of Trade, recently issued for 1912-13, shows that the tramways of the country aggregated 2,662 route miles, of which 1,818 were owned by 171 local

authorities, representing a total outlay of £54,500,000; railless trolley routes, all owned by local authorities, amounted to 13 miles. During the period the number of passengers carried was equal to about seventy-one times the population of the United Kingdom, and the ratio of working

expenses to receipts was 62.68 per cent. The nett receipts of local authorities owning tramways amounted to £1,095,957, and £544,478 was paid in relief of rates, against £61,988 aid from the rates. The capital expenditure per mile of single track for all undertakings averaged £18,229.

WATER SUPPLY.

A comprehensive review of the water supply question made from day to day at the present time would, if complete, occupy considerable space. If it were a weekly review it would of necessity have to be of a condensed and cursory character, so many and various are the matters to be dealt with. When, however, the work of a whole year has to be considered, the reviewer is at once overwhelmed with the mass of evidence before him, and may well shrink from a task so formidable. Further, the greater his knowledge the less confidence will he feel. Certainly at no period in the world's history have so many great water works been under construction, in operation, or in contemplation, and never have so many workers been engaged in considering and in dealing with the subject from every possible standpoint. To treat the year's work in such a manner as to gain a profitable retrospect it is best to divide the subject under certain headings and to give such facts and instances as will best illustrate the progress made.

WATER SUPPLY A MATTER OF NATIONAL IMPORTANCE.

Perhaps the most noticeable thing with regard to water supply in our country at the present time is the growing demand that the question shall be dealt with as a whole. This demand is shown in various ways, but chiefly by the increasing expectation that systematic observations shall be taken and returns made as to all sources of supply. The recommendations of the Royal Commission on Sewage Disposal were followed by those contained in the Report of the Royal Commission on Canals and Waterways and by those of a Parliamentary Committee, all in close agreement; but there are many other bodies and persons whose efforts and work constitute a growing power which will ultimately produce a much needed reform.

During the year our appetite for information has been quickened by a large number of reports and similar information received. The rainfall returns, the publication of the memoir of the Geological Survey on the London wells, the constant repetition by various authors of the information given in the Royal Commission's Report on Canals and Waterways, and of the complaint therein made as to the absence of trustworthy evidence as to the flow of streams, Sir Alexander Binnie's recently published work on rainfall reservoirs and water supply dealing with the question of the run-off from land, Mr. Baldwin Latham's paper on water and water supplies read before the Louth Naturalists' Antiquarian and Literary Society, and many other similar works have tended to direct the minds of water engineers and others interested in the subject to the importance of obtaining accurate information as to the sources of our supplies and also as to the great difficulty of doing so. Mr. Dunwoody, at a recent meeting of the Institution of Sanitary Engineers, urged young engineers to spend their spare time in the much-needed work of gauging streams.

This alone demonstrates the position we are in. A great deal of work is done by private individuals and by water authorities in recording the levels of water in wells and so forth, but even where such information has been made public it exists in a scattered form in numerous books, published transactions, and technical journals,

and it cannot be collected hurriedly when wanted. The Local Government Board are collecting certain data, but this has not as yet been published. Mr. J. Chisholm, at the recent meeting of the Institution of Water Engineers, drew attention to the need that water authorities should be compelled to make returns to a Government Department, giving particulars of their works. Here again we see the expression of the same feeling of the growing need for the systematic consideration of the waterworks question as a whole.

Legislation long expected does not appear to have made any considerable advance during the past year, and we still wait for the formation of a Central Authority. All are agreed as to the need for the legislation, seeing that it vitally affects every member of the community, but we nevertheless acquiesce in the delay, being attracted by the seeming importance of matters which are relatively of very small value. Whether the year 1914 will show any advance remains to be seen. The delay is certainly an adverse comment upon our present methods of Parliamentary procedure.

THE METROPOLITAN WATER BOARD.

That it is possible for a water authority to prepare and to present such statistics and information as are required is made evident by the admirable annual reports of the Metropolitan Water Board. This, the greatest water authority in the world, including as it does the works of several older water companies, finds it necessary to consider its area as a whole, and in order to do so obtains the fullest and most exact information, which it records and publishes. Similarly, if the water supply of the whole nation is to be properly and economically dealt with, the same methods as are applied to the metropolitan area must be applied to the whole country.

We see that the total rainfall on the whole of the valleys of the Thames and Lea is gauged and its quantity estimated, the flow in the rivers is carefully gauged and the results are compared. Thus at once the run-off of the watersheds during the different months can be compared with the flow in the rivers, and we are provided with valuable data which is of use under similar conditions. The same praise may be given to the work done in connection with all the various departments of the Board. Dr. Houston's work is well known, and the careful and continual examination of the London water and the published records of this work are of value to the world.

WATER PURIFICATION.

The Purification of water as regards disease germs has perhaps not aroused so much interest and discussion in the past year as was the case during the years which have immediately preceded it. This is due to the fact that methods which were then on trial have now been finally accepted or rejected, or have, at any rate to a great extent, fallen into their proper places, and are among the ordinary accepted processes applicable according to the special requirements of each case. It may be said that there are in this country two schools of thought. First, those who regard pure water as a manufactured product, and next those who demand in all cases water pure at the source.

Both opinions are to be treated with respect, but there is an intermediate class of persons whose opinion is really, consciously or unconsciously,

that money must be saved at all costs. Such persons possessing a supply which is known to be of inferior quality belittle the risk, and object strongly to any suggestion of carrying out works in order to obtain water from a purer source. They object even more strongly to the use of any artificial process of purification. They do not want their water "doctored." This intermediate class, priding itself on its common-sense, carries considerable weight, and is probably the chief cause of a large amount of expense, ill-health, death, and general distress, particularly among the poor.

The fall of the death and disease rate wherever a purer supply of water has been distributed to the people supports the contention of the medical scientist, and proves the wisdom of the accepted principle that a pure supply is necessary. The worst water may be purified by proper treatment where, as is often the case, a perfectly pure supply cannot be obtained at the source. Indeed, the opinion held by some of the highest authorities is that no water exists which is absolutely free from contamination, or which, from one cause or another, does not need treatment. Thus, on the grounds of economy alone, one water needs treatment to reduce its hardness; another to remove its corrosive qualities productive of lead poisoning or wasteful corrosion of iron pipes; another to prevent the formation of animal and vegetable growths producing clogging and incrustation of mains and other troubles; another to prevent unpleasant tastes and odours due to algal growths, and so on. There are, in fact, few supplies, if any, that do not need treatment of one sort or another for the sake of public economy alone, without regard to the question of disease germs. The work of the past year has brought this fact prominently forward.

THE TYPHOID GERM.

It is interesting to consider some of the work recently done by Dr. Houston together with that of the Royal Commission on Sewage Disposal. The officers of the Royal Commission have shown that where the volume of a river is enough to provide proper dilution to sewage discharged into it, the natural purification effected is sufficient to prevent any possible nuisance. They leave the water authorities, however, to purify such water as may be abstracted from the river for domestic use. Dr. Houston, on the other hand, having examined samples of sewage polluted river waters, reports an absence of typhoid germs, and not only so, but he also fails to find these germs in various samples of sewage collected from the large towns.

While this does not prove that typhoid germs are never present, it tends to show that they are not so generally present as is ordinarily supposed, and that sewage pollution does not necessarily mean typhoid pollution. However, seeing that typhoid cases may at any time occur in a town, there is always a potential danger which must be guarded against, and it is notable, and should be thoroughly grasped, that at no time has Dr. Houston advised any relaxation of protective measures; he has merely pointed out that the sewage-polluted water may not be so dangerous as regards typhoid fever as was formerly supposed.

There is, moreover, another point which is often lost sight of. The bacteriologist is the first to admit that his science is in its early stages, and that complete reliance as to the safety of a supply must not be based on the bacteriological test alone. Experience through the ages has shown that cleanliness and a pure supply of water promote health and well-being. The exact causes are not known to absolute certainty even yet.

It is quite possible that in the future the scientist will discover other causes yet undreamed of for disease arising from dirt and from the consumption of polluted water. We

have found by bitter trial and error, not by scientific investigation, the value of pure water, and though the scientist is now finding out slowly the various causes, it would be rash and foolish to place entire dependence upon theoretical observations, and to ignore previous experience. That this view is correct may be seen from the numerous reports of chemists and bacteriologists upon sources of supply in which they urge the strong necessity of a careful examination of the surroundings on the ground. They refuse absolutely to be bound by a standard: that is to say, they decline to admit that a water of a certain chemical and bacteriological character, approved in one case after examination of the conditions, is fit for use elsewhere where the conditions are unknown.

FILTRATION.

During the past year we have had before us numerous instances of water purification on the largest possible scale. It is evident that nothing is impossible. Waters of all kinds are treated in a variety of ways and are made fit for public consumption by the removal of hardness, corrosive qualities, iron and other objectionable characteristics; falling death and disease rates prove the satisfactory nature of the various processes. Waters containing matters in suspension and solution are treated in precipitation tanks, chemicals are added to produce coagulation varying indefinitely according to the nature of the water; purification by long storage in reservoirs allowing for natural precipitation and for the devitalisation or destruction of bacteria is now working in London: filtration through slow sand filters when efficiently carried out still holds its own, although in a very large and increasing number of cases it is found to be better, more economical, and more productive of the continuity of good results to use mechanical filters. These are now used for the very largest supplies, as may be seen elsewhere in these pages. Plants to deal with three or four million gallons per day are becoming common. It is not very clear why the sand filter with rotary distributor is not more in use.

We have in this country an excellent example at the Bedford waterworks, where slow sand filters and sprinkler sand filters are working side by side, entire preference being given to the sprinkler filters after several years' trial. The objections of short circuiting and unequal working applicable to the slow sand filter do not apply to the sprinkler filter, while the purification effected by the sprinkler filter is superior. The chief disadvantage experienced in slow sand filtration is the speedy clogging of the surface of the sand whereby the effective life of the filter is limited. This difficulty is overcome by the sprinkler filter.

THE PUECH-CHABAL FILTER.

Again, the Puech-Chabal filter also does away with the same difficulty. This filter consists of compartments filled with materials of differing grades, and is too well known to need detailed description. The system has been installed at several important waterworks in England and also abroad, and one has only to refer to such works as Cherbourg, Paris, Pau, Port Said, the Derwent Valley at Bamford, and Cawnpore, India, all of which are large works and have been photographed, the illustrations being published in the December issue of *Water*, to show the manner in which this new system is being universally adopted.

STERILISATION.

Where owing to the particular conditions of the case sterilisation is required the work of the past year shows the continued good results of hypochlorite sterilisation, which from the number and importance of the works at which it has been adopted, and from the extraordinary improvement

in the death and disease rates which has been recorded as a result of its application, is by far the most important system at present in use. This, however, refers chiefly to America and England. On the Continent there is a strong prejudice against the method. One may refer to the case of Paris, where recently the authorities had to draw 35,000 cubic metres from the river Marne, and in this emergency Dr. E. Roux advised treatment with sodium hypochlorite, but only as an exceptional measure. Similarly M. A. Calmette did the same during a recent cholera epidemic at an institution at Marseilles. There are signs, therefore, that the prejudice against the hypochlorite system is giving way in France.

Although the ozone system is well in evidence in France, it does not appear to have gained much ground generally. In this country there has been little reported beyond the examination made by Messrs. W. J. Dibdin and Son on behalf of Messrs. Ozonair, Limited, of water treated in an ozonising plant erected at Knutsford.

The method of treatment by means of the ultra-violet rays has made some progress in France, where it is being used for the purification of fairly large supplies, apparently with satisfactory results. It is, however, somewhat disappointing that this process, which appears to have so many advantages, is not applied on a proper commercial scale in this country. It seems, however, that this new method of sterilisation of water has been developed to such a point as to be commercially useful. We are told by Mr. Max van Recklinghausen that in Marommes les Ronen 100,000 gallons of water are treated daily, while another supply of 1,700,000 gallons per day is being treated elsewhere, and one may gather that certain other supplies of similar magnitude are being treated by the ultra-violet rays in France. But as yet we wait for the working figures and the full particulars.

LIME TREATMENT.

Much attention has been given to the treatment of water with lime during the past year. Dr. Houston, in his eighth report on research work to the Metropolitan Water Board, dealt with the softening, purification, and sterilisation of water supplies by means of lime. The lime process was suggested for sterilisation primarily, and secondarily and incidentally for softening purposes. The idea of using lime as a sterilising agent was new in ordinary waterworks practice, though apparently it was no new idea to the chemists, as both Dr. Rideal and other chemists in published papers have stated. In Dr. Houston's method the water was to be overdosed with lime, so that the method was only suitable for such a case as he had in view—viz., that of London, where some part of the raw water is of inferior quality, and this after being treated with the lime could be mixed with at least 25 per cent. of pure water.

Mr. G. C. Whipple, in a paper read before the New England Waterworks Association, dealt with the addition to plumbo solvent waters of lime in the form of powdered chalk, advocating somewhat cautiously the accepted English methods. Mr. William T. Burgess, in a paper read before the Institution of Water Engineers, dealt also with the lime treatment of water both for softening and hardening purposes. Mr. F. J. Dinan also dealt with the same subject at the same meeting. The American chemists, Messrs. Hoover and Scott, of the Columbus Waterworks, have claimed and apparently proved the sterilising power of lime when added to the water in doses sufficient to remove the hardness without any overdosing. We find the manufacturers of softening plants also claiming the merit of sterilisation for their processes.

It is evident that lime is not only useful for

softening water, it is useful also when added to water containing carbonic acid in neutralising the acid and in removing plumbo solvent qualities; further, if added in proper proportion, it will prevent the corrosion of iron pipes, it being found that the thinnest possible film of lime acts as a preservative. Finally, there is the use of lime as a sterilising agent, as advocated by Dr. Houston, for, although his statements have been severely criticised by chemists, no one has suggested that the sterilisation is not effected.

CHLORINE GAS.

The sterilisation of water by chlorine gas has been tried in America recently. Compound chlorine liquefied under pressure is sold in cylinders. The gas is mixed with the water, and, combining with the hydrogen of the water, forms hydrochloric acid, while oxygen is liberated, and this nascent oxygen performs the work of sterilisation. The process has been severely criticised by chemists, who consider that it does not compare favourably with the hypochlorite method. Dr. Eric Rideal's criticism, which appeared in these pages, will be remembered.

MICRO-ORGANISM TROUBLES.

The causes of the clogging of mechanical filters have received considerable attention, and recent experience shows that the degree of clogging does not necessarily vary with the degree of turbidity of the water, but that certain micro-organisms tend to produce trouble. High turbidity may produce clogging of one kind, while the low turbidity in warmer weather is sometimes accompanied by clogging of another kind, due to the presence of micro-organisms. The remedy appears to be the sterilisation of the clear water before filtration, a simple matter. Considerable trouble has been experienced owing to the presence of algae in storage reservoirs, and a great deal of work has been done in investigating the causes. Generally speaking, it is found that the difficulty may be overcome by treatment with sulphate of copper. The chemist, as a rule, seems to have little difficulty in setting matters right. It is notable, however, that the presence and growth of the various forms of vegetable life which give trouble are not constant, neither do they vary with the seasons with any great regularity.

Whatever the causes may be, these reservoir troubles are intermittent, and not easily accounted for. The importance of the question is considerable owing to the large number of great storage reservoirs and to the ever-increasing number of supplies obtained from rivers and upland sources. In London we have had some small experience of algal troubles, and there is, of course, the possibility of the same troubles occurring on a much larger scale.

The investigation which the matter is receiving is therefore most necessary, and it is satisfactory to note the success which has attended the efforts of the chemist. The new principle of purification by storage suggests that the water admitted, viz., water needing such purification, might reasonably be expected to support or produce algal growth in a greater degree than water of purer quality; therefore it is probable that the principle of purification by storage has its limitations, and that flood waters of inferior quality will need preliminary treatment, as mentioned elsewhere.

THE CORROSION OF IRON.

The causes of the corrosion of metals by water have received an unusual amount of attention during the past year. While the metallurgist is endeavouring to prepare metal which shall be proof against ordinary water corrosion, the chemist is engaged in investigating its causes. Also the various methods of protection are receiving considerable attention. Dr. Eric Rideal's paper upon the corrosion of iron, read at a recent meeting of

the Society of Engineers, is still fresh in our memory. The paper read before the Society of Naval Architects and Marine Engineers of New York by Lieutenant-Commander Frank Lyon, Mr. William Ransom's paper upon the corrosion of water mains read before the Municipal and County Engineers, and many others may be mentioned.

In the present state of our knowledge we have no complete and satisfactory preventive or cure for the corrosion of pipes, but we are learning more and more about it every day, and we have at any rate reached a stage when it is worth while to consider the quality of the water in a pipe as well as the material of which the pipe is composed. We have to consider the corrosive action of acids and electrolytic action. If the acids are neutralised much corrosion may be prevented. One of the most interesting contributions to the discussion of the subject was Messrs. George and Melville Whipple's paper, read in 1912, describing the experiments made in order to ascertain the causes of pitting in steel pipes. These experiments, which were dealt with fully in these pages, seem to prove that the pitting is entirely due to electrolytic action, which occurs owing to differences of potential between the scale covering the steel and the metal underneath, and it should be remembered that in the experiments with steel plate from which the scale had been removed by grinding with emery absolutely no pitting took place under the same conditions that produced pitting in the same plate with its scale on. It has been shown that cast-iron mains and steel mains will rust under certain conditions, and practical experience has sometimes shown that the steel pipe is the less liable to corrosion of the two with a water of given quality.

After carefully considering the work done up to the present time, it seems as if in the future we should endeavour to prevent corrosion rather by treatment of the water than by altering the nature of the metal. Coating on the outside rather than upon the inside may in the future be considered the most important. While we can do away with the corrosive properties of the water by treatment, and even apply a preservative coating to the interior surfaces of the pipes by means of the water far more effectively than we can by other means, we cannot as easily deal with the corrosive agents which may exist in the ground. For instance, the corrosion of the Kalgoorlie mains was arrested by treatment of the water with lime; while the steel main mentioned by Mr. Ransom in his paper as having been severely injured by sulphuric acid in the soil, resulting from the oxidation of pyrites present, was coated with bitumen in order to arrest the corrosion.

INCrustation of Mains.

The causes of the incrustation of water mains have received considerable attention lately. This is no doubt due to the disappointing experiences of certain water authorities, who, having spent very large sums in order to obtain a water of absolute purity from upland gathering grounds, have discovered that their mains rapidly become coated on the inside with growths which affect the quality of the water and also reduce the volume of the delivery. Where supplies are derived from wells or underground sources, or where the water has been properly filtered, the incrustation due to animal growths is not to be expected, but where it is derived from rivers or upland sources the growths are apt to become apparent.

The subject of animal growths in water mains was dealt with by Mr. Samuel C. Chapman in a paper read at the summer meeting of the Institution of Water Engineers, and is of great interest. But whether the incrustation of mains results from animal or vegetable growths, corrosion or natural deposit, it is clear that the trouble may

be overcome by proper treatment of the water. External corrosion is to be overcome by efficient coating and electrolysis by efficient insulation.

STEEL MAINS.

Many engineers at the present time are halting between two opinions as to the desirability of putting in new pipe lines in cast iron or steel. Probably the chief stumbling block is the fact that the Local Government Board demand the repayment of a loan for steel mains within a short period. It seems possible, however, that when the work of the chemist is more complete, and when he and the engineer can show and prove conclusively that the water will be treated in such a manner as to remove the risk of internal corrosion, the Board will be able to change their policy. In the meantime, ascertained facts show the rapidly increasing confidence of engineers in steel mains. In many cases the steel main is being used to replace the cast-iron pipe. In the Colonies an enormous amount of steel pipe shipped from this country is being used.

We hear of the use of steel pipes at Belfast, Burnley, and in many other towns in this country. One occasionally observes long lengths of steel main being laid in London. And we have occasional reminders that the cast-iron main is not absolutely perfect by the bursting of a large pipe and the flooding of London streets in a manner which could not possibly occur with the steel main.

ARTIFICIAL REPLENISHMENT OF CHALK SUPPLIES.

The suggestion made in the recent memoir of the geological survey dealing with the London wells is of great interest. This suggestion is the replenishment by artificial means of the vast underground reservoir which exists in the fissures of the chalk underlying the whole of the London district. It is definitely advised that water falling upon the land outside London should be collected and drained into dumb wells sunk to the Thanet sand.

The experiments of Mr. Bryan, the chief engineer to the Metropolitan Water Board, showed that it was advantageous to pour a vast quantity of filtered water from the River Lea into the wells and galleries at Lea Bridge. This had the effect of keeping the water level in the chalk up in that locality and of raising it for a considerable period in spite of increased pumping. It must be remembered that in the London district there exist a very large number of wells, and these have multiplied considerably owing to the increased water rates. Many large institutions, breweries, office blocks, and so forth, have their own wells, it being found possible to obtain a pure water in sufficient volume by simply boring through the London clay into the chalk. The result of this large abstraction has been to lower the water level in the chalk under London 100 feet or more, and it is evident that if steps are not taken to lessen the pumping or to increase the quantity of water in the chalk that in time a great many important private supplies will run short.

One can imagine that the Metropolitan Water Board might regard the occurrence with complacency. On the other hand, if the supply in the chalk were artificially increased the Board might themselves benefit by it. An area of impermeable material of about 200 square miles' extent exists upon which in a moderately wet season some 15,000 million cubic feet of rain descends. This area of impermeable material exists in the London district, and none of the water falling upon it can enter the chalk, but a great deal of it could be made to do so, and this is pointed out very clearly in the geological memoir. The suggestion is startling, but it has without doubt been made only after the most careful considera-

tion, and it points to considerable possibilities in the future as to the artificial feeding of certain water-bearing strata.

PUMPS.

The progress of the rotary pump has been dealt with somewhat fully in these pages in previous annual reviews. This remarkable advance is due largely to the use of electric motors and steam turbines and high-speed engines generally. The efficiency of the centrifugal pump is high; it is cheap, and occupies small space. Though first used for low lifts, it has been adapted with success for very high lifts by working in series. As stated in the *Times Engineering Supplement*, a pump recently made for the Westinghouse Machine Company, of East Pittsburg, designed to lift 1,600 gallons of water per minute against a total head of 700 feet, making 1,450 revolutions per minute, has a maximum efficiency of 80.5 per cent overall when delivering 2,600 gallons per minute against a head of 480 feet. Special designing for particular cases, as distinguished from the indiscriminate adoption of standard designs, is essential in order to obtain the best and most economical results.

It is from failure to grasp this point that unsatisfactory results have occurred in the past, and the matter should be taken to heart. Among new types the Rotoplunge pump deserves attention. The following description is taken from the *Times Engineering Supplement*.

THE ROTOPLUNGE PUMP.

The piston-type rotary pump, developed in South Wales by the Rotoplunge Company, has yielded some interesting results as regards efficiency and smallness of slip. In this pump a cylindrical casing, having an inlet and outlet for the water, encloses a revolving casting, in which twelve radial cylinders are bored. In these cylinders are pistons, which are attached by pins to a connecting piece common to all, on which piece are projections fitting into an eccentric guide-groove in each of the end covers of the pump. The casting is rotated by the shaft, and as it rotates the pistons move alternately inward and outward, owing to the eccentric guides in the end covers. These guides are so situated that any piston is at its outward extension when the corresponding cylinder is at the top point of the revolution of the drum, while at the opposite point of the diameter vertically below the shaft the piston is at the innermost point of its stroke. At these two points, and for a distance on each side sufficiently great to cover the width of a cylinder, is a dividing segment closing the outer ends of the cylinders, but at all other points around the rotating drum the outer ends of the cylinders are open to either the inlet or the outlet of the pump. An outward motion of the pistons, therefore, forces the water through the outlet of the pump, the inward motion of the pistons drawing the water from the inlet. The dividing segments close the suction side from the delivering side. There are no valves to become choked, and the harmonic motions of the pistons acting in succession give a steady stream of water without shock; the pump is positive in its action, and therefore requires no priming, besides working equally well on the slowest as on the highest speed; and a vacuum within half an inch of the barometer can, it is claimed, be obtained.

In some tests made with a 12-plunger rotary pump of this type, each plunger being 7 ins. in diameter by 3 ins. in stroke and running at 200 r.p.m., the theoretical capacity was 160.4 cubic feet of water per minute. The actual delivery measured over a weir when the engine was exhausting into the atmosphere was 154 cubic feet per minute, giving a water efficiency of 96 per cent. When the stream from the engine was

passed into the pump the water output slightly improved, being 155 cubic feet per minute. The slip, therefore, had the low value of about 4 per cent.

A considerable amount of work has thus been done recently in the direction of establishing the position of the rotary pump in regard to reliability and efficiency. Its compactness, comparatively low first cost, and ease of maintenance make it a powerful competitor of the reciprocating type, and its importance cannot, therefore, be ignored.

THE HUMPHREYS PUMP.

The year 1913 was marked by the advent of the Humphreys explosion pump, about which so much has been written lately that it is unnecessary to refer to it in any great detail. The probable development of this pump for sewage lifting and for smaller installations of water lifting is of considerable importance.

ECONOMY IN POWER GENERATION.

The internal combustion engine has effected great economies in the lifting of water, and the use of the producer gas plant for pumping purposes and the great saving of fuel and working costs is shown by the work of the past year. This is, of course, chiefly notable in the case of the Humphreys explosion pump, where there is not only the saving of fuel, but the saving in the first cost by the omission of the engine.

Other instances are to hand showing an all-round saving where internal combustion engines of high power have worked alongside steam plant for the raising of water. But the year's work shows other possibilities. We have the inauguration of the Shuman sun-power plant in Egypt, whereby water is pumped with the steam generated by the heat of the sun. The use of sun power in tropical regions may in the future become a matter of great importance. Mr. J. Astley Cooper, in a paper read before the Royal Colonial Institute, demonstrated that the Sahara Desert receives daily an amount of solar heat equal to that produced by 6,000 million tons of coal.

The developments of water power are also very remarkable. In France it is estimated that 600,000 h.p. are now being utilised for the generation of electricity. Ontario derives five million horse power from the Niagara Falls. In Norway 500,000 horse power has been utilised, and a further 430,000 horse power will shortly be obtained. Italy will also soon be using 665,000 horse power derived from the fall of water. In this country we have not the same possibilities, but the hydro-electric works just completed upon the site of the old Dee mills for Chester include three turbines with an aggregate output of about 1,000 horse power, whereby the Corporation of Chester hope to obtain electricity at less than 0.3d. per unit.

It may not be possible to harness waterfalls for pumping purposes in many places, but it should be kept in mind, as was recently pointed out by Mr. W. B. Ellington in the Thomas Hawksley lectures, that our rainfall over the whole country is sufficient to give 100 horse power per square mile throughout the year if it could be utilised, whereas the quantity required for domestic use is less than 1 per cent. of the total rainfall, leaving 70 million horse-power hours per year available if it could be used.

RESERVOIRS.

The chief advance in reservoir construction during the past year is the growing use of reinforced concrete. For municipal work, however, certain facts have to be faced which have a very important bearing upon the question. First, the Local Government Board rightly or wrongly will not sanction a long-period loan for such work.

Notwithstanding this difficulty, however, such is the economy to be effected by the use of re-

inforced concrete that it may be found to be worth while to use the cheaper form of construction, the first cost being so much less that the annual sum to cover the repayment of the loan is the same as in the case of a long-period loan for the more costly masonry structure otherwise required, with the added advantage that the loan is paid off in half the time. A very large number of reinforced concrete tanks and reservoirs have been in course of construction in this country during the past year.

It is interesting to note that in order to provide an earthquake-proof fire service the authorities at San Francisco, after considering every known method, decided to instal a system of underground tanks in the streets. These tanks are formed of reinforced concrete, and are circular in form, and hold about 75,000 gallons each. There are no rigid pipe connections. The suitability of reinforced concrete for this purpose is clear; it has withstood earthquake shocks in the case of buildings. Where reinforced tanks have been made in waterlogged ground they have floated intact, and have been brought back to place without harm. Again, there are cases, such as that recently reported at Washington, in America, where, owing to an overflow of water, the foundations of a reinforced concrete flume, commonly called the Congdon Ditch, were washed away, and 41 feet of the flume were left unsupported, without any failure or harm occurring to the structure. Lastly, we have the convincing evidence afforded by the existence of reinforced concrete barges. The value of this form of construction where the ground is unstable is, therefore, evident.

Having regard to the extensive use of concrete in waterworks structures, the report drawn up by the Concrete Institute upon the subject of cracks in ferro concrete is very important. Surface cracking and body cracking in mass concrete are dealt with. Surface cracking is said to be due to the skin of the concrete being richer in cement than the body, while body cracks may be due to imperfect design or to contraction. Contraction joints in plain concrete are recommended at every 4 feet or 5 feet in the case of paving and at every 10 feet in the case of curtain walls, and in the case of exposed retaining walls at every 15 feet or 20 feet. In the case of basement retaining walls or of dock walls the distance between the joints may be increased to 50 feet.

SWIMMING BATH WATER.

The possibilities of the modern swimming bath as a medium for infection have often been pointed out in these pages, and the investigations of the Massachusetts Board of Health bear out the contention. It has been shown very clearly that unless a bath is emptied and refilled at frequent intervals some method of purifying the water is necessary. Methods of filtration and disinfection have been adopted, but it is fairly evident that unless the germs present in the water are removed the process is incomplete.

Very clear evidence is to hand that water, if properly purified, can be used over and over again. It can be satisfactorily cleansed and sterilised and restored to its condition of purity, and a saving of money can thereby be effected. The Belfast Corporation have installed purifying plant in their three swimming baths. As reported in the month of July, the bath first treated had not been completely emptied and refilled since the plant was started seventeen months previously. Only water sufficient to make up losses had been added during this period, the water having been kept pure and bright all the time. Bacterial analyses show the water to be as pure as the town drinking water supply. The water is filtered and treated chemically.

The installation of aerating and filtering plant for the treatment of the bath water of the Glasgow Corporation is also worthy of note. In this case a pump draws water continuously from the deep end of the bath and discharges it into an aerator, after which it is filtered, heated, and returned to the bath at the shallow end. Thus the same water is used over and over again for a long period.

There are several other instances in this country besides the well-known and often-quoted case of Poplar, where the bath water has been treated with electrolytic hypochlorite for some years past.

It should be understood that it is not sufficient to filter the water, but that some effective process is also required in each case whereby all bacterial impurities and disease germs may be eliminated. The success of this method of purification for bath water is striking confirmation of the theory that pure water is a manufactured product.

CONCLUSION.

Much might be said of the events of the year, such as the opening of Chingford Reservoir by His Majesty the King, the tercentenary of the New River, and the inauguration and completion of other great works, such as the Catskill supply for New York. The scanty reference to what has been done abroad is to be regretted, while there are many other matters of worth and interest mention of which within the space available is impossible. It is, however, hoped that the foregoing remarks may convey a true idea to the reader of some part at least of the work accomplished during the year 1913.

VAN PUTTEN'S PATENT STEAM ROAD ROLLER WHEEL SPRAYER.

The above patent attachment has evidently made a name for itself, as over 300 have now been fitted in various parts of the country, including Scotland and Wales, while a number have been shipped abroad, Bombay, Calcutta, Shanghai and Colombo being among the cities in which it is in operation. Its utility and economy have now been fully acknowledged. The following is a list of a few of the users—namely, J. G. Anderson, contractor (4), Camberwell Borough Council (5), East Sussex County Council (8), Dundee City, Essex County Council, Glamorgan County Council (9), Kingston Corporation (2), Lambeth Borough Council (4), Lewisham Borough Council (7), Lincoln City, Marshall & Sons (4), Middlesex County Council (3), Midlothian County Council (3), City of Oxford (2), St. Marylebone Borough Council (2), Southampton Corporation (3), Steyning District Council (3), J. Sparks, contractor (6), Wallis & Stevens (4), Wandsworth Borough Council (6), Wigtownshire County Council, Worcester Corporation (2), Worcestershire County Council (3), Zetland County Council.

Public bodies who do not own but hire rollers will find it a great advantage to have this apparatus fitted to the rollers.

A surveyor who hires has written the licensee saying he thinks the sprayers are excellent, and always insists on their being fitted to all rollers working for him. The apparatus, he states, effects a considerable saving in horse hire, and, what is more important, the work is carried out to perfection. Another well-known borough engineer writes that he had one fitted as an experiment only, but has since had the whole of his rollers, to the number of five, so fitted.

A saving of 5s. 6d. to 7s. 6d. per day is claimed to be effected by this attachment.

Full particulars and information can be obtained from Mr. W. E. Horsman, 127 Pendle-road, Streatham, London, S.W.

Water Supply in Renfrewshire.—The water supply to the Eastwood and Mearns district has been augmented by the turning on of the supply from the new reservoir at Bennan Loch in the parish of Eaglesham. The reservoir was constructed under the powers given in the Eastwood and Mearns Water Act (1907) to meet the needs of such growing parts of the area as Giffnock, Clarkston, Muirend, and Whitecraigs. Messrs. W. R. Copland & Sons, Glasgow, were the engineers.

Middlesex New Guildhall.

ARCHITECTURAL DETAILS.



MIDDLESEX NEW GUILDHALL.

In our issue of December 26th last the opening was briefly recorded of the New Guildhall erected at Westminster by the County Council of Middlesex. A description of the building, including reproductions of the plans, appeared in *THE SURVEYOR* as long ago as March 31, 1911, but we venture to think that our readers will be interested in some further details of the structure as illustrated by the accompanying photographic views, which we are able to present by the courtesy of the clerk to the county council, Mr. W. G. Austin.

The site of the new building covers an area of some 17,170 sq. ft., having a frontage of 102 ft. to Broad Sanctuary facing Westminster Abbey, and of 160 ft. to Little George-street.

The whole of the elevations have been executed in brown Portland stone, which after a few years' exposure to the weather will be greatly improved in appearance. The fronts are at present all one tone of colour, but when they have weathered and become varied in tone, and the carving and mouldings have been touched by the atmosphere, the whole building will become much more interesting and effective than it is at present.

The site of the guildhall is one of the finest in London, and surrounded as it is by historical and great public buildings, it made the question of the architectural design a very difficult one, it being quite impossible to compete with the big scale of buildings like Westminster Abbey or the Houses of Parliament, and a Classic treatment which would vie with the huge blocks of Government offices would have invited failure. No attempt, therefore, was made to design the building on a big scale, but rather to keep it quite distinct in style and scale so as to preserve its own individuality and act as a foil to the larger buildings near; somewhat in the same way as St. Margaret's Church enhances the scale of Westminster Abbey.

That spirit and form of Gothic giving a picturesque variety of features and a delicacy of detail was felt to be the most appropriate treatment, and the build-

ing should be considered as a dainty piece of ornament set among the austere and formal buildings of the neighbourhood.

The detail employed, while preserving many of the features and mouldings of the Later Gothic, has been imbued with a modern spirit of freshness in precisely the same way as the original Gothic must have been kept virile by the introduction of new detail.

If the design is sufficiently interesting to attract the attention of the passer-by, it has fulfilled one of the main objects of the designer. The chief features of the interior are the large entrance hall, with its stone columns and walls, in the centre of which is placed a marble bust of the late King Edward VII., executed by Mr. P. Bryant Baker. On the same floor are the two courts for the Middlesex Quarter Sessions, the larger one being 40 ft. long, 36 ft. wide, and 25 ft. high. The special feature of this court is the fan-vaulted roof containing the Royal Arms.

The second court is 40 ft. long by 30 ft. wide by 25 ft. high, is arcaded along one side, and has a coved plaster roof carried by big moulded oak beams, supported by stone corbels emblematical of the Law.

On the first floor will be found the committee rooms for the use of the county council. These vary in size and treatment, and are furnished in a style to suit the design of the building. In the majority of cases the walls are panelled, while the ceilings are treated with decorated plaster in low relief.

On the second floor are the council chamber and ante-room, the ante-room being panelled in oak. The council chamber is 54 ft. long by 36 ft. wide by 30 ft. high, and contains seats for ninety-seven members, besides galleries for reporters and the public. The lower part of the walls are panelled with oak, and the upper part is of stone, with large windows on each side, containing the arms of the Lords-Lieutenant of the county. The roof is formed by richly carved hammer beam trusses, the Arms of the county being carved in the oak.

The whole of the decorative stone carving has been designed by Mr. H. C. Fehr, and the following brief

description of the most important features will be of interest.

Over the principal entrance, and extending on each side, is a frieze portraying three scenes of historical interest, illustrated by figures almost life-size. On the left of the entrance is the "Magna Charta" King John granting the Charter to the Barons at Runnymede, and on the bosses under this frieze are the arms of (reading from the left) Earl Pembroke, Earl Salisbury, King John, and Earl Fitzwilliam. The central scene over the main arch of the entrance shows King Henry III. granting a Charter to the Abbey of Westminster, and on the bosses below are the arms of King Henry III., the Bishop of London, a Cardinal, and the Archbishop of Canterbury.

The keystone of the arch shows a view of the Great

Above the centre figure of Britannia is a figure of St. George, forming the apex of the gable.

On the upper part of the tower there is a richly carved band of Old English Heraldic Yales, lions, unicorns, with Tudor roses, thistles, shields and arms, all typifying the historical nature of the site upon which the tower is built, while the gargoyle figures show the four angels of the Winds and the four angels of Protection.

In the niche in the parapet of the tower is a figure of Government.

On the south front of the building is a richly traceried balcony at the first floor, supported by corbel figures of Law and Justice, and over this balcony is the Royal Coat of Arms to announce the use of the building as a court of justice.

The western entrance has a figure of Truth in the niche, while below are two small figures of Justice and Honesty.

Over the ground floor windows is a series of figures illustrating the toils of the Sea, Shipping, labours of the Land and Agriculture, Literature, Metalworkers, Engineering and Electricity, Commerce, Sculpture, Architecture, Painting, and Music.

In the interior of the building there are figures representing Law, Justice, Council, Government, and an amount of Heraldry, comprising the coats of arms of the Lords-Lieutenant of the county and others connected with the business of the County Council and the Quarter Sessions.

Among other decorative wood-work designed and executed by Mr. Fehr is a group of portraits of the Kings and Queens of England carved on the oak bench ends in the council chamber.

The whole of the buildings are heated by steam on the vacuum system. The air for the council chamber, the courts and other important rooms is drawn in at the basement and washed free of impurities, and then warmed and sent along ducts and delivered into the rooms about 7 ft. above the floor line. The vitiated air is drawn away at the level of the ceiling and at the floor by means of electrically driven fans, which discharge this air into the open at various points above the levels of the roofs. The temperature in the council chamber and courts is automatically controlled by means of a very delicately adjusted apparatus which is set to give any required degree of heat in the room. The heating and ventilating boilers and machinery are situated in the basement, and the whole scheme has been carried out by Messrs. Rosser & Russell, engineers.

Mr. J. S. Gibson (of the firm of Messrs. Gibson, Skipworth & Gordon) and Mr. H. T. Wakelam, M.I.E.E., the county engineer, were the architects in collaboration for the building, the estimated cost of which was £85,000.



MIDDLESEX GUILDHALL: VIEW OF MAIN ENTRANCE.

Hall at Hampton Court, with small figures of Law on each side, the whole surmounted by the present Coat of Arms of the Middlesex County Council.

The scene on the right of the entrance shows Lady Jane Grey accepting the Crown from the Duke of Northumberland. Lady Jane's mother, the Duke of Suffolk, Earl Dudley, and Archbishop Cranmer are also portrayed in this scene. On the bosses below are carved the Arms of Earl Dudley, Lady Jane Grey, Duke of Suffolk, and Archbishop Cranmer.

Between the scenes in the elaborate niches are placed statues of Justice and Prudence.

In the gable above the main entrance is a series of statues placed in niches, all elaborately carved, and reading from the left these are: Wisdom, Architecture, Literature, Government, Sculpture, Britannia, Music, Truth, Law, Shipping and Education.

Hill's Motor Vacuum Road Cleanser.—We are informed that one of these machines is still doing successful work in Blackburn, where it will remain until the present scavengers' strike is settled. The makers are now booking numerous orders for their new model machine, both from home and abroad. This model is 30-h.p., sweeps into the channels and a 7-ft. track, carries a full load of 3 tons, and tips direct into a standard dust cart.

THE NEW CAPITAL OF INDIA.

MATTERS AFFECTING THE CHOICE OF THE SITE.

The choice of a site for a city which is to be created on a definite plan and with full provision for future expansion is a matter of great interest to municipal engineers. In the case of a city intended to be the capital of so great and important an area as that comprehended under the title "The Indian Empire," it is inevitable that the reasons which have led to the choice of the site determined on will be much discussed, and since criticisms and comments in this matter will be made on various grounds, and from different points of view, we think it desirable to place before our readers the considered opinion expressed in a leading

sanitation, water supply, and communications of the future city, and accepting, of necessity, the instruction of the Government of India that 10 square miles were to be provided for the city itself, and 15 square miles for the cantonment, they selected what is known as the southern site. "How the Government arrived at this enormous area," comments our contemporary, "can only be conjectured."

In December, 1912, Sir Bradford Leslie had read before the Society of Arts his paper advocating his lake scheme, which meant the adoption of the northern site. A passage from the *Indian Engineering* article may here be quoted as indicating the weak points of Sir Bradford Leslie's proposal: "It was a pretty *tour de force* worthy of a romance-writer, but not of a great engineer. He overlooked the point that the Jumna irrigation canals drain the river dry at

their oftakes, and that the seepage and drainage accessions lower down do not amount to more than about 100 cub. ft. a second in the dry weather. He did not take into account the enormous area submerged by his proposed dam in the monsoon, or the vast expense of confining the lake to a reasonable area. He extravagantly over-estimated the power available for the generation of electric energy, and forgot that in times of flood the available fall would be inappreciable and the extraction of power a negligible quantity. He said his scheme would render Delhi healthy, and the sanitary experts reported it would add to the ill-health. In only one point, that of supplementing the supply of the Agra Canal, can Sir Bradford Leslie be said to have been right; but the cost of obtaining this additional supply for the Agra Canal rendered the scheme for this purpose alone out of the question; and, briefly, it may be said that the committee's report showed the lake project to be unsound from engineering and economical and sanitary points of view."

It may be well to point out, in view of the sentimental or physiological character of the motives leading to the choice of Delhi as the new capital of India, that the north site is associated with the events of 1857, and the Memorial on the Ridge, Metcalf's house, and other historical sites and structures would be frequently before the eyes of the inhabitants of a city built on that site. "It has the beautiful Kudsia Gardens and other amenities of the present civil station, and it is Delhi, real Delhi, the spot that visitors from all parts of the world come to see for the sake of all it means. It is not, like the southern site, a mere geographical site, empty and barren of all historic interest." The committee had considered these things, but the available area of good building

ground on the northern site is only some 5 square miles in extent, and although this would seem sufficient for a population of 57,000, the estimate of the Government of India, the greater freedom in planning and the unlimited space available for future developments may perhaps be held to justify the selection of the southern site, apart from the definite instruction that an area of 10 square miles was to be allotted for the capital.

COST.

As regards the probable cost of the works, this has been estimated at £4,000,000, but our contemporary is of the opinion that even if railway works are charged to railway capital account, and hydraulic works to irrigation account, the cost will be far greater, "and is much more likely to amount to £12,000,000."



MIDDLESEX GUILDHALL: FRIEZE OVER MAIN ENTRANCE.

article in a recent issue of our contemporary *Indian Engineering*.

Articles on matters of administration policy which appear from time to time in the columns of that journal are usually written with so full a knowledge of the facts and so competent a grasp of local and general conditions in India that they may be regarded as expressing the best and most unbiassed opinions available to the general public. The article to which we now refer reviews the matter of the three Blue-books on the subject of the selection of a site for the new Imperial capital which have been published. The first report of Messrs. Brodie and Lutyens and Captain Swinton relates to their preliminary investigations in April and May, 1912, when they inspected all the possible sites and considered their advantages and disadvantages. Taking into consideration the

SEATTLE'S BOULEVARDS, PARKS, AND WATER SUPPLY.

Seattle is from many aspects a beautiful city, and makes a special appeal to the visitor, even though he may have travelled far and wide (says the *Times* "Pacific Coast Number"). The city has 178 miles of paved streets, 121 miles of planked streets, and 617 miles of graded streets. The work of street improvement is carried on unremittingly. In the business districts and on streets subject to heavier forms of traffic the paving is of vitrified brick and stone block, extending from which, as traffic conditions warrant, are miles of smooth asphalt road, heavily based and maintained in a high degree of excellence.

boulevards. In addition to the 30 miles of completed driveways there are 20 miles more in the possession of the city waiting for improvement.

The boulevards, always winding, follow along the shores of the lake, through virgin forests of cedar and fir, with a dense undergrowth, making the air moist and cool; they traverse attractive residential districts, and climb the hills on an easy and winding grade, revealing the panorama of valleys, mountains, and lakes, and the far extending waters of Puget Sound. On all sides the mountain ranges stand against the sky, with Mount Rainier and other great peaks rising above the general level. Apart from the boulevards the automobilist will find many good roads, especially along the Pacific highway, which will ultimately connect Seattle with Spokane, San Francisco, Los Angeles, and other Southern cities.

The city is claimed to be one of the best lighted in the United States.

A supply of Cedar River water, soft and pure, drawn from a glacier source 20 miles distant, is owned by the city. The plant has a daily capacity of 65,000,000 gallons, while the reservoirs and stand-pipes have a total capacity of 272,000,000 gallons. The average daily consumption is 35,000,000 gallons.

Seattle may well be proud of its remarkably low death-rate, which, according to the last Census was 8.53 per 1,000.

TOWN PLANNING SCHEMES.

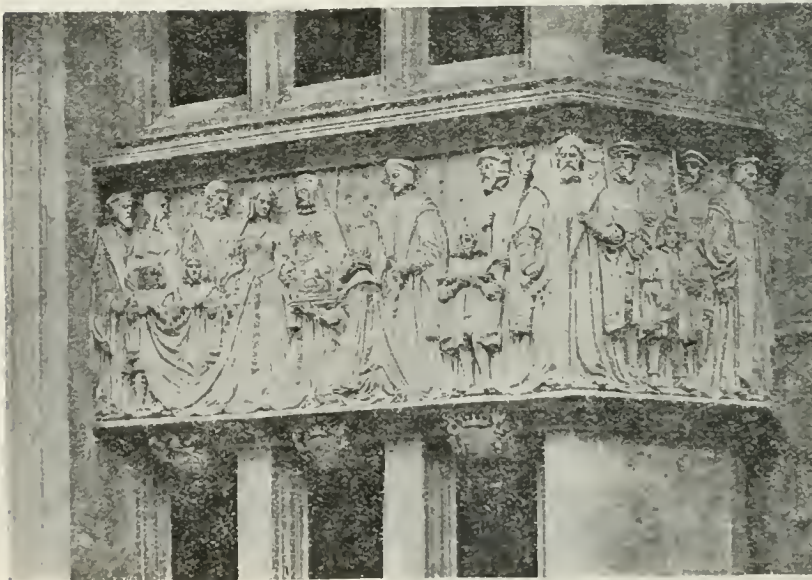
INCLUSION OF DEVELOPED LAND NOT FAVOURED.

As a result of an informal interview the Maldens and Coombe Urban District Council's clerk, Mr. J. W. Johnson, and the surveyor, Mr. R. H. Jeffes, have had with the Local Government Board, these officials have informed the urban council that the local town-planning scheme in its present form is not at all likely to receive the board's sanction. Recent town-planning schemes which have been before the Local Government Board have thrown a good deal of light upon the policy of the board in this matter, and it is now clear that they do not approve of schemes which cover more than the undeveloped land in the district, except under very special circumstances. Every case is, of course, decided on its own merits, but the clerk reported that, in determining what grounds they would accept as valid for considering that land was likely to be used for building purposes, it would be found that the board would lean towards a wide rather than a strict and narrow interpretation of the Town Planning Act. An important point bearing on the inclusion or exclusion of lands had arisen, and had been fully considered by the Town Planning Committee, and it was common knowledge that if the board were not ultimately satisfied that the reasons for inclusion were well founded, they would, in authorising the preparation of the council's scheme, exclude those parts of the district which were already developed, in which case all the trouble and expense previously incurred in connection with the service of notices would be wasted. Another point to be borne in mind was that the local authority would only be able to prepare a scheme dealing with the exact area of land embraced in the authorisation of the Local Government Board.

As a result of the report the whole question has been referred back to the Town Planning Committee.



'The "Magna Charta,"



Lady Jane Grey accepting the Crown.

MIDDLESEX GUILDHALL: FRIEZES AT SIDES OF MAIN ENTRANCE.

Throughout the city, in many of the residential districts, the asphalted thoroughfares at frequent intervals are connected with the macadamised roadways of the city's many parks.

The boulevards of Seattle are one of the distinctive features of the park system of the city. In the last seven years the city has expended £1,000,000 in parks, boulevards, and playfields, and as a result has better equipped play facilities for children and the general public than any other municipality west of Chicago, and has one of the most interesting and beautiful systems of boulevards to be seen anywhere in the entire country. Seattle, resting on her many hills, and spreading out between Elliot Bay and Lake Washington in the shape of a sheaf of grain, offers wonderful scenic possibilities in the laying-out of her

Road Signs.

By ARTHUR E. COLLINS, M.INST.C.E., City Engineer of Norwich.

It is agreed our usual arrangement of road signs is not satisfactory. In this country we have no system of marking routes so that a traveller, by noting, say, the mileposts, can satisfy himself he is continuing to travel on the route he desires. Our direction posts and plates are inefficient and inconvenient for many reasons, among these being:—

(1) Plates generally are too small to enable the instructions thereon to be written sufficiently large for reading at, say, 40 yds.

(2) Two or more plates on a post are fixed usually in one plane, and one plate often hides another, so that from some positions of approach reading is impossible.

(3) Plates are placed parallel with the roads they indicate. At acute angles they can only be read when



ROAD SIGN ON ST. CATHERINE'S PLAIN, NORWICH.

abreast. The chances of going right or wrong in such cases are even, which, of course, is absurd.

(4) Place names appear on plates which are not systematically repeated until the place, or the junction road thereto, is reached.

(5) Distances are not systematically stated.

(6) Signs to indicate peculiarities of route immediately ahead are rarely provided by the highway authorities.

(7) Lighting at night of direction posts and road signs is extremely unusual.

The writer is of opinion that the central authority (the Road Board) should decide which are the main routes of the country. Each of those routes should be provided with mileposts, each bearing, among other things, a distinctive route number. The direction posts and plates of that route should bear a similar number, and at junctions of such routes, or where two or more follow a section of route in common, the route number of each should appear.

HOW BEST TO INDICATE DIRECTION.

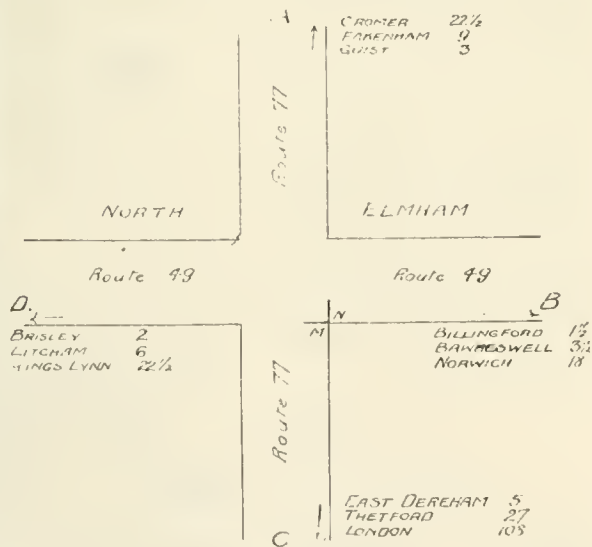
The best form of direction is a plan, and very effective and convenient road direction plates may consist of what is in effect a sort of plan as hereafter described.

It is evident the plate cannot be placed horizontally, but must be vertical to enable it to be read by approaching travellers. A traveller reading a route plan usually does so with the part of the plan indicating the area he is approaching uppermost, in which position the line on the plan indicating his line of approach runs upward, and the lines indicating the other routes are inclined at varying angles left and right on the plan, similar to the roads themselves.

The writer proposes that the plates at each junction shall repeat as far as necessary the indications of the route plan thereat in the following manner: Approximately facing each line of approach to a junction there should be a vertical plate on which is inscribed an arrow for each road leading from the junction, the arrows making similar angles with each other to those made by the roads, and to that extent repeating the plan. The road by which a plate is approached is indicated, when necessary, by an arrow pointing vertically downward, and the continuation of this road in a straight line through the junction by an arrow pointing vertically upward, the other roads right and left being indicated by arrows pointing right and left at the proper angles.

The place names, with distances and the route number or numbers of a road would be grouped abreast the arrow relating to that road. On each signpost the name of the county and place in which it is situated should be stated.

The author is fully aware that this system involves the use of much larger direction signs than are now usual; but, at the same time, he thinks the increased safety and convenience arising from them would fully justify their use. These signs form such a departure from what is now usual, that their significance would require explaining, but the essentially simple basis of the proposal could be grasped by any ordinary person in a few minutes, after which the full advantages in safety and time saving would always be realisable.



TYPICAL CASE (D).

In 1910 the author made an experimental installation of this system to guide strangers through a very awkward bit of navigation in Norwich. His experience of the public use of this has been such that in future he would endeavour to carry out his system in its entirety.

The lettering of these plates is in Egyptian block letters, black on white. They are 3 3/4 in. high, and just legible to the writer—who has normal vision—at 50 yds., and easily so at 40 yds.

TYPICAL CASES.

With reference to the typical cases of the recent Road Conference Competition, the arrangement of plates the author would adopt to suit typical case (1) would be as follows:—

The face of plate M facing A would be:—

NORTH ELMHAM, NORFOLK.			
East Dereham	5	↑	Route 77
Thetford	27		
Brisley	2	→	Route 49
Litcham	6		
King's Lynn	22½		
←	Route 49	(	Billingsford 1½ Bawdswell 3½ Norwich 18

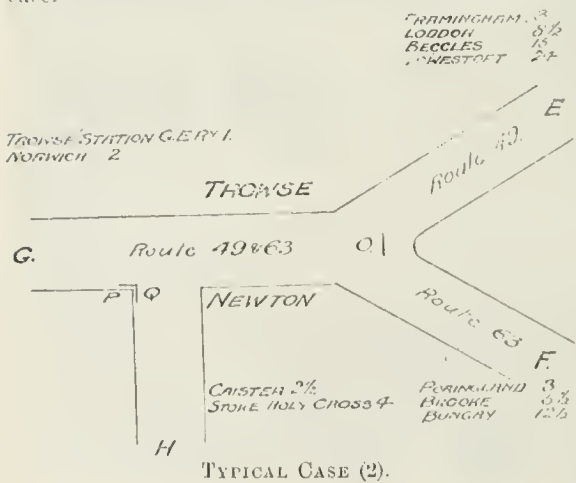
The reverse plate M facing C would be:—

NORTH ELMHAM, NORFOLK.			
Güst	3	↑	Route 77
Fakenham	9		
Cromer	22½		
Billingsford	1½	→	Route 49
Litcham	6		
Brisley	2		
←	Route 49	(	King's Lynn 22½ Litcham 6 Brisley 2

The other plate would be arranged on the same principle.

If the plates projected over paths as shown in diagram plan, plate M would be attached to the support with its bottom edge level with the top edge of plate N, in which relative positions one plate would not hide the other.

At a crossing or junction of this description there is no necessity for the place names of the road from which approach is being made to the plate to be shown on the face of approach. Whether the plates project over the footpaths or the hedges or are fastened to walls will depend on the local circumstances of each case.



TYPICAL CASE (2).

The face of plate O facing E would be:—

TROWSE NEWTON, NORFOLK.			
Trowse Station (G.E.R.)	1	↑	Route 49
Norwich	2		
Caister	2½		
Stoke Holy Cross	4		
Framingham	3	↓	Route 49
Loddon	8½		
Beccles	15		
Lowestoft	24		
↙	Route 63	(Poringland 3 Brooke 5½ Bungay 12½

The face of O facing G would be:—

TROWSE NEWTON, NORFOLK.			
Poringland	3	↗	Route 63
Brooke	5½		
Bungay	12½		
Route 49	↖	(	Framingham 3 Loddon 8½ Beccles 15 Lowestoft 24

The face of plate P facing H would be:—

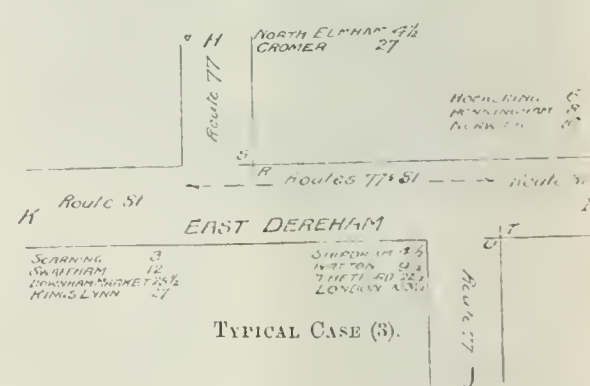
TROWSE NEWTON, NORFOLK.			
Beccles, &c.	}	→	Route 49 Route 63
Bungay, &c.			
←	Route 49	(	Trowse Station (G.E.R.) 1 Norwich 2

The face of plate Q facing G would be:—

TROWSE NEWTON, NORFOLK.			
Caister	2½	→	
Stoke Holy Cross	4		

That facing E and F would be:—

TROWSE NEWTON, NORFOLK.			
←	(	Caister 2½ Stoke Holy Cross 4	



TYPICAL CASE (3).

The face of plate S facing H would be:—

EAST DEREHAM, NORFOLK.			
Scarning	3	→	Route 81
Swaffham	12		
Downham Market	25½		
King's Lynn	27		
↙	Route 77	(	Shipdham 4½ Watton 9½ Thetford 22½ London 108½
←	Route 81	(	Hockering 6 Honningham 8 Norwich 16

The reverse of this plate would be blank.

The face of plate R facing K would be:—

EAST DEREHAM, NORFOLK.			
Hockering	6	}	Route 81
Honningham	8		
Norwich	16		
Shipdham	4½	}	Route 77
Watton	9½		
Thetford	22½		
London	103½		
← Route 77		North Elmham	4½
		Cromer	27

The face of plate R facing I would be:—

EAST DEREHAM, NORFOLK.			
Scarning	3	}	Route 81
Swallham	12		
Downham Market	25½		
King's Lynn	27		
North Elmham	4½	}	Route 77
Cromer	27		

The other two plates would be arranged on a similar basis.

As the result of many years' experience of painted wood, earthenware, enamelled iron, cut stone and painted cast-iron plates (the latter with raised or pierced letters), the author is of opinion the first and the last named are, taking them all round, more convenient than the others, the cast-iron plate with raised letters being the best for general use.

Lowest first cost with reasonable durability can be obtained by providing plain wood boards on wood posts, the latter creosoted or treated with carbolineum. To the boards would be nailed or screwed the requisite cast-iron words or letters and signs, which should have a minimum thickness of 5/8 in. Letters of place names should not be less than 3 3/4 in. high. Well-proportioned letters of this height are easily legible at 40 yds. distance. The letters for the name of place in which the sign is situated, and county, need not exceed 2 in. in height. The boards, letters and signs should be painted with two coats of genuine red lead in linseed oil, and three coats of Mander's white rubber paint, and the tops of the letters and signs painted with black paint. The name of locality in which the directing plate is situated, and of the county, should in all cases be cast as complete plates to save cost. Place names oft repeated should in all cases be so cast—i.e., separate letters should be avoided in words oft repeated.

Painting such as mentioned will last in exposed positions seven years before the necessity for repainting arises. It can be done by a handy labourer.

Generally, in towns the lighting of direction plates ought to be a part of the street lighting. This the author has done as opportunities have arisen. He finds direct lighting perfectly efficient and simple, and sees no reason for incurring the greater capital and maintenance costs of transparent signs with contained lights.

The author's aim in designing the system of road signs described is to enable any of them to be read while approaching them. Each required direction is arranged directly to face the traveller, and the common experience of attempting to read a sign the end of which alone is visible is obviated.

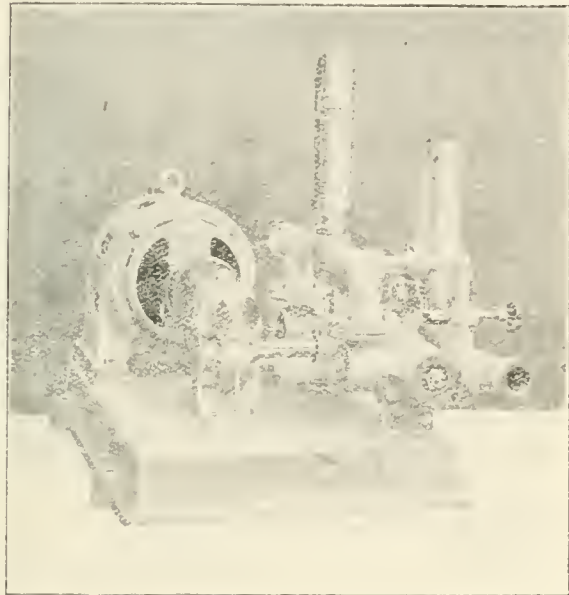
Before adopting the scheme he has outlined, the author considered the advisability of placing direction posts in advance of the road junctions, but abandoned this idea because it would too much facilitate fast driving at junctions to the danger of road users.

Street Mirrors.—Woking Urban District Council are experimenting in the use of mirrors at sharp and dangerous corners.

A MERRYWEATHER PUMP.

A very serviceable little pump, known as the "Ravensbourne," has recently been introduced by Messrs. Merryweather & Sons, of Greenwich. It is made in sizes ranging from 500 to 4,000 gallons capacity per hour, and can be driven by electric, petrol, oil, gas, steam or other available power. It is claimed to be the "best pump for small horse-powers," and is being extensively adopted in cases where light pumping machinery is in demand.

The illustration shows a compact little electric pumping set of this design, which has recently been fitted up at Pyrford Court, Woking (the seat of the Hon. Rupert Guinness), for garage water supply. The pump is of the double-barrel reciprocating type, con-



THE RAVENSBOURNE PUMP.

structed of gunmetal, with copper air vessels, and is capable of delivering 500 gallons per hour against a head of 100 ft. It is driven by an electric motor running at a speed of 960 revolutions per minute, and developing 1-h.p., the current being taken from the existing electric light installation.

The pump draws its supply from a rain-water tank, and delivers through a wrought-iron pipe into a tank placed on the roof of the garage. The roof tank is fitted with an outlet pipe to a tap close to the yard level, to supply water for cleaning operations—such as the washing down of cars. A branch is also taken from the delivery pipe at a point between the pump and the roof tank. The branch serves a small hydrant in the yard, from which the full pressure from the pump can be obtained for fire-extinguishing purposes. The roof tank is fitted with an alarm indicator, with float and electric bell, which rings automatically when the tank is full.

DRESSING OIL FOR LEATHER.

Mr. H. G. Keywood, whom many of our readers know as an old municipal engineer, has just placed on the market a dressing oil for leather which he has registered under the trade mark "Mesa." It is claimed for "Mesa" that it preserves and water-proofs leather, and is exceptionally valuable as a dressing for driving belts. One who has applied it to his footwear says it makes boots as soft as velvet, the leather absorbing all the oil and no residue whatever being left on the boots. Municipal golfers might make a trial of the oil in this way in order to gain an idea of its value when applied to harness and other leather goods. "Mesa," we understand, is already used by numerous councils, including Leeds, Leicester and Rotherham Corporations.

Mr. Keywood, who is in business as the Municipal Engineers' Supply Agency, at 40 Royal Exchange Chambers, Leeds, will be glad to send a sample of "Mesa" to any municipal engineer.

A New Type of Electrically Operated Automatic Apparatus for Contact Beds.

The new sewage disposal works at Harpenden include twelve of Dibdin's slate beds, arranged in four groups of three beds each, and the filling and emptying of the beds is worked electrically, making the whole cycle of operations automatic. The sewage enters the three beds in one group until it reaches some predetermined level, at which an electric contact is made which closes the inlet valves through which the sewage has been entering the beds, and at the same moment opens the valves in the next group and allows these to fill. At the same time a clock-work movement is started, which, at the end of about two hours, by means of an electrical contact, opens the outlet valves and allows the sewage to leave the

mechanism. The weights *W* (Fig. 3) begin to fall immediately, and after a few moments the inlet switch *H*₁ (Fig. 1) is closed, which closes the inlet valves of group No. 2 and opens the inlet valves of group No. 3. The timing mechanism continues working during the interval in which the tanks remain full, and when this interval is ended the outlet switch *K*₁ (Fig. 1) is closed, which opens the outlet valves of group No. 2 and closes the outlet valves of group No. 1. The sewage level falling in the tanks of group No. 2 will cause the float *F* (Fig. 3) to fall, and lower the rod *R* (Fig. 3), thus stopping the timing mechanism, and the further falling of the float will raise the weight *W* (Fig. 3) to its original position. When the

DIAGRAM OF WIRING.

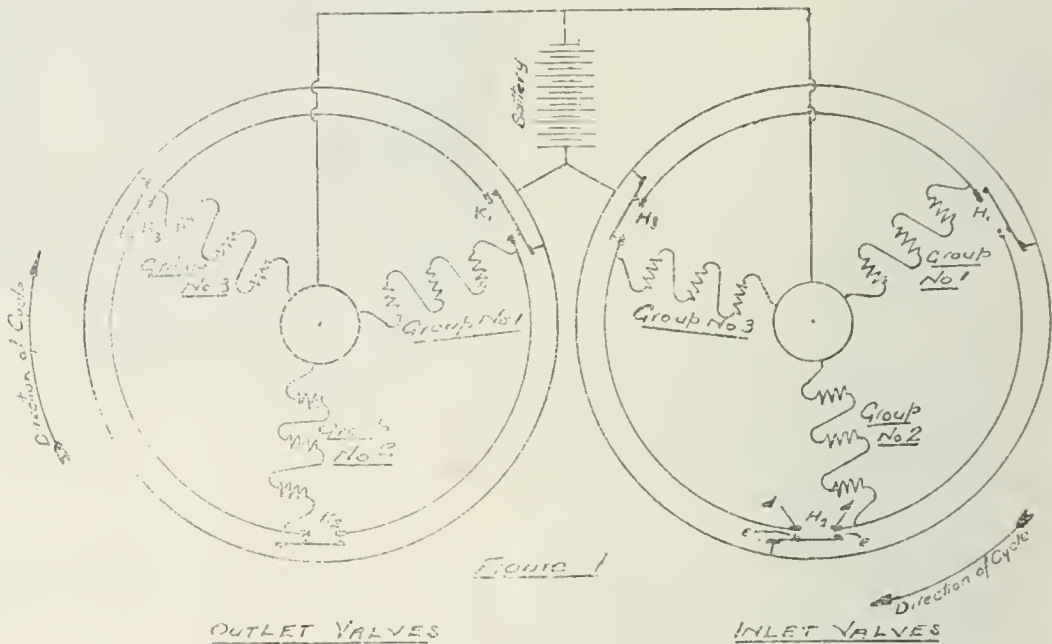


FIGURE 1

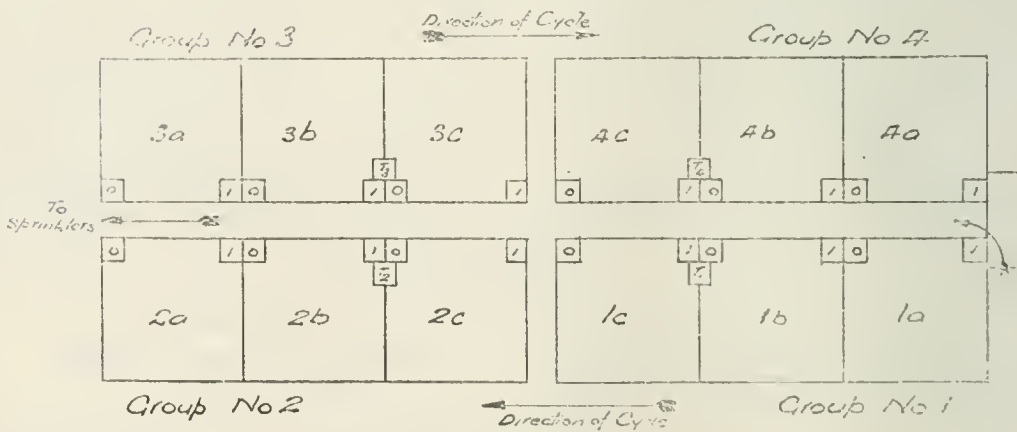


FIGURE 2

slate beds and flow to the spreaders. The subsequent treatment is similar to that at other sewage works.

The following is a detailed description of the mode of operation, illustrated by the explanatory diagrams.

The switches *H*₁ and *K*₁ (Fig. 1) are situated in and worked by the timing mechanisms, and are arranged so that if one of them is closed, say *H*₁ (i.e., the contact pieces *cc* and *dd* (Fig. 1) are pressed together), the electric current will flow through the inlet valves of groups 2 and 3, and operate them. Similarly, when *H*₂ is closed, the inlet valves of groups 3 and 1 will be operated.

Order of Operation of Valves. Assume the tanks of No. 2 group are filling, the sewage, in rising in the timing chamber *T*₁, lifts the float (Fig. 3), and raises the rod *R* (Fig. 3), which starts the timing

inlet switches *H*₁ (Fig. 1) close, the inlet valves close if their floats are immersed, and open if their floats are not immersed. Also when the outlet switches *K*₁ (Fig. 1) close, the outlet valves open if their floats are immersed, and close if their floats are not immersed.

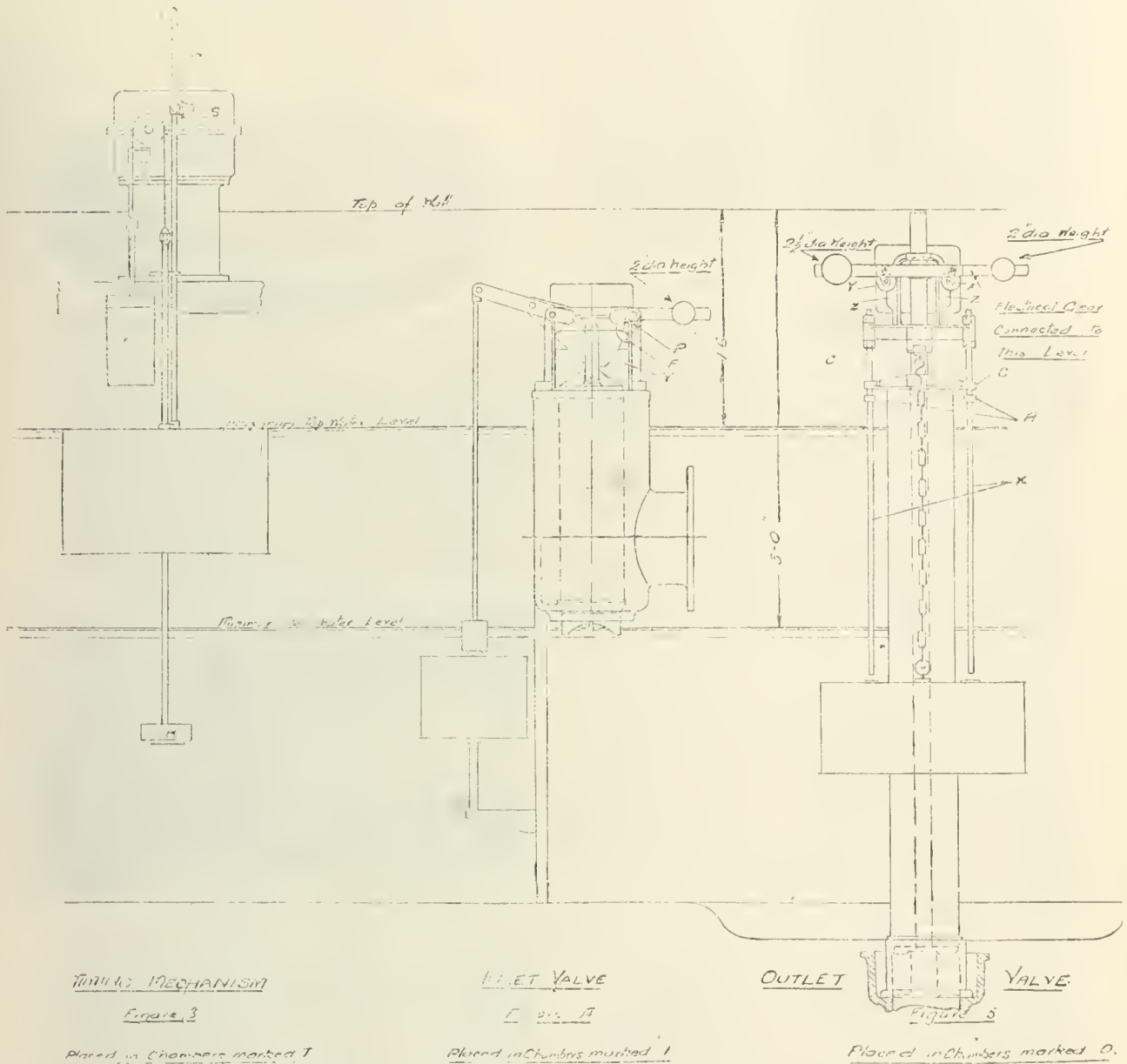
Timing of Interval during which Tanks remain Full.—The timing can be regulated by altering the weights *W* (Fig. 3). To shorten the interval increase the number of weights. To lengthen the interval remove weights.

Inlet Valves (Fig. 1).—When the tank is full the float will be pressing upwards and tending to close the valve, which will be prevented by the roller *F* being in the lower slot of the cam *V*. When contact is made, in the timing mechanism of its own group of tanks, the roller *F* will be freed,

and the valve will close. When the valve is quite closed the roller F will fall into the upper slot of the cam and prevent any further movement until the electrical current again flows. When the tank is empty the float tends to fall, but is prevented by the roller F, so directly contact is made again,

should it be desirable to clean out the two tanks at the same time. When cleaning out either of the tanks *b* or *c* the penstock connecting it to the timing chamber should be closed also.

To Operate Valves by Hand.—If it is desired to operate valves by hand, remove plug which screws in



which occurs simultaneously with the closing of the inlet valves in the previous group, the valve will open.

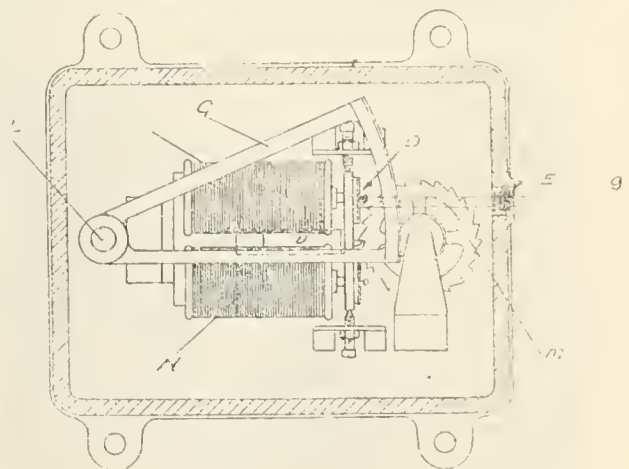
Outlet Valve (Fig. 5).—When the tank is full the float will be pressing against the rods *x*, and will be prevented from rising by the rollers *F* and *Y* pressing in the top slots of the cams *ZZ*. When contact is made, in the timing mechanism of its own group, the roller *F* will be freed, the cams rise and push aside the rollers, and the stops *AA* come into contact with the arms *CC* and open the valve. When the valve is fully open the rollers fall into the lower slots of the cams, preventing the valve closing until the electric current again flows. When the tank is empty the whole weight of the valve is taken by the rollers, so directly contact is made again, which occurs simultaneously with the opening of the outlet valves of the next group, the valve will close.

Depth of Sewage in the Tanks.—This can be regulated by the position of the rod *R* (Fig. 3), which can be adjusted to any desired height by means of the screw *S* (Fig. 3).

Cutting Valves Out of Action for Cleaning Tanks. When it is desired to clean out any tank the inlet valve can be prevented from opening by inserting the pin *P* (Fig. 4). It is important that the inlet valves in tanks *b* and *c* in any one group are not cut out together, as the sewage must always be able to enter the timing chamber *T* from one side or the other. The valve in tank *a*, however, may be cut out at the same time as either of those in tanks *b* or *c*,

hole *E* (Fig. 6), and by means of a thin rod press back the armature *D* (Fig. 6).

Electrical Gear on Inlet and Outlet Valves.—The



ELECTRICAL GEAR

Figure 6

arm carrying the roller *F* (Figs. 4 and 5) and the sector *G* (Fig. 6) are both rigidly attached to the spindle *L* (Fig. 6). From Fig. 6 it will be seen that

the sector G is free to move downwards when the armature D (Fig. 6) is attracted by the electro-magnets N (Fig. 6), which occurs when contact is made in the timing mechanism. When the sector G is released it allows the roller F (Figs. 4 and 5) to move outwards and the valve to operate. When the contact is broken the spring U (Fig. 6) pushes the armature D back into mesh with M (Fig. 6).

An interesting addition to the gear consists of an indicator which is placed in the offices. This performs the double duty of showing at any moment which series of beds is being filled and which emptied, and also automatically registering the number of times the beds have been filled and emptied, thus measuring and recording the quantity of sewage treated. The indicator is operated electrically every time any of the valves are open or closed.

This apparatus is manufactured by the well-known firm Messrs. George Kent, Limited, of London and Luton.

A CANADIAN "L. G. B."

The suggestion has been made that some central authority, like the English Local Government Board, should be formed in Canada, in order that "municipal borrowings could be sifted for the satisfaction of lenders." It is argued that some such authority, which would control municipal borrowings and supply information concerning securities offered, is much needed; indeed, that some such organisation is essential to the maintenance of high municipal credit. It is felt here, in England, that the adoption of the suggestion could work only for good, and would do much to strengthen the advances made to the Canadian municipalities. The exercise of borrowing powers in England is regulated by the Public Health Act, 1875, and the regulations for the guidance of the board are of a stringency which might not meet with favour in Canada.

As to the personnel of the English board, this is composed almost entirely of ex-army engineer officers, whose knowledge of the requirements of a town is only too often of the vaguest.* Military men are seldom a success in civilian affairs, and an officer whose life has been spent in, say, the construction of bridges in India is scarcely the man to serve as a final court of appeal in a town's requirements. There has been one notable exception in these appointments, but that official—an experienced municipal engineer—is now superannuated, and none has taken his place. If Canada decides to appoint a board of her own, she would be well advised to be chary of introducing the military element. An engineering inspectorship is no sinecure, and only the best and most experienced men should hold a position of such national importance. A staff of men who are at least open to the suspicion of having failed at their own legitimate calling—else why the necessity for their retirement for civic offices?—cannot but prove a clog upon municipal enterprise, as the English municipalities have found to their sorrow on scores of occasions.—From an article in the *Contract Record* of Toronto by the London correspondent of that journal.

Municipal Engineering (Edited by Sydney G. Turner, ASSOC. M. INST. C. E. Price 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.).—This volume consists of model answers to questions set at recent examinations of the Institution of Municipal and County Engineers, and is the second edition. It is practically identical with the first issued. It is not suggested that it should take the place of recognised text-books, but it provides useful summaries of various subjects, as well as indications as to how different types of questions may be answered. Every effort has been made to render the answers as accurate and comprehensive as possible, though they contain more than a candidate would be expected to supply. The answers are founded upon examinations held in Birmingham, London and Manchester. The appendix contains examples of questions on sewerage, sewage disposal, tramway construction, bridges, water supply, road construction, buildings, sanitary science as applied to towns and buildings, drainage, and other matters.—*Local Government Journal*.

* This statement is not now accurate, as out of some twenty inspectors only two are ex-army officers.—ED. SURVEYOR.

PORTABLE RAILWAY PLANT.

In the extension of water undertakings and the carrying out of excavation work, portable railway plant will always be required, and Catalogue No. 78, issued by Messrs. R. Dolberg, 119-125 Finsbury-pavement, E.C., offers many suggestions to the engineer or surveyor.

The portable track, with steel sleepers, shown in the accompanying illustrations is a type much favoured, as the mounting of the rails is done quickly

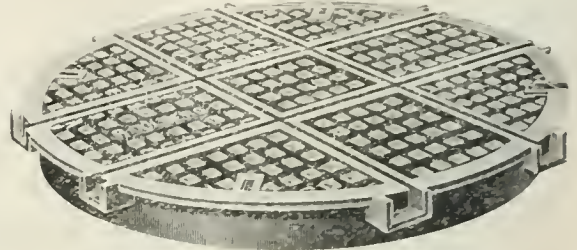
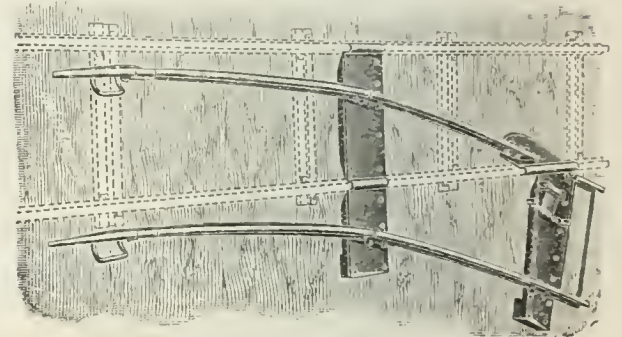


Fig L.2005

DOLBERG'S TURNTABLE FOR PORTABLE RAILWAYS.

and the loose parts are but few. The turntable depicted has been found by those who use Dolberg's portable railways to work with the greatest success; the track, being flush with the top, offers no hindrance to the ordinary traffic.

When the track has to be shifted about a good deal, or the making of temporary branch lines is advisable, a climbing switch, as shown in the illustration, will be found very convenient indeed. No tearing up



CLIMBING SWITCH.

of the track is necessary. The switch is simply put on top of the main line, while the point rails rest on the next frame of the branch line. Dolberg's special pamphlet gives full particulars regarding this climbing switch.

The tipping wagon that is in so many instances used is well known to the surveyor and engineer; but the box all-round tipping wagon will be of interest to many readers. It is a very handy type of wagon, low

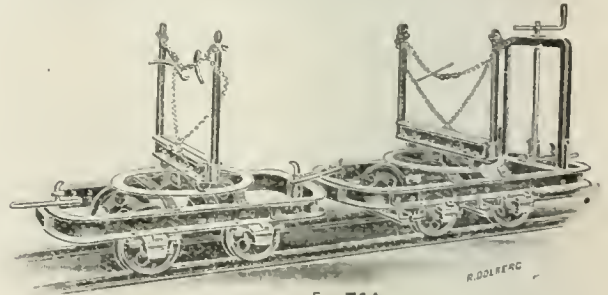


Fig. 744

TYPE OF TIMBER TRUCK.

and narrow, and can be used for practically any and every kind of work.

Lastly, we draw the attention of our readers to the illustration of a timber truck, which should be of special interest to surveyors in whose districts clearances of wooded country have to be undertaken.

Many other useful types of wagons are shown in Messrs. Dolberg's catalogue, copies of which will, we are asked to state, gladly be sent on application.

CHANGE OF TELEPHONE NUMBER.—Readers are requested to note that "The Surveyor" telephone number is now City 1046.

Works Projected by Local Authorities for 1914.

As will be observed from the returns given herewith, projected works for 1914 cover a wide field. Almost every form of municipal enterprise is dealt with, and it is noteworthy that many of the smaller municipal and urban areas, in particular some of the seaside resorts, are promoting schemes of considerable magnitude, involving a large outlay of public money. An outstanding feature is the increasing interest manifested by local authorities in the questions of housing and town planning. In this respect the record is one of distinct improvement and marked progress. The operations of the Road Board have contributed to a vast increase in the

work of road reconstruction in every part of the country, and from the details given in the following pages it will be seen that in addition to various large schemes which are now in course of fulfilment, the projected works include many new schemes of highway improvement. In once more submitting to our readers this interesting section of our Special Annual Issue, we desire to express our gratitude to correspondents who have so promptly, and with such welcome fulness of detail, co-operated in its compilation. The facts given are in every instance official, and they form in the bulk a supremely important and comprehensive record of municipal activities.

Abersychan (Mr. EDWARD WHITWELL, engineer and surveyor to the urban district council).—The council have decided on the erection of a refuse destructor with mechanical feed, tenders having already been obtained. Further houses are to be erected under the Housing of the Working Classes Act, to increase the number from 136 to 300. Three important main road improvements will also be taken in hand, involving the erection of three new bridges. A large number of private streets are to be made up under the Act of 1892. A site has been acquired for a new swimming bath to be erected in the South Ward, while a further bath is to be erected in the North Ward. Other works projected include a public park, about 1 mile of new sewers, conversion of the main roads with ordinary surfaces to tar-macadam, and the tar-spraying of an additional number of roads, with the purchase of a tar-spraying machine for the latter purpose. The council have instructed their surveyor to deal with the question of town planning, and have passed a resolution to include the whole district.



Accrington (Mr. WM. J. NEWTON, ASSOC. M. INST. C. E., borough engineer and surveyor, and engineer to the Accrington and Church Outfall Sewerage Board).—The principal works to be carried out during the year are as follows: Extensions to tramway depot to accommodate an additional thirty cars; enlargement of electricity works to provide for three 1,000-h.p. gas engines, with the necessary gas plant; the provision of a weaving shed at the technical school; the laying out of a new park presented to the town by Mr. Tom Bullough, to be called the James Bullough Park; public street improvements, private street improvements, and the completion of large extensions to the sewage works, which have been in progress during the past three years. These works are in addition to the ordinary work of the municipality.

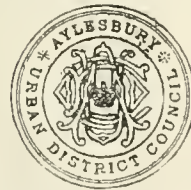
Alsager (Mr. H. V. LYNAM, surveyor and inspector of nuisances to the urban district council).—The new sewage scheme will be completed early in the present year, and an official opening will take place. The water scheme is well in hand, and the work of boring is now almost completed. The building work, both for reservoir and pumping station, and the main-laying is to commence at once. Extra work is to be carried out on the by-road repairs owing to the heavy strain caused by motor haulage to the above schemes, and the council have under their consideration the question of tar-spraying the road surfaces, and the re-making of footpaths with tarred slag, in addition to the widening of several dangerous corners and narrow lengths of roadway.

Alton (Mr. G. BERTRAM HARTFREE, F.S.I., surveyor to the urban district council).—The projected works for 1914 include the completion of works for purposes of elimination of spring and surface water from the soil sewers, including cast-iron culvert, 30 in. in diameter, and 18-in. reinforced concrete pipes, increased bacteria beds at sewage disposal works, water-works extensions, road widening, and several private street improvements. The question of working-class housing is to be dealt with early in the new year.

Ardley (Mr. J. MORLEY, engineer and surveyor to the urban district council).—A public mortuary has been provided, and a complete tar-macadam plant in-

stalled at the depot, which has proved a great success. The projected works for 1914 are the completion of the cemetery extension, construction of the Wombwell-road sewage works, provision for dealing with the storm water and reconstruction of filter beds at Brodilly sewage works, widening and straightening of Wombwell-road at a probable cost of £5,000, tar-spraying additional lengths of the roads, and further work in strengthening the foundations of the roads.

Atherstone (Mr. H. J. COLEBY, engineer and surveyor to the rural district council).—The principal work carried out during the past year has been the sinking of a 20-in. diameter borehole for augmenting the existing water supplies of the district. This proved to be very successful, and a copious supply of water is now available. Extensions have also been made to sewer and water mains in various parts of the district and in the town of Atherstone. As a first instalment of a housing scheme ten cottages have been erected. During the present year it is proposed to proceed with the erection of about forty cottages in order to relieve the congested areas in Atherstone. Small schemes are in hand for sewerage and sewage disposal in three parishes, and a scheme for supplying water to the whole district from the new boring is now being prepared. This will comprise engine-house, engines and pumps, about 7 miles of mains, two service reservoirs, and other works. In addition to the foregoing, special attention will be given to the repair of the highways, and for this purpose a new steam roller has been purchased.



Aylesbury (Mr. HAROLD TAYLOR, engineer and surveyor to the urban district council).—During the past year three bacteria beds at the sewage works have been washed, involving the cleansing of over 1,400 cub. yds. of media. Extensions to the isolation hospital and the town hall have also been carried out. During the ensuing year, in addition to the ordinary work of road and sewer maintenance, the following is contemplated—viz., Extension to Wendover-road, Stoke-road, and Mandeville-road sewers; extension to cemetery; reconstruction of screening chamber, and the cleansing of three bacteria beds at the sewage works.

Barnes (Mr. G. BRUCE TOMES, ASSOC. M. INST. C. E., engineer and surveyor to the urban district council).—The actual work of widening the High-street, Barnes, will probably be commenced, a clearance of the sites of the properties acquired for the improvement being followed by the partial reconstruction of the carriage-way and footpaths. Widening and improvements of portions of the Upper Richmond-road, Upper Sheen-lane and Lonsdale-road will also be effected, and it is hoped that Priest Bridge, carrying the main road to London over the Beverley Brook, will be rebuilt by the Surrey County Council. The buildings at the refuse destructor for the new slab-making plant, and a new cottage for the Barnes Common keeper, were to be commenced early in the year. The question of a suitable site for the proposed public baths and hall will have further consideration, and when the land has been acquired, building will be commenced. The council has approved a scheme for an additional number of workmen's dwellings to be erected at Rosemary-lane, and it is anticipated that the scheme for a ward

block and dispensary for the tuberculosis sanatorium at the council's hospital will shortly be settled in conjunction with the county authorities. A bowling green and some tennis courts with a pavilion will be laid out at Sheen Common, and the Local Government Board will be asked to authorise the preparation of a scheme under the Town Planning Act, which will embrace nearly the whole of the available land in the district.

Barnoldswick (Mr. W. ELLIS, engineer and surveyor to the urban district council). The past year has been one of considerable activity, particularly in respect to building operations, some 130 to 140 houses having been built. Plans have been approved by the council for an additional 150 houses, which will be erected in the near future. A new weaving shed, to accommodate 2,000 looms, has been commenced, and a further similar shed is contemplated during the coming year; consequently, the present flourishing state of building within the district has every appearance of continuing. There have been three lengths of Roemac-bound road put down, which, considering the abnormally heavy traffic, is a marked improvement upon the ordinary water-bound road, and a comparative length of Glutrin-bound road is at the present time being laid. A trial length of Durax armoured paving was put down in a narrow street, over which a fair proportion of traffic passes, and meets the requirements very well. In addition to the ordinary routine work (no little matter in a rapidly growing town of this description), the department has been responsible for the carrying out of several footpath improvements, the making good of added strips to highways, and the erection of a reinforced-concrete footbridge, 6 ft. wide, over Butt's Beck. Lock woven mesh was the reinforcement adopted. The by-laws relative to new streets and buildings have been revised in accordance with the model clauses, and the Local Government Board's sanction thereto will presently be applied for. Plans are in preparation for the paving and making good (under the Private Street Works Act, 1892) of Bank-street, Smith-street and Lower Rook-street; also the whole of the front and back streets comprising the Dam Head, Croft and Gisburn-street areas. Plans for the widening of a portion of Gisburn-road to a width of 36 ft., and the widening of a portion of Rainhall-road to a width of 40 ft., entailing the erection of retaining walls, and the laying of new footpaths, are in hand, and sanction to a loan for the purpose will be applied for at an early date. It is expected the works will be commenced and completed during 1914. Two alternate schemes for the provision of a new road about 1½ miles in length from Barnoldswick, through Salterforth, joining the main road to Earby, are in progress. It is proposed to acquire land to enable a road, 36 ft. wide, ultimately to be constructed, and this will be of great benefit by establishing easier communication with the neighbouring Lancashire towns. For some time past the annexation of the township of Coates (now in the Skipton Rural District) to Barnoldswick, has been occupying the attention of the council, and it is expected the matter will culminate as desired in the early part of next year. The department has also instructions to prepare the preliminary particulars for a town planning scheme for a part of the district, which will be proceeded with as the opportunity presents itself.



Barnsley (Mr. J. HENRY TAYLOR, M.INST.C.E., borough surveyor and waterworks manager).—The coming year will be rather an eventful one so far as public works and new buildings are concerned. The proposals that are before the corporation of Barnsley at the present time are chiefly as follows: (1) The negotiations with the railway companies for the provision of a joint railway station. At the present time Barnsley is very badly served in the way of railway passenger station accommodation. Barnsley and the district served are rapidly developing into what will be one of the largest boroughs in Yorkshire. This is chiefly due to the development of the coal industry, and although many newly opened-out collieries and projected ones are to the east, in the locality of Doncaster, Barnsley will be the centre, for a considerable number of new pits which are to be opened both on the easterly and the westerly side. These colliery developments mean that Barnsley will not only be, as hitherto, the market town for a large outside population, but will have to provide educational and hospital accommodation for a population approaching 200,000. It is

essential, therefore, that the railway passenger stations should be brought up to date, and with this object in view preliminary plans have been prepared by the borough engineer, and interviews have taken place between the corporation, the Chamber of Commerce, and some of the railway engineers. The matter is still under consideration. (2) The next work of importance projected is that of a new town hall, the estimated cost of which is £20,000. A site has been purchased, or agreed to be purchased, and architects have been invited to send in competitive drawings for this building. A technical school is also spoken of, but not much progress has been made with this scheme. (3) The completion of the system of sewerage by the substitution of stoneware pipe sewers for rubble drains and a further extension of main surface-water drains within the borough will also be in actual progress, it is hoped, in the course of the next three or four months. (4) The corporation have practically agreed to purchase an estate, within 1½ miles of the borough, for the establishment of a tuberculosis hospital, which it is intended shall be large enough for a very considerable population. This is an important and expensive undertaking, and will probably materialise during the next few months. (5) The Road Board have been approached with a view of granting a sum towards the widening of the main roads within the borough, but their reply has not yet been received. (6) The corporation have decided to have a destructor, and the committee who have this matter in hand are now about to report upon the subject with a view to its consummation. (7) The Dearne Valley Light Railway scheme will be presented before Parliament, it is expected, during the coming Session, and the corporation of Barnsley have been invited to assist in the development of this important enterprise, which will involve an expenditure of probably £250,000. The corporation, however, are not participants in this expenditure. The money will be provided, it is anticipated, by the different urban district councils whose districts will be served thereby. (8) The corporation are promoting a Bill in Parliament for the extension of their waterworks, and for the provision of money for the erection of a town hall and other similar works. The total sum for which powers are sought by the Bill will be nearly £70,000. (9) Other works, such as public street improvements, private street works, and improvements to the markets, will also be carried out during the current year. For the information of contractors and others who supply local authorities with materials and labour for the carrying out of public works, it may be mentioned that these works, although in prospect, may not develop for the next few months, so that applications with respect to them should be delayed for some little time.



Barnstaple (Mr. E. Y. SAUNDERS, M.R.S.A.N.I., borough surveyor).—It is the intention of the town council during the coming year to carry out the conversion of a considerable quantity of their existing gravelled paths into tar-asphalt paving. The question of the erection of a new science and art school for the district, in conjunction with the Devon County Council, at an approximate cost of £13,000, is being considered. The old St. Anne's Chapel is to be altered and adapted for the purposes of a museum. Sundry sewer extensions to the outlying portions of the borough will be carried out during the year.



Barrow-in-Furness (Mr. ARTHUR RACE, borough engineer and surveyor).—The elementary schools in the Hindpool district, now in course of construction at a cost of about £8,000, also the fresh and salt water swimming bath in Abbey-road will be completed at a cost of about £16,000. The erection of two new pavilions at Devonshire-road fever hospital will be completed at a cost of £5,350. Plans will be prepared for a new public library in Ramsden-square, estimated to cost £13,500, and also for a new central police station to cost about £15,000; two elementary schools, to cost £22,000, and a secondary school to cost £35,000. A road improvement at the junction of Mill-lane and the Walney Promenade will be carried out at a cost of £3,000; also the widening and improvement of Salthouse-road and Fairfield-lane, at a total cost of £6,035. An area of about 18 acres will be added to Biggar Bank, and a new road constructed across same, at a cost of £3,000. In addition to the usual making up of private streets under the statutory powers, the corporation will lay out new

streets on their Risedale estate, at a cost of £2,300. Further ordinary macadam streets will be reconstructed with tar-macadam, and a large amount of tar-spraying is contemplated. The completion will be effected of several roads in the public park by surfacing with Ravenhall bricks and tar-macadam, and bowling green and tennis courts, including refreshment room and pavilion, will be constructed. A 12-in. relief sewer will be constructed on Barrow Island, at a cost of £800. Street improvements will be made at the junction of Roose-road and Rampside-road, and also at the corner of Holebeck-road. A further length of streets will be planted with trees, and a recreation ground of about 2 acres in extent will be laid out on Barrow Island. It is hoped that further progress will be made toward the realisation of the town planning schemes.

Barry (Mr. J. C. PARDOE, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—Additional accommodation is to be provided at infectious diseases hospital, for which a loan of £5,050 has been applied for. The widening of Park-road and Palmerston-road will be effected at a cost of £3,500, and private street works will be carried out costing £2,000. A tender has been accepted for a manual instruction centre at Cadoxton boys' school, amounting to £400. Two shelters are in course of erection at Whitmore Bay, Barry Island, at a cost of £1,300, and a school clinic building is approaching completion, the accepted tender being £610. The council are considering the question of erection of houses for the working classes, and it is proposed to erect thirty houses, at a cost of £200 each, to commence with. Improvements are taking place in connection with street lighting, the remaining flat-flame burners being replaced by incandescent lighting. An underground convenience for both sexes has just been completed, at a cost of £2,000. A new petrol motor fire engine has been purchased at a cost of £1,100.



Basingstoke (Mr. F. REGINALD PIPPS, ASSOC.M.INST.C.E., borough surveyor and waterworks engineer).

—The chief work during the coming year will be the carrying out of the scheme prepared by the borough engineer for electric lighting. A Local Government Board inquiry has been held for sanction to a loan of £14,000, and provisional contracts have been entered into for the various sections, comprising Diesel engines and dynamos, battery, switchboard and cables. A site is also being acquired for a housing scheme, the lack of houses being acutely felt, and it is expected that about one hundred will be erected. The work of channelling in the town, for which a loan has been obtained, will also be completed during the year.



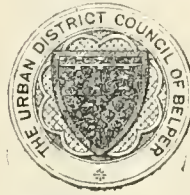
Batley (Mr. OSCAR J. KIRBY, ASSOC.M.INST.C.E., borough engineer).

—It is intended to undertake the following street improvements—viz., Primrose-hill, Ealand-road, Pearl-street, Amberstreet, Trafalgar-street and Cheapside-road. A new elementary boys' school for the Staincliffe district, extensions of the public baths, and further extensions to the sewage outfall works are also to be undertaken.

Bedwas and Machen (Mr. A. S. V. TAYLOR, ASSOC.M.INST.C.E., surveyor to the urban district council).—Road widening and improvements will be carried out during the year. A loan has just been sanctioned, and the work will be in hand early in the year. New council offices, fire station caretaker's house and stores will be commenced as soon as the loan is sanctioned, the inquiry having been held. Works of water supply will be undertaken, including the provision of storage tanks, filters and incidental works, together with extension of mains. A Bill for the lighting of Machen with gas is being promoted in the next Session of Parliament, and it is hoped that the work will be proceeded with at an early date.

Belper (Mr. ROBERT C. CORDON, engineer and surveyor to the rural district council).—During the ensuing year the council, in addition to alteration to several highways by removing dangerous corners and improving gradients, also contemplate the following works: Commencement of the Crich drainage scheme, estimated to cost £10,250; the construction of a bridge

over the river Derwent, estimated to cost £2,000; construction of sewers and sewage disposal works at Smalley, estimated to cost £500; surface-water culverts in the parish of Mackworth, estimated to cost £45; storm-water culvert in the parish of Kilburne, estimated to cost £140; the preparation of plans for a water supply scheme for the parishes of Kirk Langley and Mackworth; and many minor alterations to their highways, of which there are 162 miles in this district. These works are all under the jurisdiction of the engineer and surveyor to the council.



Belper (Mr. THOMAS FENN, surveyor to the urban district council).

—During 1914 the following works are intended to be carried out: Lander-lane Corner (near the market-place)—taking down of two dwelling-houses already purchased by the council, and the rounding-off of the dangerous corner thereat; the widening of the High-pavement from the butts to Market-place, the council having already purchased the necessary land; the widening of Kiln-lane, Park Side; rounding-off of an awkward corner situate at end of Green-lane, King-street, the land for this improvement being given by the chairman of the council, Mr. G. H. Strutt, J.P., D.L.; the laying of a storm-water drain across the recreation ground, south of Nottingham-road; the erection of an iron fence on the south side of the waterworks pumping station. During 1913 the English Sewing Cotton Company, Limited, have erected a new mill at a cost of some £40,000. The company are now erecting new offices in connection with the mill, Mr. Sidney Stott, of Oldham, being the architect of the mill and offices. The elevations of the mill present a prominent and pleasing appearance to the eye from whatever point in the surrounding landscape the building is viewed.



Bexhill (Mr. GEO. BALL, ASSOC.M.INST.C.E., borough engineer and surveyor).

—A scheme is now in course of preparation for the provision of new isolation hospitals. Contracts have just been entered upon for important road improvements, to cost about £9,000. The corporation are carrying out a scheme of groyning on the foreshore in front of the East Parade, estimated to cost £4,200. The works of levelling up low land of about 13 acres are in hand, and a scheme is now before the Local Government Board for sanction to a loan of £3,700 for recreation ground purposes. Several private street improvement works will be undertaken, and there will no doubt be further development of the several building estates in this rapidly growing health resort.

Bilston (Mr. VINCENT TURNER, ASSOC.M.INST.C.E., water engineer and surveyor to the urban district council).—The most important scheme under the council's consideration is the improvement of the surfaces of about 2½ miles of the Holyhead-road, which is estimated to cost about £14,000, and an application has been made to the Road Board for financial assistance. Other matters which will probably be taken in hand are installation of electric power at the disposal works; extensions to the fever hospital; alterations to the market hall; and some miles of new water mains.



Birkenhead (Mr. CHAS. BROWNRIDGE, M.INST.C.E., borough engineer and surveyor).

—It is expected that the erection of a sanatorium at Thingwall will be commenced. A considerable amount of paving of macadamised roads will be undertaken, and the Baths Committee will bring forward a proposal to erect baths at the south end of the borough on land already purchased for this purpose. Extensive works of road widening and improvement will be carried out, and a considerable length of new main sewers will be constructed, this having become necessary by the recent development of certain parts of the borough. The council have submitted a representation to the Local Government Board that it is desirable that the boundaries of the borough should be altered. The total area of the adjoining districts sought to be included within the borough is about 7,502 acres, and it is expected that the inquiry in respect of the representation will be held at an early date.



Birmingham (Mr. HENRY E. STILGOE, M.INST.C.E., city engineer and surveyor).—The following works are in progress or projected: River and Sewerage Works—Hay Hall sewerage, estimated cost £8,700; Erdington and Witton main valley sewer (not yet estimated); Griffin's Brook main valley sewer from Pershore-road to Bristol-road (not yet estimated); new sewers in Lordswood-road and New-road off same, including outfall, estimated cost £5,265; Rea main valley sewer extension across private property, between Dogpool-lane and Cartland-road; sewers in Flaxley-lane, estimated cost £950; enlargement of Acock's Green western outfall sewer, including canal crossing (estimate not yet prepared); Stratford-road surface-water sewers, estimated cost £5,500; and Hall Green sewerage (contract No. 2), a scheme necessitated by the increase in building operations in the Hall Green district. It is proposed to extend the Cole Valley sewer to pick up tributary sewers dealing with the sewage from the new buildings within the drainage area, and to do away with the existing cesspools. The Chinn Valley sewer will also be constructed for the same purpose. Storm-water sewers from the various roads will discharge direct into the river Cole and Chinn Brook. The total length of these pipe lines will be 7½ miles, in sizes varying from 9-in. pipes to 3-ft. brick culverts. Acock's Green Sewerage.—The object of this work is to do away with the existing sewage farm at Acock's Green owing to the site becoming surrounded with buildings. Alternative schemes have been prepared, two of them dealing with the problem by gravitation to some considerable distance lower down the valley, and the other by pumping, whereby the sewage will be discharged into the existing Cole Valley main sewer. Hockley Valley Flood Prevention Scheme.—A further length of 150 yds. of this work will be undertaken shortly. The brook will be widened on one side, and a retaining wall constructed of sufficient strength to allow of buildings being placed upon it. Public Street Improvements: Wheelwright-road, Erdington; Linden-road (extension), King's Norton; Pershore-road; St. James' place, Vauxhall; Alum Rock-road; Lordswood-road, Road No. 1 and Road No. 2 (Quinton and Harborne town-planning scheme). Private Street Works: Livingstone-road, King's Heath; Springfield, Erdington; St. Edwards-road, Bournbrook; Elmhurst-road, Handsworth; Headingley-road, Handsworth; Freer-road, Handsworth; Grove Hill-road, Handsworth; Newcombe-road, Handsworth; Uplands-road, Handsworth; St. Michaels-road, Handsworth; Insurance-passage (City). Bridges: King's-road (in progress); Forman's-road (in progress); Aston Church-road (in progress); Stratford-road (in progress); Brookvale-road (in progress); Witton-road; Cole Ford (footbridge) and Lea Ford (footbridge). Building Works: Extension to Victoria Law Courts; New weights and measures office; new underground convenience, Aston Cross; additions to police station, Selly Oak; new fire station, Aston; and new fire station, Stirehley. New Street Paving Works: Pickford-street, granite and wood; Berkley-street, granite; Holt-street, granite; Heath Mill-lane, granite and wood; Sampson-road North, granite; Barford-street, granite; and Lionel-street, granite. Widening: Marsh-lane, Erdington; Kingsbury-road, Erdington; Wharfdale-road, Tysley; Warwick-road, street widenings in connection with new tramways; Stratford-road, street widenings in connection with new tramways; Pershore-road, street widenings in connection with the doubling of the existing single tramway track; Lordswood-road; Rookery-road, Handsworth; and Oxhill-road, Handsworth. The construction of an underground convenience at Aston Cross, Birmingham, will be commenced at an early date.

Birstall (Mr. T. H. HAILSTONE, M.I.M. AND CO.E., M.R.SAN.I., surveyor to the urban district council).—During the year several roads have been tar-sprayed, and road crusts improved with various tarred materials. Improvements and extensions at the sewage works are in progress at the present time, including the putting down of new filter with Fiddian travelling distributor. Several street improvements have been carried out by this council on the county main and also on district roads, and probably a street will be made up under the Private Street Works Act, the plans of which are at present being prepared. The public lighting in the market-place is to be extended and brought up to date. A small destructor for trade refuse will be shortly completed; new sewers are to be laid, and the general highways improvements

continued. A town planning scheme is to be prepared, and map No. 1 has already been before the committee. The housing question is also receiving attention, a sub-committee having been appointed to consider and report upon a scheme.



Blackpool (Mr. JOHN S. BRODIE, M.INST.C.E., borough engineer and surveyor).—The renovation and enlargement of Cocker-street public swimming and marine baths were completed, and the baths reopened in July last. The new large public sanitary conveniences under the Queen's-drive have been completed and opened. A feature of the past year has been the extensive electrical public street illuminations and decorations, first started in connection with the visit of their Majesties the King and Queen in July, and continued until the end of October. The improved lighting will be permanent. The new large higher elementary school (1,450 scholars) has been completed and opened, and another council school in the Layton district of the borough is about to be commenced. In the immediate future, the extension of the promenade from the Gym to the borough boundary is projected, a distance of 440 lin. yds., at an estimated cost of £7,000. The scheme for a new sea wall and promenade southwards for a distance of 1,300 lin. yds. has been further enlarged and developed, the estimated cost being now £65,000. The negotiations for the land are making satisfactory progress. Several town planning schemes are being promoted, and many street improvements of an important character will be carried out. Two additional district reading rooms are being provided, and an additional municipal bowling green is being laid down. Two large underground conveniences have been decided upon, and the work will be undertaken forthwith. The formation of new private streets will be exceptionally large this year. The erection of new buildings during the past year has been unprecedented in number.



Bognor (Mr. OSWALD A. BRIDGES, M.R.SAN.I., engineer and surveyor to the urban district council).—During the year the work which the council intend carrying out will be very extensive, necessitated by the rapid growth of the town, which now ranks as one of the principal towns on the South Coast. The new outfall sewerage scheme and pumping station will be carried out, tenders for which have just been accepted. The scheme will cost about £12,000. Full military bands have been engaged for the season, and, in consequence, the bandstand and enclosure will have to be reorganised, and a large bandstand erected with a weather shelter. The widening of the eastern promenade will be carried into effect at a cost of £1,983. Public underground conveniences for ladies and gentlemen will be constructed at this end of the town. A scheme, entailing the erection of sixty-nine workmen's dwellings, has been embarked upon, and twenty-five have already been erected, while eighteen more are in course of erection. The cost is £150 per cottage, and the work is being carried out departmentally. It is proposed to make up Oxford-street, Green-lane, East-lake and Henry-street under the Private Street Works Act, 1892.



Bolton (Mr. E. LL. MORGAN, ASSOC. M. INST.C.E., borough engineer and surveyor).—The streets department has effected many important improvements, some of which had been long anticipated, while the work before the borough engineer and surveyor and staff is extensive and a material factor in pointing to the town's improvement and expansion. In 1913 the works carried out, including repair and maintenance of main roads and highways, absorbed a sum of £19,536, and private street improvement works accounted for £22,963, the previous year's figures being £13,000 and £20,000 respectively. The tramways in the centre of the town have been reconstructed, and of other works contemplated at the beginning of last year the Deane Church-lane Bridge has been widened, and is now open for traffic, and paving of that lane is being proceeded with, as is also Captain's Clough; the raising of Blackburn-road, Astley Bridge, will be completed this year, and Deansgate West improvements will be continued on the erection of the new post office; the paving of Victoria-square and Newport-street has been completed; Great Lever Park is completed, and the consumption pavilion in Hulton-lane hospital area will be completed very shortly. The Parliament Bill

provides for the improvement of Bridge-street, Deansgate, Church-wharf, Great Moor-street (from Mawdsley-street to Howell-croft), St. George's-road, Bridgeman-place, Newport-street, Oxford-street, Howell-croft North and Plodder-lane in the district of Hulton; also the following tramway extensions or improvements: From Doffcocker's Inn to Doffcocker (Delph-hill) Mill; from Eskrick-street, up Harper's-lane, through Elgin-street, on to Church-road; from Smithy Bridge to Maze-street (Darcy Lever); from Fletcher-street and Bridgeman-street to Higher Swan-lane; from Deane terminus to borough boundary about Fernhill Gate. The reconstruction of the Manchester-road route is being proceeded with. In addition to these there are contemplated improvements in Green-lane, St. Helens-road, White Gate-brow to Four-lane Ends; repaving portion of Belmont-road; completion of work on Victoria-square and Chorley New-road; improvement of Junction-road (from Wigan-road to Deane-Clough), and probable improvement of Hulton-lane. Something may also be done in providing improved corporate office accommodation, and developments are possible respecting recreation grounds and a boating lake.

Bolsover (Mr. W. G. H. BROWNE, F.I.SAN.ENG., ASSOC. R.SAN.I., surveyor and sanitary and water engineer to the urban district council).—The chief work which is likely to be carried out is the sewerage and sewage disposal of the village of Stanfree, at a cost of £2,000. The scheme has not been fully drafted yet, and it will probably be carried out from current rates. Implement sheds are to be built at the depot in Town End. There are also proposals for considerable extensions to the fire brigade. Two public urinals are to be built within the town area at an early date, one of which will be underground. Private street works, of which two contracts will be running at the end of the year, will be continued, and probably two or three more streets will be made under the Private Street Works Act. It is also likely that extensions will be made to the old sewerage outfall works, presumably by the addition of two or more bacteria beds.

Boston (Mr. G. E. CLARKE, M.INST.C.E., borough surveyor and harbour and dock engineer).—A considerable amount of tarred macadam is to be relaid during the year. Some of the roads are twenty-five years old. The road to the dock is to be relaid with granite setts, and sewerage is to be carried in the Norfolk-street area. Pumping plant to deal with storm water at the main sewer outlet is in hand. Destructors are contemplated, and estimates are before the committee. Additional cottages are to be erected on the farms. Further wood paving will be laid in business streets. The new Town Bridge has been completed at a cost of £7,000. Owing to the increasing trade, further warehouse accommodation is required, and the electric light will be extended. The new sidings are now completed at a cost of £12,000. Further lighted buoys are to be put down in the approaches; acetylene-lighted buoys, to burn twelve months, will be adopted, as that at present in use gives the greatest satisfaction. The buoyage system calls for a large amount of work, as there are ninety-six buoys afloat, and owing to the changes in the sands, constant surveying is required to keep the charts up to date. A new cradle is being fitted up to the 20-ton hydraulic coal hoist.

Bredbury and Romiley (Mr. ROBT. HARDMAN, surveyor and sanitary inspector to the urban district council).—The works proposed to be carried out by this council during 1914 include the purchase and laying out of a 4½-acre recreation ground in the Bredbury district, the widening of the Stockport main road, and an extension of the main sewer at a cost of £1,500, including pump to be driven by motor power. Land is to be purchased for the building of workmen's cottages, and for the extension of allotments. It is also intended to lay out and build a boundary wall at the Romiley recreation ground. Main road improvement and improvements on the local highways will be carried out as well as the extension of water mains in the district. Other contemplated works are the building of an eight-stalled stable, and the purchase of horses for the removal of night soil. A town planning scheme for the whole of the district is to be prepared, and paving work will be carried out in several new streets and back passages. The conversion of a good many privy closets into water-closets and other sanitary improvements have been decided upon. A length of 1½ miles of main road on the outskirts of Romiley is to be lighted.

Brentwood (Mr. A. JAMES MEESON, M.I.M.AND CO.E., M.R.SAN.I., surveyor and inspector to the urban district council).—The council are preparing a scheme for an extension of the urban area. The surveyor has been instructed to prepare a system of surface-water drainage for the district, and it is proposed to construct an underground public lavatory. The widening of a dangerous corner on county roads, in conjunction with the county council, is to be continued.



Housing and Town Planning Act, 1909.



Bridlington (Mr. E. R. MATTHEWS, ASSOC.M.INST.C.E., F.G.S., borough engineer and surveyor).—The works proposed to be carried out in Bridlington during 1914 include the extension of the borough sanatorium, to cost £1,500; the widening of Cardigan-road, at a cost of £4,600; new sewers in North-street and under the Sewerby sea defence roadway, to cost £600; the laying of several other sewers in the borough; the demolishing of Centre House Market-place, in order that the space now occupied by this may be added to the street; private street works in a number of streets; the demolishing of six houses at the junction of Quay-road and Brett-street, for street widening purposes; the erection of a house for the town's gardener, and also of a weigh office; in addition to the twenty-five workmen's houses recently erected in the old town, the erection of twelve workmen's cottages in North Back-lane, and ten in Portland-place, and the laying of wood paving in High-street.



Bristol (Mr. L. S. MCKENZIE, ASSOC.M.INST.C.E., city engineer).—Works to be put in hand this year include the erection of sanatoria for the treatment of tuberculosis, consisting of three blocks of twenty beds each, together with administration block; the erection of a tepid covered swimming bath, together with forty-eight slipper baths; the strengthening of a bow-string girder bridge across the river Avon by the insertion of a centre girder; the construction of an underground public convenience; also two new bowling greens and two tennis courts. The surface of about 140 miles of macadam roads will be treated with tar as before, and further experimental lengths of bituminous-bound macadam and carpeting will be laid, as well as the renewal of about 25,000 yds. of wood paving. A Town Planning Committee has been appointed, and a scheme is also being considered for a new low-level road to Avonmouth.



Briton Ferry (Mr. H. ALEX. CLARKE, engineer and surveyor to the urban district council).—The projected works for 1914 are: Workmen's Dwellings.—The council have now in hand their second housing scheme, comprising the erection of sixty-two workmen's dwellings, which are to be completed during the present year; nineteen houses are to be rented at 6s. per week, and forty-three at 6s. 6d. per week. When these are completed the council will have 113 dwellings. A scheme for the laying out of 6 acres of ground as a public park, with bowling green, tennis court and bandstand, has been submitted to the Local Government Board for approval. Upward of 2 miles of water mains will be added to the waterworks undertaking. The construction of new roads and sewers and other minor works is contemplated.

Burley-in-Wharfedale (Mr. HARRY RIDING, surveyor, inspector, and gas and water manager to the urban district council).—The council have approved plans and estimate, prepared by the surveyor, for a mechanical water filtration plant, and have applied to the Local Government Board for sanction to borrow £1,400 for carrying out the work. The water mains are to be extended in order to supply an adjoining authority with water, and several thousand yards of mains are to be scraped and cleansed. It is hoped that an early start will be made with an important road widening scheme, costing £2,600, to which the Road Board are

contributing one-third of the cost. Several other road improvements are at present under consideration, and it is proposed to lay down trial lengths of Tarvia, grouted granite, and Glutrin-bound granite on the main road. During the early spring about 30,000 super. yds. of Tarvia spraying will be taken in hand. There is every indication of a fairly busy year.

Burnham, Somerset (Mr. WM. H. CHOWINS, engineer and surveyor to the urban district council).—The New Year promises to be an exceptionally busy one. In addition to the ordinary routine work, which, owing to the rapid growth of the town is greatly increasing, the council have decided to construct a new promenade pier, and to carry out extensive repairs and alterations to the existing jetty. A Provisional Order under the Board of Trade is being applied for in the next Session to authorise the council to undertake these works. The extension of the urban area by including portions of two neighbouring parishes will probably come into effect on April 1st next, the county council having made the necessary Order. This will involve the construction of sewerage works, including pneumatic ejectors, gas engines and air compressors, which will have to be undertaken forthwith.



Burnley (Mr. G. H. PICKLES, M.INST.C.E., borough engineer and surveyor).—The following is a list of municipal works projected in 1914: Tramway extensions; Church-street widening; town hall extension; two schools; mortuary chapel at cemetery extension; Lightenhill Park shelter and bowl store; Barden-lane recreation ground bowling green, shelter and bowl store; and extension of sewage works, main sewer and street works.



Burton-upon-Trent (Mr. GEORGE T. LYNAM, M.INST.C.E., borough engineer and surveyor).—The question of the further widening of Burton Bridge is still under consideration. The relaying of the wood paving in High-street is to be continued. Station-street is to be further widened, for which property has been acquired. Negotiations are being conducted for the acquisition of property in Lichfield-street for improving the highway. The additions to the administrative block and sanatorium, and provision of additional bathrooms at the hospital are nearing completion. The duplication of the sewage rising main for a distance of $\frac{1}{2}$ mile from the pumping station will be completed, and the clearing of the old main of lime scale will be proceeded with. The extension of the office accommodation for the medical officer of health and treasurer's department is under consideration, and various small sewerage extensions are contemplated. The stores and workshops at the gasworks are being extended at a cost of about £3,000, and tenders are being obtained for extending the retort house at a cost of about £5,000. The construction of a museum and gas and electricity showrooms, to cost about £7,000, has been commenced. The extension of the gas mains to Rolleston and Tutbury is in hand. The improvement and extension of the refuse destructor plant will probably be considered.



Bury (Mr. J. AINSWORTH SETTLE, ASSOC.M.INST.C.E., borough engineer and surveyor).—The works contemplated during 1914 include the conversion of local sett and macadam roadways to granite paving on concrete, construction of tanks for treatment of trade waste water, extension of tramways, extension of electric power station, various works of sewerage and road improvements, conversion of an existing building into a tuberculosis dispensary, and the extension of the housing scheme.

Bushey (Mr. ERNEST E. RYDER, surveyor to the urban district council).—During the year the following works will be carried out: New fire station, storm-water sewer to deal with the Koh-i-noor estate, and the laying out of an open space in front of the old village church. The council will also have under consideration a scheme for developing about 100 acres as a garden suburb. The whole of the footpaths on the main London road will be paved, kerbed, and channelled. Negotiations are in hand for securing land and properties for purposes of street widening

and it is hoped that the county council will carry out a scheme of reconstructing the London-road, over which a frequent service of motor 'buses now runs.

Calverley (Mr. WILLIAM WALKER, surveyor, water-works manager, sanitary inspector, and housing inspector to the urban district council).—An application has been made to the Local Government Board for sanction to borrow £1,700 for purchase of land (10 $\frac{1}{2}$ acres). The inquiry has been held, and the decision of the board is expected shortly. Should sanction be given it is intended, in the near future, to construct works for the disposal of the sewage of the district. The existing works will be dismantled, and all the sewage diverted to the new works. An extensive improvement of a road between Calverley and the adjoining urban district of Farsley will be completed. The council having purchased a machine, most of the roads in the district will be tar sprayed.



Cambridge (Mr. JULIAN JULIAN, borough surveyor).—A considerable amount of work in connection with private street works, street improvements and small sewer extensions will be carried out during the year. The site for a new bridge for vehicular traffic over the river Cam is under consideration, and a further housing scheme is contemplated. The erection of two new ward pavilions and additions to the administrative block at the sanatorium will be commenced shortly. The County Borough Bill will probably come up for third reading during the next Session of Parliament.

Cannock (Mr. ROBT. BLANCHARD, engineer and surveyor to the urban district council).—The extension of the sewage disposal works, at an estimated cost of £12,270, is in course of construction, together with a further contract for sewers in the district. The usual work of tar-spraying of main roads and laying down tar-macadam will be continued, and it is anticipated that two road widening schemes will be undertaken, as well as various small improvements. Contract No. 3 for kerbing and channelling about 4 miles of district roads will shortly be let, and several streets will be constructed under the Private Streets Works Act, 1892. A new school will be erected during the year. The advisability of erecting houses under the Housing and Town Planning Act, 1909, and an isolation hospital, is receiving consideration by the council.

Cardiganshire (Mr. DAVID DAVIES, county surveyor).—The council carried out a splendid improvement last year at Llechryd to stop the river Twy flooding the road. The surface of the road was raised 7 ft. for 240 yds., and a new bridge was built. It is an excellent job, and the river has never flooded the road since. It cost the county £1,400. This year it is proposed to carry out the following improvements: Making a new road from New Quay to Gilfach Yrheda, and thence widen it to Llanarth, where it will join the old main road. This when done will open the country from New Quay to Aberayron and Aberystwyth. It will cost about £10,500. Reconstructing the main road from Cardigan to Cenarth, at a cost of £5,700. A new bridge is to be built at Rhydy Vallon, at a cost of £795.



Carlisle (Mr. HENRY C. MARKS, M.INST.C.E., city surveyor and water engineer).—The corporation's application for county borough powers having been granted, the council are proceeding with the financial adjustments with the county council, and are formulating schemes for the carrying out of the Insurance Act, and the requirements of the Board of Education with respect to higher education. Extensions to the swimming baths and electric power station are also contemplated, together with additional sewerage of the areas recently added to the city.



Carmarthenshire (Mr. R. W. JONES, M.M.C.N.E., county surveyor).—The chief additional works to be executed in the Western Division of the county to that of the ordinary maintenance of 153 miles of urban and rural main roads and the bridges thereon, will be the strengthening of about 10 miles of main roads, and surfacing with tar-macadam of about 8 miles of roads. About 15 miles of road will also be treated with surface tarring. A new bridge is to be erected at Nantyci, near Carmarthen.



Carshalton (Mr. W. WILLIS GALE, ASSOC.M.INST.C.E., surveyor to the urban district council).—The year 1914 will see many improvements carried out. The new bridge across the Wandle at Hackbridge will, it is hoped, be constructed. The question of an open-air bath in the newly acquired park is under consideration, and the town planning of the district will be actively proceeded with under the permission granted by the Local Government Board. The building of stables and the provision of horses and plant for the council's work will be taken in hand, and the question of building cottages for the council's employees has been referred to a committee for report. The making up of the roads on the Highfields and Fairview estates under the Private Street Works Act will be considered.

Caterham (Mr. H. R. MARTIN, engineer and surveyor to the urban district council).—An extension of the sewage works has been carried out during the past year, including new tanks, travelling sprinklers, revolving sprinklers, sand filter and sludge heds to take the drainage from the asylum, at a cost of £3,300. In addition to the usual work of resurfacing the roads, experiments have been made, with success, in crushing the round pebbles obtained from the local gravel pits for use in dressing roads and paths treated with tar.

Chelmsford (Mr. PERCIVAL T. HARRISON, ASSOC.M.INST.C.E., borough and water engineer).—During the past year the council have adopted a second housing scheme for 106 houses, which is well in hand. When completed an amount approximating to £30,000 will have been expended on workmen's dwellings in three years. Other works completed include stables and depot, borehole 540 ft. deep, new engine-house and suction-gas plant for main waterworks station, wood block paving (£7,000), several considerable improvements, and extensions of sewers and water mains. The schemes under consideration by the council include new municipal offices, further works of water supply, refuse disposal scheme, remodelling of the whole of the sewerage and sewage disposal works, and town planning.



Cheltenham (Mr. J. S. PICKERING, M.INST.C.E., borough surveyor and water engineer).—The scheme for the purification of the sewage of the borough, which has been in progress for some time, will be completed and brought into operation during the coming year. The works comprise precipitation tanks, percolation filters, and pumping machinery for dealing with the sludge. In addition to these works, the corporation own two sewage farms having an irrigable area of about 330 acres. Further progress will be made with the resewering of the borough, the council having approved an application to the Local Government Board for sanction to a loan for the reconstruction of sewers in another district. During the past fifteen years a sum of upwards of £50,000 has been spent on this work, and £40,000 on sewage disposal. The Local Government Board have sanctioned a scheme for the adaptation of five properties in the Promenade as municipal offices, the designs having been prepared by the borough surveyor. The conversion of the water-bound roads into tar-macadamised roads will be continued.

Chiswick (Mr. EDWARD WILLIS, ASSOC.M.INST.C.E., F.S.I., engineer and surveyor to the urban district council, and architect to the Education Committee).—The principal matter before the council in the present year is the proposed acquirement of the electricity undertaking, and the purchase of lands for burial ground and educational purposes. The engineer has already prepared plans in connection therewith, and the Bill has been deposited for submission in the coming Session. The extension of the surface-water drainage scheme has been proceeded with during the past year, and it is intended to further extend same during 1914, while the several street widenings and improvements set forth in the Chiswick Urban District Council Act, 1911, will also be proceeded with from time to time. Extensive widenings, in addition to those approved by the above Act, are also anticipated, and some will be carried out during 1914. Owing to the motor-omnibus traffic, it is hoped that the wood paving will be extended, but this may be held over if no assistance can be obtained from the Road Board. Additions to elementary schools are anticipated to be carried out by the architect to the committee, and the

new secondary school, for which the county architect (Mr. Crothall) is responsible, will probably be started in the spring. The laying out of a section of Chiswick Common for the use of children will be proceeded with at once, and it is possible a further open space may be acquired during the year. The most important feature in the district is the proposal to instal a huge gasworks undertaking, for which nearly 100 acres is to be purchased, and which would be erected and worked under the most up-to-date conditions if the company are successful in obtaining the necessary Act of Parliament. The present intention is for such company's land to immediately adjoin the sewage disposal works. Special provision would be made in the scheme for cottages to be erected on garden city principles, and a complete belt of tall trees would be planted to lessen the objection to existing outlooks. There is also a movement on foot to lay out an eighteen-hole golf course on the vacant land immediately adjoining the finishing point of the University Boat Race, and should such be successful, it is probable it would prove one of the most convenient courses for residents in the Metropolis. The necessary private street works will be carried out in the early part of the year.

Chorley (Mr. GEORGE H. HOPKINSON, borough surveyor).—Sanction has been obtained, and contracts partly let, for the sewerage of the southern portion of the borough, and the extension of the Cowling sewage works (£4,463), which comprises the construction of 1,283 lin. yds. of pipe sewers, additional tanks and filters. A new council school is to be erected, at an estimated cost of £6,000. The Town Planning Act is under consideration in respect of several areas, and the council intend applying for sanction to prepare schemes. A recreation ground, about 5 acres in extent, is nearing completion, and other matters occupying the attention of the authorities are the provision of baths, town improvements, and the making up of private streets and back passages.



Church (Mr. W. E. WOOD, M.INST.M. AND CO.E., surveyor to the urban district council).—During the year a gravitation sewer has been laid, at a cost of £5,000, to take the Altham sewerage into the Church sewers for treatment at the sewerage works at Coppy Clough. It is proposed to tar-spray one of the secondary roads leading to Clayton-le-Moors, at a cost of £770, though this work may not all be done in one year. New council offices have been erected in Blackburn-road, as well as new public conveniences. Several back streets are to be paved and sewerage. A new council school will be erected in Hyndburn-road, at a cost of £8,000.



Cleethorpes - with - Thruscoe (Mr. CHAS. H. WAITHMAN, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—During the past year the principal works carried out were the construction of the pier approach shelter in reinforced concrete and terra-cotta, underground conveniences, bandstand, shelters on Kingsway, and the laying out of the Kingsway enclosure. A Local Government Board inquiry was held in connection with the erection of a 4-cell refuse destructor, and designs were approved for the new outfall and town pumping stations. The works projected for 1914 are the erection of refuse destructor and outfall and town pumping stations, the conversion of the Kingsway enclosure into a Floral Hall, and the laying out of 6 acres extension to Sidney Park. The council have also under consideration a scheme for the construction of a marine lake and extension of the promenade and gardens, which is estimated to cost £25,000, the surveyor's plans having been provisionally approved. There will be a considerable amount of street work, as, in view of the approaching completion of the sewerage scheme, several estates will be developed. The council's electricity undertaking, initiated in 1912, is now in working order, and further cable extensions are projected.



Clitheroe (Mr. ARTHUR R. BLEAZARD, borough engineer).—The most important works to be carried out by the Clitheroe Corporation during the year are: Erection of a new elementary school; laying out two parks; the erection of twenty semi-detached cottages, and the erection of sprinkler beds at sewage works. Several street improvements are on hand.

Clydebank (Mr. GEORGE ROSS, burgh surveyor).—During the year 1914 a ladies' shelter is to be built in the Overton Park, consisting of waiting-room, lavatory, and two water-closets, at a cost of £360. A number of private streets are to be temporarily repaired. A new 21-in. F.C. pipe sewer, 170 yds. long, will be laid in Singer-road, at a cost of £250. It is proposed to widen Killowie-road from 40 ft. to 60 ft. for a length of 240 yds., and to pave a portion of Dumbarton-road of about 3,600 sq. yds.



Colne (Mr. T. H. HARTLEY, borough surveyor).—During the year 1914 the following works will probably be put in hand under the borough surveyor: Tramways Purchase.—The corporation have promoted a Bill in the last Session which has now received the Royal Assent authorising the purchase of the undertaking of the Colne and Trawden Light Railway Company. The arbitration to settle the purchase price is shortly to be held, and no doubt this will entail new works of various kinds. Town Planning.—There has not been much further progress made in regard to the town planning scheme, which embraces 930 acres, up to the westerly boundary of the borough. Further steps will be taken during the year to forward the scheme. Main Sewers and Sewage Disposal Works.—Further developments in this direction are anticipated, but no definite scheme is yet formulated. Private Street Improvement Works.—Further works of private street paving and sewerage will be taken in hand out of the loan now sanctioned of £21,000. Main Roads Granite Paving.—The granite paving of the main roads will be completed during the year, at an estimated cost of £14,000, and a number of public street improvements and road widenings will be taken in hand. Water Carriage System.—Further works of this character will be executed, embracing the conversion from pail and tanks to water carriage, the sanction of the Local Government Board having been obtained to this work. The estimated cost is £4,470. Tar Spraying and Tar Grouting.—The highways are being reconstructed as far as the funds will allow on the most modern methods of tar construction, and further lengths will be dealt with.



Colwyn Bay (Mr. WILLIAM JONES, ASSOC. M. INST. C. E., surveyor and water engineer to the urban district council).—The continued remarkable progress of this seaside resort has made it the largest and most important coast town and the second largest town in North Wales, both as a residential and visiting centre. Plans of 111 new houses, twenty-eight additions, and of several other minor buildings and alterations were approved by the council during the last twelve months. The Promenade extension at Rhos has been completed at a cost of £3,000. There is now a continuous sea wall of 3 miles in length. Seven shelters have been erected on the Rhos section of the promenade at a cost of £1,150. An underground convenience is in course of erection at Rhos, at a cost of £1,100. The council are now in negotiation with the Victoria Pier and Pavilion Company for the purchase of the pier and pavilion at an approximate cost of £15,000. A great amount of road improvements and widenings will take place during the year—viz., Abergele main road widening to Colwyn, at an estimated cost of £12,000; Mochdre main road widening, at an estimated cost of £3,500; Brompton-avenue widening, at an estimated cost of £1,160; and Llanrwst-road widening, at an estimated cost of £1,500. A grant of £6,000 has been given by the Road Board towards the cost of widening and improving the through road between Colwyn Bay and Llandudno, the interested authorities making up the extra £2,000 of the estimate for carrying out this work. The council have approved of a scheme submitted by the surveyor for the erection of eighty-eight houses for the working classes on about 7 acres of land, at an estimated cost of £18,700, and the erection of these will be proceeded with as soon as the sanction of the Local Government Board has been obtained. The question of the provision of a refuse destructor is now very prominently before the council, and tenders will, it is expected, be very shortly advertised for. Owing to the extensive developments of the building estates in the district, several lengths of water, gas and electric mains will have to be laid, and several streets taken over by the council under the Private Street Works Act, 1892. An entirely new code of building

by-law will, it is hoped, come into operation during the year.



Coventry (Mr. J. E. SWINDLEHURST, M. INST. C. E., city engineer and surveyor and water engineer).—Much work of an important and varied nature will be carried out by the city engineer during the year 1914. Sanction has now been received to the borrowing of £35,000 for the purpose of constructing twelve bacteria beds and humus tank at the sewage farm, and the preliminary work in connection with this scheme has been started. Sewers are intended to be laid in Holbrooks-lane and Lythalls-lane for the purpose of the drainage of certain areas adjoining these thoroughfares. The corporation have in hand the preparation of a town-planning scheme for about 1,000 acres on the north-west side of the city, and other areas are under consideration. The city engineer has in hand a report on the question of annexation, together with an important scheme having for its object the relief of traffic in the central streets of the city. The Waterworks Committee have decided to treat the water which is derived from Whitley well chemically, and the city engineer has been authorised to deal with this matter. It is intended to proceed with the construction of an additional covered reservoir at Coundon, while the large water tank at Spon End waterworks will also be roofed in. A tar-macadam plant is about to be installed, as a considerable amount of tar-macadam road work will be undertaken during the year. Other works in hand, or under consideration, comprise re-sewering of the city; extensions to public baths (£15,400); public conveniences (£7,000); extension of housing scheme; depot for highways department (£4,000); erection of model lodging-house; extension of Drinkwater Arcade; public abattoir; extension and enlargement of water mains in certain parts of the city; and street paving scheme which will comprise the laying of many thousands of yards of flags manufactured at the refuse destructor from clinker. The Earlsdon and Chapel Fields surface-water scheme (£12,000) is proceeding apace, and the new arterial sewer to serve the Radford district has been commenced. The extensions to the city hospital have been completed during the past year, as have also the public mortuary, extensions to the market hall, three branch libraries, and the branch slipper baths at Primrose-hill; while the extension of the Narrow-lane housing scheme, comprising 104 cottages (four with shops), is being pushed forward rapidly by the contractors, several of the houses being ready for occupation. The order has been placed for the motor fire pump and motor first-aid appliance, and it is expected that these will be delivered within the next few months.

Cramlington (Mr. WILLIAM J. COULSON, M. M. UN. E., engineer and surveyor to the urban district council).—The council propose to purchase horses, instead of contracting, for the removal of house refuse and other work, and plans are now being prepared by the surveyor for the erection of stables, sheds, and other buildings. Instructions have been given for the preparation of plans for new sewerage and sewage disposal works for the northern portion of the council's district. It is expected that the laying of gas mains to Shankhouse, East Hartford, East Cramlington, and West Cramlington will be completed in time to enable the council to have the whole of the streets at these places lighted with gas from the beginning of next lighting season. Further extensions of water mains, private street works, and highway improvements will also engage the attention of the council.

Cromer (Mr. ROBERT CROOME, surveyor and sanitary inspector to the urban district council).—The widening of the coast road between Cromer and Overstrand is receiving consideration, and the cost will probably amount to about £2,500. The laying out of the Marrams, an open space at the top of the cliffs at the west end of the town, is also under discussion, with the provision of a bandstand and additional shelters.

Croston (Mr. Wm. T. HOGNEX, engineer and surveyor and inspector of nuisances to the urban district council).—The only works of importance in addition to the general routine projected for the ensuing year are extensions of sewers to embrace the Drinkhouse-lane and Grape-lane districts, and the provision of new duplicate sewage pumping plant and two additional ejectors.



Croydon (Mr. GEORGE F. CARTER, M.INST.C.E., borough engineer, surveyor and water engineer).—A new fire station and library at Thornton Heath will be completed early in the New Year. A local inquiry has been held in respect of the construction of a covered service reservoir to hold 10,000,000 gallons, a borehole, pumping plant and buildings at Waddon Well, and many miles of water main, the whole estimated to cost £95,000, and it is expected that the work will be put in hand. An application has been made to the board for further works of sewage treatment at the South Norwood sewage farm. Progress is being made with the extension and covering in of a swimming bath at South Norwood. The local inquiry has taken place for an addition to the borough of 5,658 acres. Tenders have been invited for the widening of West Croydon Bridge, at an estimated cost of £18,000, to improve the main London and Brighton road through the borough. Further extensions at the borough hospital are contemplated, as well as the provision of tuberculosis wards.

Cumberland (Mr. WILLIAM FINCH, county surveyor and bridgemaster).—This year promises to be a very busy and important one in connection with the county main roads and bridges. In addition to the usual maintenance and repair of the 530 miles of county main roads, and 490 county bridges, many other works are to be carried out. It is intended to erect a new ferro-concrete bridge on the Glasgow main road, to take the place of the historic metal bridge, built by Thomas Telford in 1820. The estimated cost of the new bridge and approaches is £16,000. The erection of a new stone bridge and road diversion in the Alston district will cost £3,500; road diversion at Rowrah will cost £5,350, and the completion of the sea defence works at Dibunill, near Allonby, £8,300. Several other smaller road and bridge improvements will be carried out. The resurfacing with tar-macadam, and the surface treatment with tar, of various sections of the main roads will be continued, as well as the scheme, commenced last year, of resurfacing with granite, or whinstone, those roads hitherto covered with land cobbles and limestone. Several applications have been made by rural district councils for contributions from the county council towards the cost of widening and improving certain district roads, with a view to such roads being eventually taken over as main roads by the county council.

Barlington (Mr. GEORGE WINTER, borough surveyor, waterworks engineer, and architect to the Education Committee).—A new pumping plant, consisting of two sets of three-throw ram pumps by Messrs. Hathorn, Davey & Co., belt-driven from a 220-h.p. Hornsby-Stockport double-cylinder gas engine, and gas-producing plant, will be installed at the waterworks, and the necessary alterations and extension required to the existing buildings carried out. A new elementary school, to accommodate 1,200 children, will shortly be commenced, and later in the year two elementary schools, accommodating 840 and 200 children respectively, will be commenced. Application has been made to the Local Government Board for a Provisional Order to extend the borough boundaries, and obtain the powers of a county borough. Twenty-two and a-half acres of land in the Cockerbeck Valley will be laid out as a recreation ground and as allotment gardens. It is proposed to spend about £5,000 on improvements to the corporation cattle market. About 8,000 tons of tarred slag macadam will be laid, about 2 miles of private streets put into permanent repair, and various lengths of the main roads paved with granite setts. A new main sewer, 1 mile in length, will be laid in the Cockerbeck Valley. Sewage disposal works, comprising septic tanks, storm-water tanks and percolating filters, which it is proposed to substitute for the present system of irrigation on land, will also be commenced.

Denbighshire, Western Division (Mr. R. B. ADAMS, county surveyor).—In addition to the usual road repairs, which are becoming more costly every year, owing to the great increase of all kinds of motor vehicles on the roads, the council propose, during the year ending March, 1915, to improve the main road from Abergele, through Llangerniew, to Llanrwst, by cutting off seven dangerous curves or corners. It is also proposed to widen the Abergele and St. Asaph main road near the entrance to Abergele. These improvements are estimated to cost £277. The council also propose to tar-spray a much larger area of road

surfaces than has been done heretofore. The widening of certain sections of the main road between Colwyn Bay and Llanrwst will be carried out during the year.



Derby (Mr. JOHN WARD, M.INST.C.E., borough surveyor and waterworks engineer).—During the present year it is expected that a considerable amount of work will be taken in hand. A town planning scheme is being considered, additions to the sanatorium are to be made, and the re-sewering of the Alvaston district will probably be carried out. Additions to the public recreation grounds, including new bowling greens, tennis courts, and running and cycling tracks for the training of athletes, are in hand. The fire brigade station is to be remodelled and extended, and various large street improvements will be taken in hand on several of the main roads, and the use of tar-macadam will be extended. Several new streets are being laid out by private owners. The Education Department will be erecting new schools and extending other existing schools.

Disley (Mr. C. S. RIGHTON, F.A.S.T., M.R.S.A.T., engineer and surveyor to the rural district council).—It is again proposed to tar-spray the whole of the main trunk road, except such portions as are being relaid with tar-macadam, and paving works are being carried out on one of the district roads. The sewerage of the Furness Vale portion is almost completed, and it is expected that the Local Government Board's sanction to the sewerage scheme for the Newtown portion and enlargement of the outfall works will be received shortly. Gas is now laid throughout the district, except in the outlying areas. Several large houses are being erected in the district.



Borchester (Mr. H. D. STRANGE, borough and water engineer).—In addition to the usual work, the council have under consideration schemes of street improvements, extensions to surface-water sewers, alterations and additions to stables, cart sheds and corporation depot, the provision of disinfection plant and premises at the isolation hospital, alterations and improvements to corporation properties and shelters in the borough gardens. At the sewage disposal works a scheme of improvement is under consideration by deepening the existing filters, the provision of sprinklers, erection of pumping plant, and the extension of irrigation area.



Douglas, Isle of Man (Mr. FRANK COTTLE, borough engineer and surveyor).—During the past year the following works have been carried out: A service-water reservoir has been constructed at Ballaquayle; a system of waste-water meters installed; the Victoria Pier has been widened on the south side, and the Kursaal, a large public hall built by the corporation on the sea front adjoining Villa Marino Gardens, has been completed and opened. The Kursaal has accommodation for 3,000 persons, and has cost £25,000 to build, the grounds adjoining covering over 8 acres, and which the corporation purchased at a cost of £60,000. Further private street works have been carried out. The Harris Promenade has been improved by the removal of the public shelter and the space given up to traffic. Broadway, a main thoroughfare leading from the promenade, has been widened and improved. The works pending are: The widening of the Harris Promenade; the erection of a public shelter and convenience adjoining Villa Marina; the widening of Promenade-south; sec. 2 of the Town Improvement Scheme; and erection of artisans' dwellings; further private street works; public swimming baths at Port Jack, and extension (to include the Onchan district) of the borough boundaries.



Dover (Mr. W. C. HAWKE, ASSOC. M. INST.C.E., borough engineer and surveyor, and water engineer).—During the current year the corporation will be constructing a ferro-concrete viaduct in the Pier district. This work will include the demolition of a large number of properties, the laying out of new streets, diversion of sewers, and the erection of workmen's cottages. Other work will include the erection

of an elementary school for 700 children, provision of new tennis courts, tar-painting of about 7 miles of carriageway, and new kerbing and channelling, Folkestone-road.



Droithwich (Mr. H. HULSE, M.I.M.E., borough engineer and surveyor).—The scheme for the erection of twelve working-class dwellings has been developed during the past year. The houses were commenced in November last, and will be completed early in 1914. The present police station, which is municipal property rented to the county council, has been reported upon adversely, and the county council have communicated with the town council as to providing other quarters for the police. The highways department will deal with about 40,000 sq. yds. of surface tarring during the year, using local tar refined to pass the Road Board Specification. Several corner improvements and road widenings are likely to be carried out, so as to improve the roads for motor traffic. The usual work for road maintenance and strengthening of surface crusts will be carried out.

Droxford (Mr. ARTHUR VICTOR CARTER, surveyor to the rural district council).—In addition to the ordinary repairs and maintenance with local material, several of the more important district roads will be strengthened and the granite sections extended, with one or two improvements by widening. About 10 miles of surface tarring will be carried out.

Dukinfield (Mr. SAMUEL HAGUE, borough surveyor).—The corporation contemplate carrying out the following work during the ensuing year—viz., the making up of Adamson-street with concrete bed and granite paving; Corra-street and Malpas-street, for which borrowing powers have been obtained, and the widening of several streets, in addition to the ordinary work of maintenance. Extensions at the sewerage works will be carried out, also the erection of urinals in various parts of the borough, and the erection of a new dining-room, bathroom and storeroom at the gasworks. Several private streets are near completion.



Dundee (Mr. JAS. THOMSON, city engineer and city architect).—The corporation have made good progress with their schemes under the National Insurance Act, 1911, and have acquired Ashludic Mansion House and grounds, extending to 50 acres, as a sanatorium. It is proposed to provide accommodation for sixty patients, and to alter the existing buildings for administrative purposes, the total cost being about £8,500. At King's Cross Hospital an additional eighty beds will be provided for advanced cases, at a cost of £14,000, including the necessary administrative buildings. Three town planning schemes, embracing a total area of 297 acres, are in course of preparation, and it is expected that the approval of the Local Government Board will be given shortly. A commencement will soon be made with a central improvement scheme, involving an expenditure of about £500,000, for which sanction was obtained in last Session of Parliament. Under the Dundee Boundaries Act, 1913, the burgh of Broughty Ferry was annexed, and it is anticipated that several improvements will be carried out in the newly acquired area. The tramway system is being extended along the Blackness-road route, at a cost of about £7,000.



Dunfermline (Mr. W. R. MAXWELL, F.I.S.E., burgh engineer, surveyor and master of works).—During the year it is proposed to proceed with the construction of the third section of the large outfall sewer to the sea, costing about £35,000. It is also proposed to causeway several streets in the city, and renew water mains in others.



Durham (Mr. JOHN T. PEGGE, F.A.S.L., city engineer).—The Local Government Board have approved of alterations to the pump well at the sewage works, and the work is to be commenced at once. The council have selected two ferro-concrete bridge schemes, and if the Local Government Board will give an early consent, it is expected that the work will be proceeded with forthwith. The city and county councils have arranged a

programme for improving and strengthening the main roads during the year, and a grant has been made by the Road Board. Several important improvements are contemplated to provide for the ever-growing rapid motor traffic through the city, which will be paid for out of revenue. The workmen's dwellings are well in hand, and a smaller type of house is now under consideration for the next block. Several streets are under consideration for repaving with Durax, this being considered cheaper, longer-lived, and the cleanest type of granite paving. A ferro-concrete river wall will be commenced in spring. A number of private street works will be done during 1914. The matter of public conveniences is also being considered. Numerous small works of no special importance are in hand.

Ealing (Mr. W. R. HICKS, ASSOC. M.INST. C.E., borough engineer and surveyor).—The following is a list of the works contemplated during the year: Building of the senior block of the North Ealing school; finishing of the town hall extension; laying of 1½ miles of 24-in. surface-water culvert; extension of branch library, West Ealing; erection of new branch library, South Ealing; erection of new slipper baths, South Ealing; various public improvements, and the laying of some 2 or 3 miles of carriageways with tarred slag; the usual private street works, and the routine work in connection with a borough surveyor's department.

Earby (Mr. J. E. ALDERSLEY, engineer and surveyor to the urban district council).—The council will carry out an extension to the sewage disposal works at a cost of £4,790. Eleven streets will be made up under the Private Street Works Act, at a cost of £3,600. It is expected to carry out bridge construction costing £760, and to build stabling and a depot at a cost of £1,500. It is also intended to construct several sections of roads in tar-macadam.



Eastbourne (Mr. A. ERNEST PRESCOTT, borough engineer and surveyor, and surveyor to the education authority).—The main and surface-water drainage scheme will be continued during the present year, when it is hoped that two-thirds of the scheme will be brought into operation by connecting up the whole of the Upperton district, the heaviest part of the work having now been completed. The Pleasure Grounds Committee are now considering a scheme for the extension of the Central-parades, immediately opposite the Western bandstand, which will mean a probable outlay of £10,000. It is hoped also during the present year to come to some definite decision with regard to the proposal for the formation of a new coastal road between Eastbourne, Bexhill and Hastings. Plans for this work have already been prepared in the Eastbourne borough engineer's office, and a conference will be held very shortly of the various authorities interested. It is hoped that a Bill will also be promoted in Parliament at the next Session for the acquisition of the Devonshire Park, including grounds, pavilion, baths, theatre and shops, for £108,000.



East Grinstead (Mr. W. E. WOOLLAM, M.R.SAN.I., engineer and surveyor to the urban district council).—The projected works include the purchase of a site for depot, and the erection thereon of a refuse destructor (a tender for which has been provisionally accepted by the council); purchase of property for the purposes of erecting public sanitary conveniences; purchase of land for allotments and public recreation purposes, and private street works and sewer extensions.



Eccles, Lancashire (Mr. THOMAS S. PICTON, M.I.M. AND C.O.E., borough engineer and surveyor).—The coming year is likely to be a busy one, as it will see the commencement of several large schemes and the completion of many smaller ones. A portion of the main trunk sewers is to be reconstructed and enlarged; a new outfall sewer with a large catchpit, fitted with duplicate screens and automatic bucket elevators, will be constructed; and two large storm-overflow sewers are also included in this scheme, which is estimated to cost nearly £60,000. The South-East Eccles area scheme is for the purchase and demolition of about 7 acres of insanitary pro-

perty, and the erection on the site of artisans' dwellings after the necessary road improvements have been carried out. Owing to the very heavy traffic on the main road between Manchester and Liverpool, which passes through this borough, a portion of it, for about 1,800 lin. yds., is to be entirely reconstructed, the old grit setts being replaced by 5-in. by 4-in. granite setts on a foundation of concrete 6 in. thick. This work is estimated to cost £4,140. Peel Green-road for a distance of nearly 400 yds. will be widened from a 6-yd. road to a 14-yd. one, and will be repaved, flagged and kerbed. Additional office accommodation is to be provided on a site at the rear of the town hall for the sanitary and surveyor's departments. Several alternative schemes have been prepared for the laying out of a triangular plot of land in Clarendon-crescent, which the council have under consideration. A large number of private streets at Peel Green will be paved with tar-macadam. The council have obtained powers to borrow £600 for the revision of the 1/500 Ordnance survey of the borough, and this work will probably be undertaken during the present year.

Evesham and Pebworth (Mr. E. HOLLOWAY, M.I.M. AND CO.E., surveyor and inspector to the rural district councils).—The councils contemplate carrying out the undermentioned works this year—viz.: Extension of the water scheme to the parishes of Hampton, Offenham, Badsey, Wickhamford, Aldington; completion of road from Bretforton to Littleton Station; making up of three private streets under the Private Street Works Act, in the parish of Badsey; and a small sewerage scheme in the parish of Ashton-under-Hill. The housing schemes under the Housing Acts are: Offenham, 26 cottages; The Littletons, 20 cottages; Bretforton, 20 cottages; Harvington, 12 cottages; Honeybourne, 10 cottages; Pebworth, 10 cottages.



Exeter (Mr. THOMAS MOULDING, M.INST.C.E., city engineer and surveyor).—During the coming year my council will be considering schemes for improving the sewage disposal works both at St. Thomas and Belle Isle, and also for connecting up the Whipton and Heavitree sewage works to the Belle Isle works. The street widenings in Bartholomew-street, Paul-street and Blackboy-road will be completed during the year, and the necessary workmen's dwellings for housing dispossessed tenants in the above areas will be erected. A scheme for improving the Commercial Road side of Exe Bridge will be before the council. A scheme for improving the steam pumping power at the waterworks will also be submitted for the approval of the water committee. It is intended to consider the resurfacing of several roads, and the paving of Sidwell-street with wood will also be considered. The above work, in addition to the ordinary administrative work, which this year is increased by the annexation of the neighbouring authority, will keep the surveyor busy.



Falmouth (Mr. JOHN S. WALTON, borough engineer and surveyor).—The contractors have now the work of erecting the forty-four houses under the housing scheme well in hand. Four of the houses are occupied, three more are roofed in, and another four are up to the first floor. Plans are being prepared for additions to the Princess Pavilion, which was erected early in 1911. It is proposed to lay out the new cemetery, 7 acres in extent, during the year, an agreement for the purchase of the land having been entered into. A number of private streets will be dealt with under the Private Street Works Act, 1892, and a scheme, estimated to cost £6,000, for dealing with the footpaths throughout the town is under consideration. The paving of the main street is receiving the careful consideration of the council. It is certain that a greater length of roads will be treated with tar next summer, as last year's tarring proved such a success, and also a saving in watering, scavenging and repairs. A scheme for the further widening of High-street, at the old town prison, will be carried out, and the question of a new approach road to the town is being discussed. It is hoped that the East Kerrier Rural District Council and the adjoining landowners will join with the Falmouth Town Council to carry out a scheme to repair the damage caused by the sea at Swanpool. The town council are willing to contribute

substantially to the cost, although the damage is outside the borough boundary.

Farnborough (Mr. J. E. HARGREAVES, surveyor to the urban district council).—The important works to be carried out in this district during 1914 are: Completion of refuse destructor, extensions to the sewage disposal works, extensive footway improvements, erection of artisan dwellings, and sundry private street works. These works represent a prospective capital expenditure of about £18,000.

Foleshill (Mr. A. ERNEST NEWBY, M.I.M. AND CO.E., engineer and surveyor to the rural district council).—During the past year the streams at Bedlam and Holbrooks-lane, Foleshill, have been bridged over, and the highways are now being raised to the required new level and widened. The footpaths in Mill-street, Bedworth, and Station-road, Longford, have been paved with granolithic slabs, and this paving work will be continued in other parts of the district. Other work to be undertaken is a sewerage and sewage disposal scheme for Walsgrave-on-Sowe, the approximate cost of which is £7,000. Additional septic tanks and reconstruction of filter-beds at Bedworth (first scheme) will cost £1,200. The culverting of the stream and widening of Watery-lane, Keresley, owing to the increasing traffic to a new colliery, will be undertaken, and it is the intention of the council to apply to the Road Board for a grant towards the cost of this work. The making good of Sleath's-yard and Eden's-yard, Foleshill, under the Private Street Works Act, 1892, will be taken in hand, notices having already been served upon the owners. Other schemes receiving consideration are a refuse destructor and water reservoir for Bedworth, and the extension of sewers and water mains; also the purchase of a steam road roller instead of hiring.



Friern Barnet (Mr. E. J. REYNOLDS, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—Road widenings, private street improvements, and various works continue to keep the engineer and surveyor's department busy. The widening of the Colney Hatch-lane from about 40 ft. to 50 ft. wide, near the Hornsey boundary, is now proceeding. The widening of the Friern-lane, opposite the North Middlesex golf links and Queen Elizabeth's well, to 50 ft. is being continued. The Friern Watch estate, a large estate in the north of the district, is being developed, new sewers constructed, new streets laid out, and building operations are now in progress on the estate. Plans have been deposited for further developments on the White House and other estates, and a scheme is now in hand for a garden village on the Bethune estate. The building of workmen's cottages in the southern portion of the district will shortly be commenced. The council have purchased and taken over for the purpose of allotments some 5½ acres of land, which includes Rathbone cottages, in Oakleigh-road North, Whetstone. The widening of the bridge carrying the Friern Barnet-road over the Great Northern Railway from 30 ft. to 50 ft. has now been completed. Further improvements have been carried out at the Friary Park. The bowling green is now considered among the finest around London, and winter tennis courts are now in the course of construction. The council have before the Local Government Board an application to borrow money to complete the purchase of land comprising some 22½ acres for the purpose of forming another recreation ground, and the development of this will be commenced as early as possible. A scheme is before the council for the construction of an underground convenience near the Great Northern Railway station. The building trade is brisk in the district, some 200 houses, in addition to other buildings, being in course of erection at the present time.

Frome (Mr. FREDERICK W. JONES, ASSOC.M.INST.C.E., surveyor and waterworks engineer to the urban district council).—The council will consider proposals for modernising the pumping plant at the waterworks and alternative proposals for an entirely new pumping plant. Other questions to be considered will be the reconstruction of Christchurch-street West, carrying out various street improvements, constructing a bridge over the river Frome below the town, and the provision of additional public conveniences.



Gillingham (Mr. JOHN L. REDFERN, borough engineer and surveyor).—It is proposed to widen Woodlands-lane, which at present is about 12 ft. wide, to 40 ft. for a length of 1½ miles, and construct foul and storm sewers. A large relief culvert is to be laid in Dockyard Approach-road. A block of eight workmen's flats will be erected in Wood-street, Brompton, and fifteen artisans' cottages in Toronto-road. Brompton infants' school is to be remodelled.



Godalming (Mr. J. H. NORRIS, borough surveyor and waterworks engineer).—The following proposals are now before this corporation: (1) Construction of new open-air swimming bath; (2) erection of a memorial cloister to Jack Phillips, the "wireless" operator of the "Titanic"; (3) underdraining and grading land at the sewage outfall works, and (4) erection of public sanitary conveniences.

Codmanchester (Mr. C. MAYFIELD, borough engineer).—The only work contemplated is the remaking of the High-street, and for this purpose the borough engineer intends to make use of a new binder, the outcome of the six months' experiments.



Gosforth (Mr. GEO. NELSON, ASSOC. M. INST. C. E., engineer and surveyor to the urban district council).—The following works are receiving the consideration of the council—viz., erection of residence for fire brigade superintendent, making up a number of private streets (tenders are being invited for these works), the provision of open spaces for recreation grounds, an important road improvement in Church-road and Station-road, the purchase of a site for a storeyard and refuse destructor, revision of the building by-laws, and a number of minor works.



Gosport (Mr. HERBERT FROST, engineer and surveyor to the urban district council).—With the exception of the reconstruction of the ferry landing at Portsmouth Harbour, known as the "Hard," the works so far projected for the forthcoming year are not of special importance, being more of the routine order. The sewage outfall at Stokes Bay is already well in hand, and a tender has been let for the substitution of a steel steam main at the air compressing station. The estimated cost of the "Hard" work is £2,800, in ferro-concrete, with greenheart king piles and Purbeck paved surface. About eight new streets are to be made up, and other roads constructed and improved to give increased facilities for intercommunication within the more newly developing parts of the district. Certain lengths of road are to be laid down with Tarmac, and small areas paved with soft wood blocks or asphalt. A number of the older houses at present not connected up with the new drainage system are to be connected up at the general cost, in accordance with a scheme recently approved by the Local Government Board.



Gloucester (Mr. RICHARD READ, ASSOC. M. INST. C. E., city surveyor).—During the coming year it is contemplated to complete the tunnel and syphon under the river Severn in connection with the new sewer outfall. If the recent pumping test of the 15-in. borehole 350 ft. deep in the new red sandstone at Kelford proves satisfactory, it is intended to sink another borehole or a well, with a pumping installation, and probably a 10-in. or 12-in. rising main to the reservoir at Ipleadon, 2½ miles distant. This scheme is being advised upon by Messrs. Fox, Moore, Bateman & Fox, of Victoria-street, London, and will probably be proceeded with during 1914. By the generosity of Mr. Henry Nice, a citizen of Gloucester, twenty-four houses are about to be built on land given by him, subject to their being let at not exceeding 3s. 6d. per week each, the whole, both cottages and land, to become the property of the corporation at the death of Mr. Nice.

Greenock (Mr. ROBERT MILLAR, burgh surveyor).—The works to be carried out during 1914 include the completion of five tenements of dwelling-houses, now

in course of erection, for the housing of the poorer classes. A further and more extensive housing scheme will shortly be proceeded with. In this scheme twenty-four tenements, providing about 216 houses, will be erected on ground recently acquired by the corporation. The cost is estimated at about £30,000. The corporation have under consideration the acquiring of a suitable site for the erection of public baths and wash-houses. A public bowling green and a pleasure ground are to be formed at one of the public parks. An extensive scheme for the repaving of the main thoroughfare is also being considered, and a proposal to carry out an improvement scheme at a part of the town which is very much congested, and where the streets are very narrow.



Grimsby (Mr. H. GILBERT WHYATT, M. INST. C. E., borough engineer and surveyor).—During the past twelve months several constructional works have been carried out, the most important of them being the following: The extension of the new cemetery, the estimate of which was £9,300, has been completed at an actual expenditure of £9,204; the new sewer in Welholme-avenue across the line of an old river bed filled with peat, has also been completed; the length of the sewer was somewhat over 300 yds., and some of the piles reached a length of over 60 ft. During the construction two previous sewers were found, both of which had subsided so much as to be of no further use, and in one position no fewer than five different roads were found superimposed, the total thickness of road metal being nearly 6 ft. The estimated cost was £1,560, but the actual cost of the work will probably not exceed £1,390. The conveniences for both sexes at Nelson-street have been completed, at a total cost of £553. The ventilation of the sewers of the Western District, the estimate for which was £850, is now approaching completion. The construction of the culverting of the fresh-water streams in the Clee District received sanction of the Local Government Board, at an estimated cost of £5,990, and the work is now in hand, the accepted tender being £5,663. Stables for the Watch Committee are now approaching completion, the tender being £248. The construction of a new street on the corporation estate is now well in hand, the tender being £599; and in December a tender was accepted for the construction of streets upon the Freeman's estate for the sum of £3,639, and this work is now in hand. The corporation, last autumn, appointed a whole-time town clerk, the last town clerk, who had held office for over fifty-two years, having died, being, at his death, the oldest and the longest appointed town clerk in the country. Offices are now being constructed in the municipal buildings for the newly appointed town clerk, at a cost, including furnishing, of nearly £700. Schemes are before the Local Government Board for the purchase of the Fisherlads' Institute in the town, at an estimated cost of £2,476, and also for the construction of public conveniences for both sexes in Hainton-square, and for males only near Welholme-road level crossing, at a total estimate for the two of £1,100. Sanction has been received from the Local Government Board for the construction of new sewers and culverts in the Ainstie-street and Wintringham-road district, at an estimated cost of £7,948, and tenders are being obtained for the constructional work. Schemes are now being prepared for the construction of a foot subway under the railway at Wellowgate, at an estimated cost of £3,600; the widening and improvement of Weelsby-road and Bargate, including the construction of a bridge under the Great Northern Railway, the estimate probably being £18,000; additional slipper baths at the Oxford-street lavatories; further public conveniences in Pasture-street and Ropery-street, and for an open-air bath 100 ft. in length. A town planning scheme will be put in hand early in the new year, this matter having been delayed owing to the change in the town clerkship. A committee is considering the erection of a new bridge over one of the docks, on the cantilever principle, but a certain section of the town council think, for the present, it would suffice to repair the present swing bridge. A scheme for the erection of a porter's lodge and reception office at the sanatorium will probably be prepared early in the year, the expenditure having been delayed from this last year in order that laundry machinery, at an estimated cost of £400, might be installed. The Great Central Railway obtained Parliamentary powers in 1912 for the construction of a large extension to their fish dock at Grimsby, and as trial borings, for the purpose of preparing the plans

for the lock pit, were taken last autumn, it is anticipated that work will be commenced early in 1914.



Guildford (Mr. C. G. MASON, ASSOC. M. INST. C. E., borough engineer and surveyor).—The council propose to erect new offices and carry out an important street widening to open up a district to the south of the town, at a cost of from £6,000 to £7,000. A proposal to widen the main road from

London, commencing at the northern boundary of the borough, and continuing a distance of 1,300 yds. on the western side, is receiving careful consideration, and will no doubt be carried out in order to facilitate the motor traffic through the town. A new secondary school, to accommodate 235 girls, is to be opened during the coming year, and a suggestion is being considered to extend the technical institute. Several large building estates are being laid out in the borough, and further developments in this direction are likely. A good many trial sections of road surfacing have recently been laid, and other experiments will doubtless be carried out in the near future. A new artesian tubed well is being sunk to the north of the town, and water has already been found in considerable quantities.

Halifax (Mr. JAMES LORD, M. INST. C. E., A. M. I. E. E., borough engineer and surveyor).—In addition to the usual maintenance works, a considerable amount of granite paving will be carried out on certain of the main roads. An important widening of the Huddersfield-road, co-extensive with the sewage works, involving the construction of a heavy retaining wall, and doubling the existing tramway, will be taken in hand on receiving sanction from the Local Government Board. Towards this scheme the Road Board have made a substantial contribution. It is proposed to relay portions of the tramway permanent way in Haley-hill, Gibbet-street, and Commercial-street. The 48-in. cast-iron main outfall sewer in the bed of the Hebble Brook will probably reach completion, while contracts are about to be made for relaying the 24-in., 18-in., and 15-in. cast-iron sewers in the higher reaches of the Hebble Brook. A start is about to be made on the first section of the Ovenden sewerage scheme. The sewage works will probably be completed by a scheme for the treatment of storm water by the provision of "stand-by" tanks and appurtenances. The schemes for town planning in Ovenden, Warley, and Bradshaw are in preparation, permission to proceed in each case having been granted by the Local Government Board.



Harrogate (Mr. C. E. RIVERS, ASSOC. M. INST. C. E., borough engineer and surveyor).—Among the works projected for the year 1914 are the duplication of about 1 mile of inverted cast-iron siphons on the south outfall sewer, the provision of new surface-water drainage schemes for several districts in the borough, and the relaying of several old sewers; the laying of a new sulphur-water main from the springs on the Harlow Car estate, which has been recently purchased by the corporation, and which is situated just outside the borough; the erection of a new elementary school for 450 children; and the erection of a new bandstand and shelters in the Crescent Gardens. Private street improvement works will proceed as usual; twelve streets are now in hand, or are to be commenced shortly, and plans are being prepared for a further fifteen streets. The council have under consideration the provision of a refuse destructor, several improvements to the Stray, the provision of a municipal golf course, and alterations to the Kursaal. The work of converting the roads from ordinary water-bound macadam to tar-macadam will be continued.



Hartlepool (Mr. A. P. HORSLEY, borough engineer and surveyor).—The council have under consideration a scheme for clearing away a large insanitary area in the centre of the town, and the erection of about 100 artisans' dwellings on the site. The council have passed plans for a public shelter and lavatories on the Headland Promenade, and a new elementary school for 841 scholars. The new cemetery chapels and lodge



are now in course of erection, also the workmen's dwellings in High-street.

Harwich (Mr. F. HAROLD FRENCH, borough surveyor).—The projected works for 1914 comprise sewerage works and new pumping plant, estimated cost £3,000; extensions of sewerage system; main road widenings and improvements, estimated at £2,000; resurfacing a considerable length of main road; and completion of new elementary school, known as Hill schools.



Haslingden (Mr. J. SINGLETON GREEN, borough engineer and surveyor).—Several important road widening schemes have been prepared, which will probably be carried out during the present year. An improvement at Acre on the main road will include the setting back of a retaining wall which supports the road, and is about 17 ft. deep. This wall will be built upon reinforced concrete foundations. The erection of a new council school, estimated to cost close on £20,000, is progressing, and is expected to be near completion towards the end of the year. The council also propose to erect new education offices, plans of which have been prepared by the borough surveyor. Several important drainage schemes will be carried out, and lengths of road treated with Rocmac. In addition to the resurfacing of the roads and maintenance of sewers, a number of private street improvement works will be completed. There is also a scheme on hand for developing a portion of Knowl Gap estate as a garden city, and plans for this have been deposited with the town council.



Haverfordwest (Mr. W. BEVAN, M. I. M. U. N. E., C. R. S. I., borough surveyor, water and gas engineer, and sanitary inspector).—The year 1914 promises to be a fairly busy one as regards municipal matters. The town council will have under consideration the advisability of erecting a refuse destructor for the disposal of the town's refuse. They have decided to apply to the Local Government Board for a loan for the installation of a complete scheme of sewer ventilation on the Webb's sewer ventilating lamp system, and an application is now before the Local Government Board for a loan for the purchase and laying out of about 5 acres of land, adjoining St. Martin's burial ground, as a public cemetery, which it is hoped will mature during the present year. New paving work is to be undertaken in Dew-street and Barn-street, and an application will be made to the Road Board for a grant in aid of removing a dangerous corner and carrying out a much-needed improvement in City-road, opposite St. Martin's burial ground on the St. David's-road. The old pebble paving in Tower-hill, Goat-street and Rosemary-lane will in all probability be taken up, and the roadways made up on the Rocmac system, or with tar-macadam. A few short lengths of defective sewers will be reconstructed on modern principles, and the council will consider the installation of a water level indicating apparatus communicating between the high-level reservoir, the borough surveyor's office, and the pumping station. An improvement is to be effected on the fair ground in Merlin's Hill, by properly draining, sloping and surfacing a considerable area with impervious material; and a street improvement scheme, involving the demolition of a house adjoining the Bethesda Baptist Church is to be considered forthwith. An application now lies with the Local Government Board for sanction to a loan for the erection of a new gasholder at the corporation gasworks, and provisional tenders have been accepted for the work, which will probably be put in hand early in the spring. It is quite possible that the erection of an isolation hospital for the borough will again engage the attention of the town council, as the joint isolation hospital scheme that has been before the county council for the last two years has been deferred indefinitely.

Haworth (Mr. JAMES REDMAN, surveyor to the urban district council).—During the past few years the council have spent £3,000 on road widenings and general improvements, and it is proposed shortly to finish the widening of the Lees and Hebden Bridge main road at Lees. This has become necessary by reason of the trackless trolley system, which has been installed by the Keighley Corporation, who have obtained sanction

to run into the district. There is also on foot a movement to establish a free library, which is being supported fairly well.

Hayes (Mr. DOUGLAS C. FIDLER, M.S.E., engineer and surveyor to the urban district council).—The following works will be proceeded with during the ensuing twelve months: Private street works, costing about £6,000; Yeading housing scheme, consisting of twenty-two houses, and costing about £5,000; Yeading sewerage scheme, consisting of about 2,000 yds. of sewers, an ejector station, rising and air mains, estimated cost £3,000; Botwell housing scheme will probably cost about £12,000. The sewage disposal works will be enlarged and additional percolating filters provided, and the town planning of the district proceeded with in accordance with the request of the Local Government Board.



Hebden Bridge (Mr. T. WADDINGHAM, surveyor and water engineer to the urban district council).—A new road-retaining wall will be built on the Todmorden, Halifax and Bannley main road, alongside the Rochdale Canal, for about 110 yds. Schemes have been submitted to the Road

Board for two widenings on this main road, to be carried out at an estimated cost of £4,500. These include the demolition of buildings and the widening of one bridge over the river Hebden at West End, and the erection of a new steel girder bridge to replace a stone arched bridge over the Golden Water, at Bank-foot. Several streets in the town will be repaved with Lancashire setts, and many private streets will be made up, principally with sett paving. The tar-spraying of roads will be continued, and a portion of the Todmorden main road at King-street will be recoated with tarred slag. An additional filter-bed will be constructed at the Hollin Hall filtration works. Additional hydrants and valves will be fixed on 3-in., 4-in., 6-in. and 8-in. water mains throughout the town, and a waste-water detecting meter will be fixed on the 10-in. main at Hollin Hall. The sewage from a large adjoining portion of the Todmorden Rural District's area will be connected up to the council's system. The enlargement of the filtration accommodation at the sewage disposal works will, it is expected, be commenced early in the year. Surface and spring water will be disconnected from the sewers in several districts, and new sewers laid for this water, thus relieving the pumping at the sewage disposal works. The question of providing additional public conveniences is under consideration. The work of widening the Station-road bridge over the Rochdale Canal will be commenced by the Lancashire and Yorkshire Railway Company at an early date. The council have appointed a committee to consider the question of providing public baths.



Herefordshire (Mr. G. H. JACK, F.G.S., M.S.A., county surveyor, architect and bridgemaister).—Further progress will be made with the four years' scheme of road reconstruction under Road Board grants. Roughly the work to be done during 1914-15 consists of 7 miles of new foundations and 8 miles of Tarmac surface, together with some miles of draining.

The bulk of the main roads of Herefordshire, 434 miles, are now maintained by direct management, only 30 miles being dealt with under the old contract system. Several bridges and culverts are to be rebuilt, and the ancient 6-arch bridge and culverts over the river Wye at Ross is to be strengthened and the parapets rebuilt. This, one of the finest masonry bridges in the West of England, was built late in the sixteenth century. The architectural department will be kept busy with the building of two new schools, and enlargements and improvements to several old ones. Preliminary plans are in preparation for new county offices, new police court at Ross, and additions to the county asylum. Sketch plans have been prepared for the establishment of a sanatorium for the treatment of tuberculosis on high ground near the city of Hereford.

Hertford (Mr. J. H. JEVONS, ASSOC. M. INST. C. E., borough surveyor and waterworks engineer).—The works projected for next year include new sewage disposal works and about 4,000 yds. of new water mains.

Hessle (Mr. W. COULSON, surveyor to the urban district council).—With respect to projected works, the council are in virtually the same position as they were

last year. In addition, they propose erecting, as an experiment, six working-class dwellings under the Housing of the Working Classes Act, 1899. The council are also proceeding to get authority to prepare a town planning scheme for the district.



Heywood (Mr. JAMES B. NUTTALL, borough surveyor).—In addition to the usual amount of work for the various committees of the corporation, the borough surveyor will be called upon to maintain the main and secondary roads and highways in the borough, the macadam surfaces being tar-sprayed again. The constructional works in hand include granite paving (£13,000 sanctioned), widening of Heap Brow (£1,100 sanctioned), and more than the average amount of private street works. Besides these it is expected that during the coming year the following will mature—viz., laying out as a miniature park the proposed town hall site, and the provision of a new market ground and public conveniences; extensions of electricity works for a bulk supply; further development of recreation grounds and provision of a playing field for secondary school purposes; and, in all probability, the opening stages connected with the town planning scheme.

High Wycombe (Mr. T. J. RUSHBROOKE, borough surveyor and waterworks engineer).—It is proposed to extend the use of tar-macadam in road reconstruction. A scheme has been prepared for the erection of fifty-four workmen's dwellings, which it is hoped will be erected during the present year. The estimated cost is £11,200. The provision of a refuse destructor is under consideration. It is hoped that the sewage disposal scheme (£33,500), prepared last year, will be proceeded with during the coming year. A town planning competition was held during the past year, the first prize being awarded to Mr. E. W. Turner, of Sheffield. It has not yet been decided to take any further steps. A new road with ferro-concrete bridge is proposed to be constructed, connecting the manufacturing part of the town now directly with the main London and Oxford roads. Further extensions of water mains are to be carried out.



Hinckley (Mr. E. H. CRUMP, ASSOC. M. INST. C. E., surveyor and waterworks engineer to the urban district council).—Additional working-class houses similar to those now being erected will be provided. The parish of Burbage will be provided with a new water scheme. Experiments are now being conducted at the sewage disposal works with a view to the provision of

additional liquefying tanks, and the treatment of the whole of the sewage by means of trickle beds, and such scheme will probably be prepared during the coming year. It is also hoped to provide a refuse destructor in connection with this scheme. Additional lengths of tar-macadam roadway will be laid, and the work of tar-spraying all other roads will be continued.



Hindley (Mr. OSWALD P. ABBOTT, engineer and surveyor to the urban district council).—A large number of private streets will be constructed during the year, and the conversion of grit paving to granite paving on the main roads will be continued. Electricity is intended to be distributed in a portion of

the district under the council's electric lighting order. A contract for the fencing and draining required at the proposed infectious diseases hospital has been made, and the building of a part of the hospital is expected to be commenced in the spring. Plans are in course of preparation for a new elementary school at Platt Bridge to accommodate 450 scholars, and building will be commenced as early as possible. Extensions to the Platt Bridge sewage works are proposed; the sub-pumping station in connection with the works is nearing completion. The question of a public bowling green is under consideration.

Holsworthy (Mr. FRANK J. HARRIS, M. INST. M. AND C. E., ASSOC. M. R. SAN. I., surveyor to the rural district council).—The work in the highway department for next year (besides the ordinary routine) consists chiefly in the substitution of imported basalt and granite for inferior local material, and the substitution of clean limestone binding for all main roads to replace mud binding. The widening, filling and strengthening of sides of roads will also be taken in

hand, in addition to the ballasting and altering gradients and contour of roads subject to heavy traffic. It is intended to abolish the contract system for all main roads and, it is to be hoped, for district roads at an early date. In the sanitary department very little work will be done besides the routine work of inspecting. Both the urban and rural councils, however, are pledged to build houses to replace old and insanitary dwellings, and to meet the increased demand for working-class cottages. The urban council are taking this in hand, and are offering a premium for competitive plans for the first block of houses.

Holland, Lincs, South Division (Mr. A. W. LLOYD, district county surveyor).—The following works are proposed in this division during the present year: Lyme-road (from Sutton Bridge to Norfolk boundary, length 1½ miles).—It is proposed to widen, remet and steam roll this road. Boston-road (Spalding boundary to Surfleet, length 2½ miles).—It is proposed to remet and steam roll this length. Other roads, having a total length of just over 2 miles, are to be remet and steam rolled. Tar-spraying.—It is proposed to tar-spray the main road from Spalding to the Norfolk boundary (east of Sutton Bridge), a length of about 11 miles. This is the main road to many East Coast resorts, and consequently much used by motor traffic. The total amount to be spent on roads and footpaths in this division is about £10,000. An application has been made to the Road Board for a grant towards the roads named and the tar-spraying.



Honiton (Mr. A. TILLOTSON, M.I.M.E., borough surveyor, sanitary inspector and waterworks manager).—The town council are applying to the Local Government Board for sanction to borrow £4,500 for the carrying out of a scheme, prepared by the borough surveyor, for sewer extensions and alterations, and also new sewage disposal works. The work is expected to be carried out this year. A scheme is likewise in preparation for the extension and improvement of the water supply, at an estimated cost of about £3,000.



Horsforth (Mr. H. RAVEN, M.I.M.E. AND CO. E., R.SAN. I., M.I.MUN.E., engineer, surveyor and waterworks manager to the urban district council).—The work proposed during the next year, apart from the ordinary routine work, is as follows: The erection of a two-cell destructor, with appurtenant works; sewerage of the Newlay district of the council area; erection of a pumping station, and provision of extra filters at the sewage works, and several street improvements and private street works. Public baths are also under consideration.

Horsham (Mr. R. RENWICK, surveyor and water engineer to the urban district council).—No new works of any importance are in contemplation for the coming year.



Hove (Mr. H. H. SCOTT, borough surveyor).—The enlargement of the police department at the town hall will shortly be put in hand, together with the construction of underground lavatories for men and women near the town hall, and of another on the Western Esplanade. The town council have approved plans, &c., for widening Hove-street, at an estimated cost of £10,000, and have agreed to contribute £3,750 towards the reconstruction of the railway bridge over Sackville-road.

Hoyland Nether (Mr. F. J. THACKRAY, surveyor to the urban district council).—It is anticipated that sanction will be received from the Local Government Board to proceed with the construction of humus tanks and sludge lagoons at the sewage disposal works, in accordance with the plans prepared by the surveyor. The council have definitely decided upon a small housing scheme, and the surveyor has been instructed to prepare the necessary plans. The provision of a covered swimming bath is also to receive the attention of the council during the forthcoming year, the council having abandoned the idea of an open-air bath. The proposed scheme for the lighting of the district by means of electricity has considerably advanced during the past year, and it is anticipated that a definite scheme will be decided upon during the early part of the year.



Hucknall Torkard (Mr. W. SWANN, surveyor and waterworks engineer to the urban district council).—The council have under consideration the widening of Nottingham-road, Spring-street, and Watnall-road, according to plans and estimates prepared by the surveyor. A considerable length of tarred material (Tarmac) is being laid on the grant-in-aid roads.



Huddersfield (Mr. K. F. CAMPBELL, M.I.M.E., borough engineer and surveyor).—In addition to the usual work connected with the maintenance of highways and sewerage system of the borough, a commencement will be made with granite and wood paving of certain sections of six main roads within the borough, involving an expenditure of £72,000. Various improvement schemes will also be carried out as properties are acquired under a recent Provisional Order. The extension of the tramway system, a portion of which is now in course of construction from the borough boundary to the neighbouring town of Elland, will be completed during the early part of the year, after which it is proposed to commence other extensions for which Parliamentary powers were obtained last year, involving an expenditure of £126,378. The corporation propose to erect 500 working-class dwellings in various parts of the borough. The Local Government Board have approved of a loan amounting to £103,555 for the purchase of land, and the erection of Houses under Part III. of the Housing of the Working Classes Act, 1890. An application will shortly be submitted to the Local Government Board for authority to prepare a comprehensive scheme of town planning confined to three areas within the borough. The preparation of plans for new baths and washhouses is in progress, and it is intended to deal with this subject on an extensive scale early next year. Plans and estimates are now before the Local Government Board and the Board of Education for the erection of a tuberculosis hospital for children and adults, involving an expenditure of about £20,000. Three large additions are in progress to existing schools for the Education Committee. Plans and estimates have been prepared in connection with an open-air school, and the subject is one which will be dealt with on an early date. From the foregoing short account of the special works committed to the corporation during the ensuing year, it will be observed that a very busy time may be anticipated in the engineer's department for some time to come.



Hull (Mr. A. E. WHITE, M.I.M.E., city engineer).—No street works or street widenings are likely to be carried out. A certain number of paving works will be undertaken in existing streets, including the paving of two streets with granited asphalt, which has not hitherto been tried in the town. The tramway extension on Hessle-road is nearly completed, and afterwards a loop through Brook-street and Jameson-street will be put in hand. This will probably be followed by other extensions which have been authorised. It is intended to erect extensive repair shops at the Liverpool Street depot. The ground is being levelled for the erection of a tuberculosis hospital at Cottingham Castle. Early in 1913 a boating lake was presented to the town by the Rt. Hon. T. R. Ferens, M.P. for East Hull, and this has proved such a success financially that it is proposed to add about 3 acres to the lake. It is also proposed to construct another bowling green, and make some minor improvements at the parks. The Education Committee will continue to add to their schools.



Hyde (Mr. JAMES DIGGLE, ASSOC. M.I.M.E., borough and water engineer).—The council are now completing the construction of a new swimming bath and other offices in connection therewith, at a cost of about £9,000. They are also extending the town hall by the addition of a large public hall, police and coroner's courts, cells and other offices, at a cost of £15,000. This work will probably be completed by the end of next October. Borrowing powers for additional sewerage, and the paving of certain highways with granite, estimated to cost about £6,000, are also under consideration.

Ilford (Mr. H. Shaw, M.INST.C.E., engineer and surveyor to the urban district council).—The projected works in Ilford for the forthcoming year include town hall extensions—£20,000. The council have approved plans for this, and quantities are about to be prepared. It is intended to commence the work in the early part of 1914. The extensions consist of new offices and council chamber, committee rooms, minor hall, extensions to stage and dressing rooms. Baths.—Sketch plans and rough estimate have been prepared for new baths to be erected at a cost of about £18,000. Outfall Works.—Extensions will be made to the outfall works. The laying of a new main sewer is contemplated. The town planning scheme will be dealt with by a special committee of the council. Goodmayes recreation ground will be extended by about 17 acres. Motor fire pump and first-aid equipment and tender will be supplied by Merryweather & Sons, Limited, subject to the consent of the Local Government Board. Plans have been prepared, and it is proposed to commence the erection, as early as possible, of extensions to the hospital for the treatment of consumptives. It is also proposed to erect a refuse destructor, at an estimated inclusive cost of £21,578. The usual number of private street works, laying out new estates, road and sewer construction and channelling, will be carried out as in former years. An electricity transformer station is about to be erected, at an estimated cost of £4,000, and the council are at present considering plans and estimates for artisans' dwellings.



Ilkley (Mr. T. H. SMITH, surveyor to the urban district council).—The council have under consideration the installation of electric light in the town, including the erection of a power station and the laying of mains and services, at a cost of £18,000. Application has been made to the Local Government Board for sanction to the borrowing of the money. In connection with the laying out of "The Holmes" as pleasure grounds, sanction to a loan of £9,500 is being sought. This scheme includes a suspension bridge over the river Wharfe, an open-air swimming bath in reinforced concrete, a large shelter, bandstand, fountain, conveniences, and a special playground with boating pool for children. The Winter Garden, which is being built as an annexe to the town hall, will probably be opened early in the year, as also will the underground public conveniences in Station-road. At the sewage works, two percolating filters, each 80-ft. diameter, have been installed. During the past year a large number of private streets have been made up and taken over by the council, and this policy will be continued during the coming year.

Inverkeithing (Mr. DAVID GALLOWAY, burgh surveyor and master of works).—The council propose to renew 3 miles of roads in macadam and tar-macadam, reconstruct the bridge at the harbour, and erect new public conveniences. The town planning scheme, which embraces a large area within and beyond the burgh, is expected to be in operation during 1914. Owing to the large amount of labour in the district, and the housing accommodation being rather limited, the town planning area is expected to be built on rapidly. This will mean the construction of new roads, large extensions to distributing water mains, and a complete new sewerage scheme.



Ipswich (Mr. JOHN R. MEAD, borough engineer and surveyor).—The following works will be carried out during the year: Extensions to infectious diseases hospital, £5,000; extensions to borough sanatorium, £4,500; school clinic, tuberculosis dispensary, and new offices for medical officer, £7,250; ferro-concrete bridge over Orwell, £3,000; steel bacule bridge over Orwell, £7,500; and public swimming and slipper baths, £7,000. Schemes are being prepared (and the work will be commenced during the year) for modernising the sewage works, providing new plant for lifting the sludge, erecting a storage reservoir for the sludge, building a new jetty and steam barges for removing the sludge, and disposing of the sludge by taking it out to sea. A portion of the corporation estate will be developed on the lines laid down in the town planning scheme, which was prepared in connection with the competition open to the public.

Kettering (Mr. THOMAS READER SMITH, ASSOC.M. INST.C.E., engineer and surveyor to the urban district council).—The principal work in the current year, so far as the surveyor's department is concerned, will prob-

ably be the erection of new public baths, comprising both an open-air bath and covered swimming bath. The preliminary works, consisting of concrete foundations and bath walls, are being executed directly by the council, and the contracts for the constructional works will be offered early in the year. A cleansing and disinfecting station is also in hand, and this will be completed in the early months of the year. Various matters are under consideration, but no further works have at present been decided on.

Kidderminster (Mr. A. JAMES, borough surveyor).—The council will have under consideration the drainage of the areas recently incorporated into the borough, and new sewage disposal works; also a scheme for strengthening the foundations of certain main roads, due to the inauguration of a motor bus service, and the tar-painting of 7½ miles of roads and gravelled footpaths.

Kingston-upon-Thames (Mr. R. HAMPTON CLUGAS, borough surveyor).—The principal work for the year, in addition to the ordinary routine work, includes extensive road widening of the main London road. The corporation have completed the contract for wood-paving various streets at a cost of £15,000, and propose adding to the area by including St. James's-road and Penrhyn-road. Additional overground conveniences are to be constructed, and the relaying of a bowling green with Cumberland turf; making two Cumberland turf greens. Other projected works include the laying out of extra hard tennis courts, and alterations to the town hall. A proposal to provide a new justices' court and to rearrange the present courts is being considered by the committee. Several streets will be made up under the Private Streets Works Act during the year.

Kiveton Park (Mr. FRANK HEWITT, F.S.L., engineer and surveyor to the rural district council).—Sewerage.—The sanction of the Local Government Board having been received to a scheme of additional sewers at Dinnington, the work will shortly be commenced. Surface-water sewers at Kiveton Park and Firbeck are being laid at present, and plans for several others are in preparation. The sanction of the Local Government Board to a surface-water scheme prepared by the surveyor for part of Dinnington is expected shortly. The work is estimated to cost about £1,300, and consists of stoneware pipes and steel-ribbed concrete tubes, with all manholes. The outfall sewer from South Anston having subsided, it is to be raised; the pipes are of iron carried on back piers. Several sewer extensions are contemplated in various parishes. Sewage Disposal.—The surveyor is preparing a scheme of sewerage and sewage disposal for the hamlet of Waleswood. Drawings for considerable enlargements of Dinnington outfall works have been prepared by the surveyor, and are ready for despatch to the Local Government Board. The work proposed includes screening chambers, pumping sumps, alterations to engine-house, storm-water tanks, septic tanks, humus pits, filters, and sludge-drying beds. The cost will be nearly £4,000. The surveyor has received instructions to get out plans for extension to the sewage works at Kiveton Park embracing screening chambers, sludge beds and sand filters. Improvements at Anston sewage works may also be asked for during the year, and small improvements to the Woodsetts works. The Local Government Board are pressing the council to proceed with a scheme of sewerage and sewage disposal for Harthill. Refuse Destructor.—Some improvements will be made to the destructor during the year. Water Supply.—The Thorpe Salvin scheme is nearly completed. A number of extensions of water mains are to be made this year in various parts of the district. Buildings.—The alterations to the council offices are now completed, and specifications for the painting work are being prepared. The question of erecting depot buildings from the plans already prepared by the surveyor is like to come up shortly. Instructions have been given for the preparation of drawings for a mortuary at Dinnington. Public conveniences are to be erected at Dinnington and Kiveton Park. Over 100 houses are in course of erection in Dinnington. Bridges.—Turner Wood Bridge was recently reconstructed in steel. The surveyor is preparing plans for a new bridge at Hardlane. Highways.—Several widenings in Laughton-road have been recently completed, and plans are nearly finished for six other road widening schemes. These are to be followed by about seven more. The Local Government Board's sanction to the Outgaulane improvement scheme is expected. The surveyor's estimate for the work is £600. A large amount of re-surfacing will be done during 1915 with granite, slag,

limestone and tar-macadam, and considerable tar-spraying and tar-grouting carried out. An additional tar boiler and sprayer will probably be obtained. Private Streets.—A large number of private streets require making up at Dinnington, Anston, Harthill and Kiveton Park, and application has been made to adopt the Private Street Works Act, 1892. The surveyor has prepared a scheme for the surface-water drainage of several back streets at Dinnington, and the work will probably be done during the year.



Knaresborough (Mr. ROBERT E. WILSON, M.I.M. AND CO.E., surveyor to the urban district council).—In addition to the ordinary routine work, the council intend widening Stockwell-lane to 36 ft., and also to lay a new asphalt footpath, 9 ft. wide, in Stockwell-road, and one 6 ft. wide in Stockwell-lane. About 600 yds. of 9-in.

sewer is to be laid in Park-lane, Stockwell-lane and High Bond-end. A portion of the old stone culvert in Kirkgate is to be replaced with 9-in. earthenware pipes. A new three-stall urinal is to be erected in High-street. Application is being made to the Road Board for a grant towards the reconstruction of the roadway in High-street and York-road. The numbering of houses and naming of streets not already named will be carried out. The question of putting down electric lighting plant for street lighting is now being considered by the council.



Knaresborough (Mr. W. LUPTON and Mr. J. H. HALSTEAD, surveyors to the rural district council).—During the past year several lengths of new drainage work have been carried out, and inspections under the Housing Acts have been made. The chief work to be carried out during the coming year,

in addition to the ordinary sanitary and highway work, will be private street works in about six parishes, and the widening of several dangerous corners on main and district roads. Extra lengths of main and district roads are to be tar-sprayed, as the success of this work during the past four years warrants its extension. Several miles of new footpaths are to be made, while many of the present gravel footpaths are to be asphalted.



Leeds (Mr. W. T. LANCASHIRE M.INST.C.E., city engineer and surveyor, and building surveyor).—The work necessitated by the extension of the city boundaries in November, 1912,

is in hand, the outlet sewer having been carried a considerable distance up the main valley, and the completion of the scheme will occupy at least another twelve months. A considerable part of the added area and the adjacent portions of the city as it existed prior to the extension of the boundaries, have been included in two town planning schemes, comprising altogether about 3,700 acres, which have been approved by the city council. During the last Session Parliamentary powers were obtained for the construction of a new street 60 ft. wide in connection with the extension of the Leeds General Infirmary. This street will afford a valuable alternative route to the north-west suburbs. Most of the land has already been purchased, and demolition is being proceeded with. The reconstruction of the area in the centre of the city, containing about 66 acres of slum property which was acquired under the Housing of the Working Classes Act, 1890, is proceeding steadily. To date upwards of 1,600 houses have been demolished, and the diversion and culverting of becks, extensions of subways for pipes, and the widening and construction of new thoroughfares is being dealt with. The construction of a new road 60 ft. wide and about ½ mile long, lying about 1 mile east of the centre of the city, is in hand. The question of the housing of the working classes is receiving considerable attention, and a census has been prepared of the unoccupied houses in the city, but no decision as to housing by the municipality has yet been arrived at. The tramways department are now constructing central sheds for trams and work on the plot of land purchased from the Improvements Committee in the centre of the city. Under Mr. G. A. Hart, M.INST.C.E., considerable progress has been made with regard to the sewage disposal works at Thorpe Stapleton, and contracts have been let for the construction of a portion of the high-level im-

cepting sewer, and for portions of the new disposal works; some of these works are being carried out at the present time. Parliamentary powers are being obtained for waterworks, including the laying of a long line of pipes in connection with the supply of water to Doncaster and other places, and for considerable extensions of the tramway system, trackless trolley system, and street widenings in connection therewith.



Leek (Mr. W. E. BEACHAM, surveyor and waterworks engineer to the urban district council).—During the past year the main sewerage of the town has been proceeded with, and the western outfall sewer coupled with that of the north district preparatory to dealing with the provision of sewage disposal works for that area. A new convenience has just been completed, and during the year the first-class swimming bath at the public baths has been stripped and retiled and a serious leakage remedied. During the present year Ashborne-road and Buxton-road, both county main roads, will be widened and improved. Plans for the laying out of Brough Park are being prepared, and an early application to the Local Government Board is intended, so that the work may be proceeded with. The housing scheme which was under consideration at the early part of last year, but was deferred to await the result of local enterprise, is likely to be again advocated, as there is still a dearth of houses of the artisan type in the town. Several street widenings are under consideration, and are likely to receive attention. The new council school, which has been erected under the supervision of the surveyor, is just opened. Extensions and additions to the disposal works at the south district are foreshadowed, and altogether the year promises to be up to the average in municipal progress.



Leicester (Mr. E. GEORGE MAWPEY, M.INST.C.E., borough engineer and surveyor).—Several important works will probably be put in hand during the year. Chief among these may be mentioned a storm-water sewage disposal scheme. The Local Government Board inquiry for this has been held. Another work will be the extension of the electric tramways, sanctioned by Parliament last year. One route will be commenced in the early spring. A large building for car-repairing shops has just been started in Abbey Park-road, as an additional to the main car depot, the estimated cost of which work is about £23,000. The extension of the tramway generating station and erection of a new chimney shaft will shortly be carried out. A start has been made with the work of the improvement of another section of the Willow Brook. The estimated cost is £5,025, and the work will be done by direct labour. Extensive street improvements in connection with the electric tramway extensions will be taken in hand during the year, and three new public conveniences will be built.



Leighton Buzzard (Mr. E. J. SAUNDERS, A.R.SAN.I., surveyor to the urban district council).—A scheme has been prepared for an additional water supply for street watering purposes. An artesian-bored tube well has been sunk, and application for a loan has been made to the Local Government Board for the carrying out of the scheme. A new fire engine-house, to be built on the same site as the old, off North-street, is also included in the application. It is anticipated that tar-painting will be extended to some of the main roads resurfaced this winter.

Leiston-cum-Sizewell (Mr. CHARLES F. BROWN, M.I.M. AND CO.E., A.R.SAN.I., water engineer, surveyor, and inspector to the urban district council).—The council are in negotiation for the purchase of land on which to erect some fifty or sixty houses for the working classes. Plans are also to be prepared for the laying out of about 4 acres of land as a cemetery. Plans have been prepared for the erection of an engine driver's cottage; also forming roadways, fencing site, and providing entrance gates at the new waterworks pumping station, and application is to be made for sanction to the necessary loan. The new liquefying tanks at the sewage outfall works are nearing completion, and should be

in operation early in the new year. Certain private street works will also be carried out under the 1892 Act.



Lincoln (Mr. R. A. MacBRAIR, M.INST.C.E., city engineer and surveyor).—The Lincoln Corporation are considering large schemes for the extension of the city boundaries and the provision of houses for the working classes. If the first named is carried out as proposed Lincoln will be more than double its present size. A phthisis sanatorium, with all necessary buildings, sewage sprinklers at the sewage farm, the laying out of three old burial grounds for the public use, the construction of a bowling green in the recreation ground in Monks-road, and the construction of a bathing-place on the river Witham at the east end of the city will be put in hand. The building of a refuse destructor, of the Heenan & Froude type, has just commenced. The following works commenced will be completed—viz.: Administrative block and pavilion at the city infectious diseases hospital, the recreation ground in Westgate, and the continuation of the tar-macadamisation of the suburban roads, with the help of the Road Board. A complete new set of building by-laws will be adopted as the final revision will shortly be considered. A length of the river wall behind the old houses on the High Bridge (a feature well known to tourists), the repair of which has been in dispute for many years, will be taken in hand. The work is to be carried out at the joint expense of the corporation, the Great Northern Railway, and the owners. The place is locally known as "Glory Hole," a name given humorously, considering all circumstances.

Littleborough (Mr. GEORGE H. WILD, surveyor to the urban district council).—The work to be carried out includes the conversion of macadam, on Todmorden-road, about 1½ miles, to granite-sett paving on a concrete foundation, at a cost of £9,600; also a portion of Halifax-road. Several private street improvements are to be proceeded with, and an extension of sewer in the Summit district, where an estate is to be developed on garden city lines.

London, Deptford (Mr. J. SUTCLIFFE, ASSOC. M. INST.C.E., borough surveyor).—Plans are in preparation for the erection of a public library and a public baths and wash-houses in Evelyn-street; a well is to be sunk for the water supply. The Jarrah wood-block paving of High-street, and the 6-in. concrete foundation are to be taken up, and a 2-in. thickness of asphalt laid on a 9-in. bed of concrete, at an estimated cost of £3,128, early in the year. White Post-lane has been taken over as a new street, and the work of paving is at present in hand. Other paving works to be put in hand during the year include the making up of portions of each of the following roads—viz., St. Norbert-road, Arica-road, Revelon-road, and Avignon-road. The carriageway breasts of New Cross-road, Deptford Broadway, and the portions of Deptford Bridge and Queen's-road within the borough, are to be paved with creosoted deal blocks upon a 12-in. concrete foundation, at an estimated cost, including all necessary footway alterations, of £22,854. The council propose to construct a public convenience in the neighbourhood of Brockley Tips. Alterations and additions are to be carried out at the council's depot, Knott-street, and consideration is being given to the question of roofing over the yard. In addition to this the ordinary maintenance work in highways and other borough council properties will be undertaken with the usual or improved materials.



London, Finsbury (Mr. P. G. KILLICK, borough surveyor).—It is not anticipated that any very special work will be done during the present year. A considerable area of carriageway paving in the main roads of the borough will have to be repaved, probably with creosoted deal. A few sewers will be reconstructed. It is hoped that a further portion of Whitecross-street will be widened, and a portion of Garrett-street.

London, Holborn (Mr. E. SPURRELL, borough surveyor).—This council have not yet decided on the works to be carried out in the coming year, but they will include the reconstruction of certain sewers and the repaving of certain roads. The council have

also under consideration the erection of workmen's dwellings.

London, Lewisham (Mr. ERNEST VAN PUTTEN, M.INST.C.E., borough engineer and surveyor).—It is proposed to pave a number of roads with improved surfaces, at a total of £24,474 for wood pavement, and £7,015 for bituminous-bound and tar-macadam roadways. Practically the whole of these roads are motor-omnibus routes, and these improved forms of surfacing are to take the place of water-bound macadam, which will not stand the modern traffic. A still larger sum was spent last year on other roads in consequence of the advent of the motor omnibus. At the Forest Hill public baths a new system of water heating is being adopted, at a cost of £750, replacing two Cornish boilers which were fixed about thirty years ago. At the Ladywell public baths a reinforced-concrete storage tank, to hold 75,000 gallons of water, is to be erected at a cost of about £500. At these baths there is a well and borehole belonging to the council; by providing a storage tank it will now be possible to fill both swimming baths each night without drawing any water from the Metropolitan Water Board's mains, and a very large saving will thus be effected. A tuberculosis dispensary is to be erected on a site adjoining the Ladywell baths, at a cost of about £1,000. An extension of the existing tramways from Victoria to Catford will be opened as far as Southend village. The terminus of the tramways at Park-road, Forest Hill, will be connected by a linking-up line of about ¼ mile in length, to the terminus in London-road, Forest Hill, thus abolishing two dead ends. The following is a list of the roads proposed to be paved with improved surfaces, 1914-15: Wood paving (creosoted deal blocks laid upon a concrete foundation)—Eltham-road and Lee Green, 2,643 yds. super., at 14s. per yard, £1,850; Dartmouth-road, Forest Hill, 5,070 yds. super., at 14s. per yard, £3,631; High-street, Sydenham, 5,898 yds. super., at 14s. per yard, £4,129; Kirkdale, 6,818 yds. super., at 14s. per yard, £4,773; West-hill (Kirkdale to Lawrie Park-road), 436 yds. super., at 14s. per yard, £305; Sydenham-road (from Newlands Park to railway bridge), 2,200 yds. super., at 14s. per yard, £1,540; London-road (from Dartmouth-road to near Queen's-road, breasts of road along tramways), 2,287 yds. super., at 14s. per yard, £1,601; Lee-terrace, 5,867 yds. super., at 14s. per yard, £4,107; Lee-road, by Blackheath Railway Station, 800 yds. super., at 14s. per yard, £560; Belmont-hill (part of), 2,826 yds. super., at 14s. per yard, £1,978; total, £24,474. Resurfacing with bituminous-bound macadam—Belmont-Hill (part of), 2,937 yds. super., at 4s. 9d. per yard, £697; Lawrie Park-road, 4,800 yds. super., at 4s. 9d. per yard, £1,140; Dover-road, Blackheath, 8,929 yds. super., at 4s. 9d. per yard, £2,121; Burnt Ash-hill (Newstead-road to Baring-road), 1,894 yds. super., at 4s. 9d. per yard, £450; total, £4,408. Tar-carpeting surface of road—Baring-road (Burnt Ash-hill to Grove Park Station), 19,249 yds. super., at 2s. per yard, £1,925; Royal-parade and road to Montpelier-row, 2,153 yds. super., at 2s. per yard, £215; Montpelier-row (part of) and Shooters Hill-road, 4,668 yds. super., at 2s. per yard, £467; total, £2,607.

London, St. Pancras (Mr. WM. NISBET BLAIR, M.INST.C.E., borough engineer and surveyor).—The works for which provision has already been made are limited to the period prior to March 31st next, and no estimates have yet been considered for the subsequent period.



London, Woolwich (Mr. J. RUSH DIXON, M.INST.C.E., borough engineer and surveyor).—In connection with the electrification of the tramways by the London County Council, the widening of a further portion of the Woolwich main road to Greenwich and London will be completed. The paving works, &c., are being carried out by the council by arrangement. The question of linking up the London County Council tramways in the Eltham district is under consideration, and if it is decided to proceed with the work, extensive street widenings and improvements will be undertaken. The resurfacing of part of the main London and Folkestone road through Eltham, estimated to cost £26,000, will be completed. Sewering and flood prevention schemes for the old Woolwich portion of the borough, estimated at some £12,000, have been passed, and the work in connection therewith will be put in hand during the year. In addition to the usual

private street works, there will be further development of the several large building estates in the borough, one in particular, on garden city lines, being already commenced at New Eltham.



London, Paddington (Mr. E. B. B. NEWTON, M.INST.C.E., F.S.I., borough surveyor).—The council's works for the ensuing year are not yet decided upon, but it is probable that they will include the erection of new public baths and washhouses, extensive wood paving renewal works, new wood paving works, an important street improvement, new cleansing station, and the extension of area of "special" macadam. Probably the new Ranelagh-road footbridge will be completed early in the year.

Louth (Mr. D. STARKIE, M.I.MUN.E., district surveyor to the rural district council).—In addition to the ordinary work of maintenance of some 500 miles of highways, considerable steam rolling will be carried out. In all probability the area of road surface to be tar-sprayed will be increased. Plans are in hand for the improvement of several dangerous corners on the main and district roads.



Lowestoft (Mr. G. H. HAMBY, ASSOC.M.INST.C.E., borough engineer).—Application has been made to the Local Government Board for a loan for £11,000 for the drainage of districts on the outskirts of the borough, and involving the construction of three pumping stations and mains to convey the sewage to the existing outfall. A large number of bathing huts and chalets will be constructed on the South Beach, and a new shelter will be constructed on Gunton Cliff. A new pavilion for eleven beds, two single-bed observation wards, and a lodge will be erected at the isolation hospital. A much-needed public convenience will be erected on the South Cliff, and additions practically doubling the existing accommodation will be made to the Royal Plain convenience. Some thirty private streets are under notice to be made up, and the council are turning their attention to the planning of areas about to be developed. It is likely that considerable additions will be made to the town hall to provide much-needed extra office and committee room accommodation. Under the increasing heavy traffic of the rapidly expanding fishing trade, it has been found impossible to keep certain macadam roads in repair without great expense, and a scheme is under consideration for paving the more important of these with granite setts. Some road widenings and improvements will also be carried out, and altogether a very busy year is anticipated.



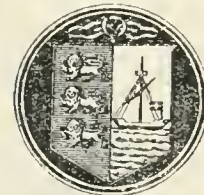
Luton (Mr. J. W. TOMLINSON, borough engineer and surveyor).—The confirming Bill granting county borough powers will be before the House of Lords Committee at the beginning of the next Session. Considerable progress has been made with the storm-water drainage scheme, and it is anticipated that the whole of the scheme will be completed during the coming year. While this is in progress, enlargements of foul-water sewers will be carried out. A scheme has been submitted to the Local Government Board for the extension of the sewage disposal works, and it is expected that the whole work, involving an expenditure of £7,500, will be carried out during the year. A new refuse destructor to deal with 70 tons per day is to be installed. A railway footbridge, 17 ft. wide, spanning both the Great Northern and Midland railway stations, together with a roadway between them, will be constructed. It is expected that a town planning scheme will be finally submitted to the Local Government Board for confirmation. Hard tennis courts are to be provided in the public park. One elementary school for 450 children and one for 1,000 children will be erected. Subject to the application for county borough powers being successful, a scheme for a large boys' secondary school will be proceeded with. A length of main road included in the town planning scheme is to be constructed, involving the provision of large sewers and the construction of a railway bridge.

Macclesfield (Mr. S. C. BAGGOTT, M.I.M. AND CO.E., borough engineer and surveyor and waterworks engineer).—The following schemes are now before the Local Government Board—viz.: Waterworks scheme for mechanical filters and 4 miles of high-level trunk mains; cost about £15,000. Provision is to be made for an additional impounding reservoir. The borough isolation hospital will be considerably enlarged during the year, and this together with the redrainage of the existing hospital will be connected to the sewerage system; total cost £7,000. A scheme is in course of preparation for extensions at the sewage works, comprising percolating filters, humus tanks, pumping mains, &c., to cost £10,000. It is expected that a considerable quantity of granited rock asphalt will be put down on the highways, and that the committee will purchase some traction engines to replace horse-drawn vehicles. Other work includes about 4 miles of private streets, main sewerage extensions, sanitary conveniences, additions to public baths. The council are revising their present code of by-laws relating to new streets and buildings. A new electric lighting and power station is being erected, in connection with which the cables are at the present time being laid.

Maesteg (Mr. SAMUEL J. HARPUR, engineer and surveyor to the urban district council).—During the past year several small contracts have been carried out, including public and private street improvement works and sewer extensions. The larger works carried out include heavy retaining walls alongside the river Llynfi, relaying of main sewer, new road to secondary school site, and new bridge crossing the river. At present the following works are in progress: Alterations and additions to town hall and markets; river retaining walls; and private street improvement works. The following works will be put in hand during the coming year, the sanction of loans having been obtained: New municipal buildings, £4,360; new sewage disposal works, £20,000; private street works in about twenty streets. All the foregoing works have been designed and carried out by Mr. Harpur and his staff.



Maidstone (Mr. T. F. BUNTING, borough surveyor).—The new works to be carried out include an extension of the electricity generating station, which, with the machinery to be put in and the addition of new offices, will cost upwards of £5,000. A considerable amount of work will have to be done for the preservation of the ancient Tithe Barn, which has recently been purchased by the corporation as an ancient building. One or two small street improvements are also in view, but beyond this the work of the year will be ordinary maintenance and repairs.



Maidon (Mr. T. R. SWALES, M.INST.C.E.I., borough engineer and surveyor).—A scheme is in course of preparation for the provision of thirty-two working-class dwellings, the erection of which will probably commence at an early date. Extensive road improvements will be carried out, in addition to the usual work of maintaining and tar-surfacing the main roads of the borough. The council have under consideration the further development of their pleasure grounds, including the providing of additional tennis courts. A further extension to the water supply will be carried out. An entirely new code of building by-laws will come into operation during the year.



Mansfield (Mr. THOS. P. COLLINGE, ASSOC.M.INST.C.E., borough engineer and surveyor).—The work proposed during the ensuing year will include the making up of several new streets under the Private Street Works Act, and the carrying out of a number of public street improvements under a Provisional Order. Plans for additions and extensions to the infectious diseases hospital have been approved by the town council, at an estimated cost of £5,000, and the work will be put in hand during the year. Application is to be made to the Local Government Board for a loan of £1,600 for sewerage purposes in Westfield-lane and Sandy-lane, and a scheme is being prepared for sewerage a portion of Pleasley-hill. It is hoped this

work will be put in hand at an early date. A town planning scheme, to comprise the whole of the district unbuilt upon is in hand, and the first conference of owners and interested parties has been held. New council schools will be erected in Chesterfield-road and at Rainworth. Plans for the erection of a new town hall and municipal offices are in course of preparation, and the council have under consideration the erection of a new fire station and public abattoir. The buildings in course of erection in the borough include three large picture houses, and considerable additions to the Mansfield hospital and free library. During the past year 215 new houses have been certified for occupation. The new railway through Mansfield from Clipstone to Kirkby is now nearing completion.

Marple (Mr. D. J. DIVER, engineer and surveyor to the urban district council).—The works projected for 1914 consist of sewerage the Low Marple portion of the district, and the making up of the following private streets—viz., Derby-street, John-street, Eastvale, Chadwick-street, and Chapel-fields. The Towns yard recently purchased at Rose Hill will be adapted to suit the council's purposes. The question of erecting a refuse destructor, disinfector, and tar-macadam plant is now being considered by the council.



Matlock (Mr. JOSEPH TURNER, M.R.S.A., surveyor and water-works engineer to the urban district council).—The council have recently purchased some old buildings in the centre of the town, and it has been decided to have these taken down for the purpose of widening and improving one of the approaches

to the county bridge. Additional improvements will be carried out on the Hall Leys Pleasure Grounds. To improve the entrance from the main road into the pleasure grounds arrangements are being made for the re-erection in a more suitable position of an existing footbridge over the river Derwent. The surveyor has been instructed to invite tenders for a steam fire engine, and also to prepare plans for alterations and additions which it is contemplated to make to the present fire station. The main sewerage scheme for the district is being proceeded with.

Meriden (Mr. THOMAS HENRY NEGUS, surveyor to the rural district council).—The proposed works include some 2 miles of sewers and outfall works at Fillingley; completion of a further section of Hampton-in-Arden sewerage; a "lifting" scheme of sewerage and outfall works at Coleshill; the sewerage of Bickenhill and Marston Green. Plans are in hand for two or three other schemes of village sewerage. The extension of water mains will doubtless be carried out in four or five villages, and scavenging schemes at Coleshill, Castle Bromwich and Water Orton; while the erection of cottages for the council's workmen in some of the twenty-two villages within the district is foreshadowed.

Merthyr Tydfil (Mr. A. J. MARSHALL, borough engineer and surveyor).—The ensuing year is likely to be a very busy one from the standpoint of municipal engineering works. The council have had sanction for a loan amounting to £24,000 for main sewer diversion works, and this work will probably be started in the spring. Several street improvement works are contemplated within the borough, and the renewing of the permanent way of the electric railways through the main thoroughfares; substituting wood blocks for stone setts will be undertaken. A new recreation ground will be laid out at Gellifaelog, and the widening of a long length of roadway in connection therewith. It is also intended to lay out a new cemetery at Aberfan. The question of a refuse destructor is also under consideration, and a special committee has been appointed to report upon the sites available. In addition to the ordinary maintenance works connected with the highways and sewerage system, several schemes are in hand for their improvement and extension respectively, and various storm-water mains and overflows will be constructed. The usual private street works will be carried out, and further developments of building estates, including a new garden village, is in progress.

Middleton (Mr. W. WELBURN, M.I.M. AND CO.E., borough surveyor).—The following works are in hand: Post office extension, school extension, granite paving (£4,100). The following works are proposed for 1914:

Private street works (£2,440), new sewer (£3,000), tram shelter (£270), and new town hall (£18,000).



Middlesbrough (Mr. S. E. BURGESS, M.INST.C.E., L.R.I.E.A., borough engineer and surveyor).—

The borough boundaries have recently been extended by the taking in of an additional area of 1,500 acres. During the coming year extensive works are contemplated as follows:—Floods prevention scheme: The first section has just been commenced; estimated cost, £33,000. The total estimated cost of the complete scheme is £69,000. Road and street paving works: Public works, £20,000; private street improvement works, £10,000; total, £30,000. Road widening schemes, £9,000; provision of recreation ground, Ayresome district, 7½ acres in extent, with swings and giant strides, £7,000; the abolition of privy middens and pan closets and conversion into water-closets is to be proceeded with, at an estimated cost of £12,000; and the extension of the sanatorium and the provision of a new laundry for same, £6,000. A new divisional police station is to be built at a cost of £4,000, and new bowling greens, tennis courts and pavilions at the Albert Park, at an estimated cost of £1,200. The alterations to public mortuary will probably cost about £60. In addition to above, schemes have been adopted under the Housing and Town Planning Act, 1909, for dealing with the insanitary property in the borough, and further schemes are being prepared. A town planning scheme has been completed for the unbuilt-up portion of the borough, and a further scheme will be put in hand in connection with the unbuilt-up portion of the recently added areas. A committee has been appointed to consider the question of extending the public swimming baths. A Bill is being promoted in the next Session of Parliament for the abolition of the toll bars in the borough, the purchase of the North Ormesby Gas Company's undertaking, and seeking further powers with respect to building by laws.



to allow boats to land at any state of tide, estimated cost £3,700; and making up carriageways with tar-macadam to the extent, probably, of about £800.

Monmouthshire (Mr. WILLIAM TANNER, F.S.I., county surveyor and county architect).—There is a considerable amount of work in hand from last year not finished, and the council do not intend to consider any new work until this is completed.



Montgomeryshire (Mr. G. A. HUTCHINS, M.INST.C.E., county surveyor).—The works in hand on the main roads at the present time and expected to be carried on and completed by the county engineer during the year 1914-15 are: The installation of a tar-macadam mixing machine, fed by a rotary heater and drier with the metalling to be used in its manufacture, patented by Messrs. Ord & Maddison, of Darlington; about 15 miles in length of tar-macadam surfacing on the Welshpool, Newtown and Llanidloes main road, under a Road Board grant, 7 miles of which have been done this year, and the remaining 8 miles, it is expected, will be finished by next September; tar-spraying main roads through the town of Montgomery, the villages of Meifod, Llanfechain, Llandisilio and Llandrinio and the hamlet of Arddlyn, besides rolling-in on the main roads the usual 24,000 tons of water-bound macadam, as against the 8,000 tons per annum laid down in the year 1890-91 and left for the local traffic to consolidate. In the Education department seven new provided schools are to be built at Llanwrin, Cemuaes, Esgairgeiliog, Hirnant, Rhos-y-Briithdir, Faenor and Berriew, and existing council schools are to be improved and brought up to date at Llawryglyn, Staylittle, Glandwr, Trefnannau and Rhiwhiraeth, making in all a round dozen to be dealt with by the county architect, in addition to the thirty-eight already completed since the appointed day.



Morecambe (Mr. J. W. HIPWOOD, ASSOC.M.INST.C.E., borough engineer and surveyor).—The council are considering schemes for the further development of their pleasure grounds and for their electric illumination, also the provision of additional sanitary conveniences and shrubberies

on the promenade. New groynes will be erected, and the surface-water drainage scheme at the west end, which is proving so successful, will be completed. The recent rapid increase of building operations will necessitate the making up of several streets with tarmacadam, and the laying of a number of water mains. The successful application of the Deacon waste detection system, which resulted in a saving to the town of £1,150 last year, will be extended. Tests are being conducted with automatic pressure wave street lighting, and complete adoption is anticipated. The electrification of the corporation tramways, which is the burning question of the day, will probably be decided upon. The extension of the Victoria Esplanade to the borough boundary and to Hest Bank is also receiving consideration. The widening of Slyne-road, deferred from last year, will be carried out with the assistance of the county council. Plans for the alterations of the council chamber are under the consideration of the council. The tar-spraying and Pulviciding of all roads in the borough will be carried out as usual.

Morley (Mr. F. TURNER, B.S.C., ASSOC.M.INST.C.E., borough engineer and surveyor).—The year 1914 will be a season of activity in municipal work. The corporation have under consideration the provision of houses for the working classes, and plans and estimates are being prepared for the erection of about seventy cottages, together with the construction of the necessary streets and sewers. Additions are to be carried out at one of the public elementary schools, and a caretaker's lodge erected at the infectious diseases hospital. Experiments are to be carried out at the sewage disposal works for the recovery of grease from the sewage sludge, and also for reducing the volume of sludge, which is rapidly accumulating. The by-laws with respect to the erection of new buildings and the laying out of new streets are being remodelled, and the draft of the proposed regulations will shortly be submitted to the Local Government Board. In nearly all cases the resurfacing of the macadam roads (both county and district) will be carried out with tarred metal, and all water-bound macadam roads will be tar sprayed where the gradients will permit.



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FLUMINA HABITARE

Morpeth (Mr. J. DAVISON, borough surveyor).—Some of the private streets commenced during last year are to be completed. Improvements to streets are contemplated at Castle-square and Dam-side, where it is proposed to widen the road by the acquisition of a portion of the adjoining property and land. A new concrete ford across the river Wansbeck has just been completed, and thirty-three houses have been finished and occupied during the year just ended. The town council are now inviting offers of land suitable for building purposes with a view to erecting more houses. Improvements to corporation property in Corporation-yard are to be made during the current year, plans having already been approved. It is hoped that during the next few months arrangements will be completed for the erection of a quay wall, and the making up of a road by the riverside between the Mayor Bridge and Oldgate Bridge.



Mossley (Mr. R. H. BUCKLEY, borough engineer and surveyor).—The most important schemes which the council propose to undertake during the present year are: Another new council school, to be built in Lancashire Ward; public baths, which are being given to the town by the generosity of Mr. John L. Tattersall, a large ratepayer and employer of labour; and several long lengths of additional sewers.

Motherwell (Mr. W. ROSS, burgh surveyor).—The town council have agreed to erect a swimming pond and baths at a site in High-road, adjacent to the town hall. The construction of the sewage purification works for the western district of the burgh will be started shortly. Land has been secured on advantageous terms from Lord Hamilton of Dalzell for a

housing scheme, and competitive plans are presently being invited for same from local architects. A Parliamentary Bill is to be promoted for a large extension of the burgh, and extension of water area. Plans are now in hand for the construction of a phthisis pavilion at the burgh hospital, and for extensions to the administrative block. Several street improvements have recently been carried out, and one street has been laid with tarred steel slag with satisfactory results.

Nantyglo and Blaina (Mr. W. J. DAVIES, M.I.M. AND CO.E., surveyor and water engineer to the urban district council).—The year 1914 will see the completion of the Central Ward housing scheme—viz., the erection of seventy-four cottages, at a cost of £17,000, including purchase of the land and the construction of roads. The works projected in the district during 1914 include the following: The erection of 101 cottages in the South Ward; the erection of a laundry and disinfecting block at the isolation hospital; a public convenience, and the widening of a part of High-street, Blaina; children's recreation ground at Nantyglo, and the widening of Cwmcelyn Bridge, Blaina, and the approaches thereto. Improvements are to be effected in the following streets: Abertillery-road, Part-street, Lancaster-street and Surgery-road, Blaina. A considerable expenditure will be incurred in providing foundations and strengthening road crusts on the main roads through the district in view of the proposed running of railless electric traction cars by the Western Valleys (Mon.) Railless Traction Company.



Neath (Mr. D. M. JENKINS, ASSOC. M.INST.C.E., borough engineer).—

Contracts have just been let for auxiliary waterworks, comprising service reservoir and mains, in connection with the Ystradfellte water supply, and the work will be proceeded with at once. Additional feeders are being laid for the purposes of the electricity undertaking, and extensions of distributing mains are to be carried out during the year. The widening of Gasworks-road is in hand, and other street improvements are being considered. The erection of ninety-three workmen's dwellings, at a cost of £16,000, and extensions of the Gnoll council school, at a cost of about £10,000, are well in hand; and various private street works are being proceeded with. The council have under consideration the erection of cottage flats to be let at low rents; and the improvement of houses, under the powers of the Housing and Town Planning Act, 1909, will be continued during the current year. Among the works completed during last year were the extension of Llantwit sewage purification works, the paving of stone yards with lithofalt blocks, and extensions of sewers and electric distributing mains.



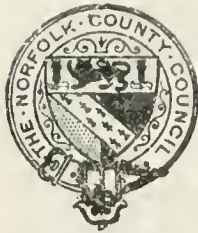
Nelson (Mr. W. SHACKLETON, ASSOC.M.INST.C.E., borough engineer).—

The present year promises to be an exceptionally busy one. A scheme of public abattoirs, estimated to cost £20,000, has been prepared and forwarded to the Local Government Board for their sanction for a loan. The high-level sewer and sewage works extensions, comprising additional liquefying tanks, storm and detritus tanks, and sludge press house and presses (£23,500), and Carr Hall Bridge (£3,500), will be completed. Application has been made to the Local Government Board for a loan of £35,000 for the making up of seventy-five private streets, a great number of which will be put in hand immediately sanction is obtained. Further steps will be taken in respect of a town planning scheme for some 1,300 acres within the borough. A Provisional Order for extensive street widenings—obtained last year—will be put into effect, and others are likely to develop.

Newark-on-Trent (Mr. T. P. FRANK, ASSOC.M. INST.C.E., F.S.I., borough engineer and surveyor).—It is proposed to add a new infectious ward to the present isolation hospital, and plans are in course of preparation for the scheme. The preliminary work in connection with the proposed sewage disposal scheme has been commenced. Plans have recently been passed by the council for a sewage installation at the sanatorium. One or two public street improvements are under consideration, as is also the question of the adoption of new building by-laws and new waterworks regulations.



Newbury (Mr. S. J. L. VINCENT, ASSOC. M. INST. C. E., borough surveyor).—The works projected for 1914 include: wool paving, £4,000; infant school, £2,600; cattle market extension, £1,350; corn exchange reconstruction, £3,000; reconstruction of outfall works, £2,700; and surface water scheme (second instalment), £400.



Norfolk (Mr. T. H. B. HESLOP, M. INST. C. E., county surveyor).—The works projected by the county council for the present year are as follows: An expenditure of about £20,000 for reconstruction of roads; about £4,000 for road widenings and improving dangerous corners; a new steel bridge over the river Waveney at Mendham, approximate cost £3,000; completion of steel bridges at Ingworth and Ellmehdale; construction of a ferro-concrete bridge at Saxthorpe Ford; restoration of the interior of the Shirehall at Norwich, and refacing the exterior in brickwork with stone dressings; new kitchens at county asylum, and additions; drainage of the county asylum premises; and erection of cottages for roadmen.



Northampton (Mr. ALFRED FIDLER, M. INST. C. E., borough engineer and surveyor).—The Bridge-street improvement scheme will be continued, and probably completed. The scheme provides for a width of 50 ft., which will involve the purchase of much valuable property, and the widening of a three-arch masonry bridge over the river Nene. During the year the Far Cotton tramway scheme, which passes along Bridge-street, consisting of a double line, will be constructed. In connection with this the car depot is to be extended, and additions to the generating plant carried out; also a portion of the Kingsthorpe section will be doubled. The erection of workmen's dwellings will be further continued by an addition of about forty cottages to the fifty which are already in course of erection. Schemes in connection with the racecourse, Far Cotton, and Kingsthorpe recreation grounds will be executed. The question of the provision of district baths is under consideration, and schemes which have been prepared, in all probability, will be adopted. The erection of a branch police and fire station is contemplated. The cattle market is to be extended, by the construction of cattle pens, to the extent of half an acre, and the erection of settling rooms in other buildings.

Northfleet (Mr. J. A. MITCHELL, surveyor to the urban district council).—The Northfleet Council have recently purchased a farm of about 68½ acres, which will be laid out as allotments and depots for the treatment of refuse, and a site for a smallpox isolation hospital. A comprehensive improvement of the High-street is also under consideration, and the improving of Springhead-road is about to be carried out. The subject of the housing of the working classes is under consideration, and the improvement and strengthening of road surfaces is also being steadily proceeded with.

Northwich (Mr. JOHN BIRTWISTLE, surveyor to the rural district council).—The council have decided to remodel the Hartford sewage works, and to resewer two portions of the township. The main sewer of the Heyeswood district will be carried over the railway cutting by means of a steel bridge. It is hoped to proceed with the laying of about 6 miles of water mains for the benefit of three townships if the approval of the Local Government Board can be obtained. Land has been obtained, and a scheme for the erection of twelve farm labourers' cottages approved. It is intended to erect six in the first place by way of experiment. New building by-laws are expected to come into operation during the year. Several important schemes of water supply and sewage disposal are under the consideration of the council. During the past year the supplies of water to three of the council's works have been supplemented, and the supply to another installation is being augmented from an additional source. The reservoir and pumping plant in connection therewith will shortly be completed, when it is hoped to extend the service mains about 3 miles.



Notts (Mr. E. PURNELL HOOLLY, M. INST. C. E., county surveyor).—Few counties are developing coalfields much faster than Notts. This necessitates a great number of new schools, and it is anticipated that new schools will be required at Harworth, Ramworth, Kirklington, Rampton, Mansfield Woodhouse, Work up, and other places this year. A new police station is to be built at Mansfield Woodhouse. A commencement is to be made of the new direct road to North Notts from Nottingham, with the assistance of the Road Board. This road, which will be about 3½ miles long, will pass directly through the Dukeries, and link up sections of country roads that are now practically derelict. It is anticipated that about 30,000 tons of Tarmac will be used on the existing ordinary macadam roads of the county this year in continuation of the work of improved surfacing, commenced over ten years ago.



Norwich (Mr. ARTHUR E. COLLINS, M. INST. C. E., city engineer).—The city engineer anticipates that the following municipal works will be commenced, proceeded with, or completed during the present year—viz.: Arising out of the 1912 flood, schemes have been prepared for dredging, widening and improving the rivers Wensum and Yare between New Mills (Norwich) and the Haven Bridge (Great Yarmouth). The total cost of the works is estimated to be £350,000. Where the river passes through the city the scheme proposes to purchase properties adjacent to the existing banks, so as to give a minimum width of 80 ft. Between the limits of the city proper and Breydon the new river widths proposed to be secured will vary from 80 ft. to 220 ft. The proposed new depths will vary from 10 ft. below mean water level between New Mills and Foundry Bridge (Norwich), and 17 ft. below mean water level between Foundry Bridge and Great Yarmouth Haven Bridge. The proposals also include the construction of new cuts, removal of inconvenient bends, and provision of washes, giving a minimum width of 150 yds., with suitable river walls. Such works as the corporation have actually undertaken are on the lines of these proposals, but the scheme as a whole has not yet been adopted, financial considerations standing in the way. In connection with the demolition of dilapidated houses, consequent upon the Norwich flood, it is proposed to clear away a number of dwellings in the area which was inundated, and to erect housing accommodation for the displaced population on a site belonging to the corporation near at hand. Plans are in hand for the erection upon the site of the old wholesale fishmarket in the centre of the city, of large additions to the municipal offices. The scheme under consideration is estimated to cost £12,000. To enable this to be done a new fish market has been built, and this was opened on December 24, 1913. Negotiations are in progress for the purchase, or lease, of a site now occupied by dwellings situated between Prince of Wales-road and the river Wensum, for the construction of a wharf for loading lighters with domestic refuse. The carrying out of this scheme will necessitate the pulling down of some of the houses; others will be remodelled for letting. The method of refuse disposal at the sewage farm marshes adopted a few years since is continuing to prove quite satisfactory. Preliminary attention will be given to the question of further enlarging the city asylum. An underground convenience, estimated to cost £660, will be erected on Tombland, this provision mainly being made in the interest of the 30,000 to 40,000 tourists who annually visit Norwich Cathedral. The Norwich Electric Tramways Company are desirous of obtaining Parliamentary sanction to the carrying out of extensions and modifications of the existing tramway system. The estimated cost of the works, including street widenings and a contribution towards the cost of the widening of Duke's Palace Bridge over the river Wensum, is about £35,000. There is a Bill in Parliament for this for next Session. Improvements of the main roads of the city, assisted by loan and grant from the Road Board, will be effected. The expenditure incurred under this heading is expected to be about £7,000, almost entirely for extending the large areas of solidly grouted bituminous macadam existing in Norwich. New sewerage, it is

expected, will include the extension of Unthank-road storm-water relief sewer (£2,600); provision of sewage and surface-water sewers for the drainage of Earham-road and western district (£5,800); storm-water outlet for Queen's-road and south-eastern district (£4,000); repairs and reconstruction of existing sewers, and providing surface-water sewers in private streets previously to their being made up by the corporation for adoption as public highways (£1,200). It is anticipated that the labour demands requiring to be met by the Distress Committee will be satisfied in connection with some of the above works, more particularly the river widening.

Nuneaton (Mr. F. C. COOK, ASSOC.M.INST.C.E., borough surveyor and water engineer).—A new water pumping station at Griff is on the point of completion, and will be brought into use during the year. Other works to be carried out comprise the conversion of two primary contact beds into percolating filters and the provision of separating tanks at the sewage disposal works; the erection of a steel foot-bridge over the Coventry Canal; the Newdegate-corner street improvement, involving an expenditure of £8,250 in the purchase of property; and the straightening of Ansley-road, in respect of which a grant has been received from the Road Board. An addition will also be made to Riversley Park, in connection with the gift of an art gallery, made to the town by Councillor Melly, a former mayor.

Oakham (Mr. ARTHUR L. PARKER, M.I.M. AND CO.E., M.I.MUN.E., engineer and surveyor to the urban district council).—Sanction to a loan has been given by the Local Government Board for widening the High-street, and the work will be put in hand early in the year. Plans have been prepared for additional septic tanks at the sewage farm, and it is the intention of the council to commence this work in the spring. Tar-painting of the roads will again be carried out next summer; more than two-thirds of the roads have already been so treated. In the year's estimate for road maintenance, Vianex binding is included instead of the ordinary road-binding material commonly used, and it is hoped that better results will be obtained with very little extra cost.



Okehampton (Mr. FRANCIS J. WORDEN, borough surveyor).—The principal works contemplated during the ensuing year are—(1) Proposed extension of reservoir and water mains, and a scheme for scraping old mains which have become corroded on inside; (2) extensions of sewers to take drainage of new buildings; (3) public conveniences for both sexes; (4) proposed development of a site purchased for the purpose of erecting public buildings; and (5) block flooring and heating apparatus in market hall. Among other works projected are erection of a police station by the county authority, workmen's houses, and a scheme for proposed cottage hospital, under a joint arrangement of the local Nursing Association and the Holditch Trustees. A scheme for the extension of the borough boundary will also be considered, but in this respect opposition is anticipated.

Ongar (Mr. W. N. JARVIS, A.R.SAN.I., surveyor to the rural district council).—The council have under consideration sewerage schemes for the village of Blackmore and the village of High Ongar, and a short length of new road under the Private Street Works Act.

Ossett (Mr. H. HOLMES, M.INST.C.E.I., borough surveyor and water engineer).—There is every prospect of a busy year in the borough surveyor's department. Several schemes included in last year's forecast are completed, including the reconstruction of the main outfall sewer and storm tanks; the erection of fire station, stores, workshops, &c.; the purchasing of a motor fire engine; Pildacre-hill sewerage scheme; the preparation of land for filtration; and also the Gawthorpe surface-water and sewerage scheme, during the carrying out of which rock was encountered in the headings and progress could only be made by the use of ammunition. The forecasted extensions to the water mains are being completed, and further schemes will be considered during the year. A sludge main at the sewage disposal works is now being completed, and the underground conveniences in the Market-place are in course of construction. Sanction has just been received for a loan of £8,356 for extensions to the sewage disposal works. These include

four 100-ft. percolating filters, settling tanks, concrete carriers, and the laying out of more land for filtration. This work will be begun at once and carried out by direct labour. There are still many private streets in the borough which require making up and sewerage, and a number of these are scheduled for consideration during the year. An extension to the isolation hospital is proposed, and a scheme has been prepared. A considerable amount of tarred slag has been used on the main and district roads, and this work will no doubt be continued this year. The corporation and officials are at present engaged on a Private Parliamentary Bill by which further powers, particularly with reference to the disposal of trade refuse, are sought. The Parliamentary Agents for the Bill are Messrs. Sharpe, Pritchard & Co., Westminster.

Oswestry (Mr. G. WILLIAM LACEY, borough surveyor and water engineer).—The chief proposals for the year 1914 are the laying of a duplicate 7-in. water main for a distance of 1½ miles, tenders for which have already been accepted; the reconstruction in reinforced concrete of the water service reservoirs, at an estimated cost of £5,000; and the erection of a park lodge. Tar-macadam for roadways is likely to be still more largely adopted for the repair of the main streets of the town.



Oxford (Mr. W. H. WHITE, M.INST.C.E., city engineer).—During 1914 it is expected that the long-pending question of the electrification and extension of the tramways will be brought to an issue, or in lieu thereof of a complete motor omnibus service installed. At present appearances seem to point to the latter alternative. Another river bathing-place (the seventh), similar to the one for women opened this year, will probably be provided, and the question of covered public baths is being considered. It is intended to build two or three additional public conveniences, and there will be several new roads, water-works extensions, and street improvements. The subject of town planning is also before the council, and a scheme may be formulated.

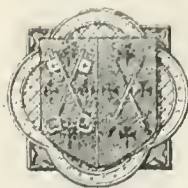
Oxfordshire (Mr. S. STALLARD, ASSOC.M.INST.C.E., county surveyor).—The principal work in this county that is pending is the reconstruction of 60 miles of main roads, at a cost of £95,000. This will be commenced in April next, and, it is hoped, will be completed in two and a-half years.



Paignton (Mr. C. OWEN BAINES, engineer and surveyor to the urban district council).—About £9,100 will be expended upon road improvements during the year, chiefly on main roads. Included in this sum is the provision of a motor road approach to the town from Preston to meet the Marine-drive, alongside the large area of lands and foreshore recently purchased by the council at a cost of £5,200. A further sum of £5,600 is being applied for to lay out, level, and plant these lands, and to provide public conveniences, promenade, and shelters. It is intended to proceed with the erection of a new isolation hospital, at a nett cost of £2,500, exclusive of land. The year 1914 will also see the preparation of a new scheme of sewerage for the district, also the completion of the new machinery depot in Well-street.



Pembrokeshire (Mr. ARTHUR H. THOMAS, A.R.I.B.A., county surveyor).—In addition to the annual routine of repairs and maintenance of the county buildings, bridges and main roads, it is contemplated to carry out considerable improvements to the main roads with the assistance of grants from the Road Board. These latter comprise the substitution of granite in place of local limestone macadam on the Tenby—Carmarthen road; removal of dangerous corners; diversion of Wolfseastle-hill and that from Fishguard to Lower Town, both of which have steep gradients and hair-pin bends; removal of the hair-pin bend and improvement of the gradient of Windy Hall-hill between Fishguard and Goodwick, and alterations to King's Bridge, Pembroke, with diverted approaches. A new police station is being built at Pembroke, and alterations and additions are to be made to the police station at Spittal.



Peterborough (Mr. J. W. WALSHAW, city surveyor).—The council have before them a report upon the Housing and Town Planning Act. No action has, however, yet been taken in the matter. They also have under consideration a borough extension scheme, and reports upon the subject by the several corpora-

tion officers are in course of preparation. A further extension of a surface-water drainage system will be carried out, and £600 expended on in situ concrete footpaths for which a loan has been obtained. All main and principal roads upon which there is much motor traffic will be tarred and granited. An application has been made for a loan of £11,000 for the purchase of land for a new cemetery and the laying out of the land.



Portsmouth (Mr. ARTHUR W. WARD, ASSOC. M. INST. C. E., borough engineer).—

A scheme for considerably enlarging the infectious diseases hospital is under consideration, and the provision of a sanatorium is contemplated. The new tuberculin dispensary being now completed, the old one will be used to house the plant for the manufacture of disinfectant by the Hermite system. An immediate start is to be made with the installation of a salt-water supply for the northern part of the town, dealing with an area equal to about one-third of the borough. Portsmouth is an island cut off from the mainland by a narrow arm of the sea, over which there is only one road bridge; consequently, there is but one road out of the borough. It is hoped, however, that in the near future a second and entirely new road out will be provided. The making up of new roads under private improvement powers will be steadily pushed forward during the present year, and possibly many schemes now only mooted will materialise. Progress is being made with a £20,000 system of storm-water sewers, the work being about half completed. The contract has been accepted for the erection of forty-three houses under the Portsea Improvement scheme.



Prescot (Mr. RICHARD NORRIS, surveyor and inspector of nuisances to the urban district council).—Plans are being prepared for fourteen workmen's dwellings, to be built on land belonging to the council, and adjoining the thirty-eight already built under the Housing of the Working Classes Act. Plans have been passed for a new fire

escape station, and the building will be completed, and a new escape purchased from Messrs. John Morris & Son, Salford, by the end of February. A scheme is under consideration for the general conversion of all the privies in the town (about 850) into water-closets under the Act of 1907. An inquiry has recently been held as to an application from the council for an extension of their district by including an area of 112 acres of the adjoining township of Whiston, and developments in connection with this may be expected during the present year. It is proposed to make up a number of passages under the Private Street Works Act, 1892, at an estimated expenditure of £1,000. Several important street improvements, consisting of converting macadam surfaces to granite sett pavement on concrete are being considered.



Preston (Mr. THOMAS COOKSON, ASSOC. M. INST. C. E., M. R. SAN. L., borough engineer and surveyor).—

The Parliamentary Bill for Session 1914 comprises works in connection with Ribble navigation, streets improvement, three bridges, tramways, and many matters for the general improvement of the government of the borough. It is likely that, in addition, the new baths scheme will be carried out; also new markets offices at an estimated cost of £3,250; playfield for grammar school, and piling the bank of the river Ribble opposite the parks. A number of minor streets improvements are to be taken in hand, and paving works of considerable magnitude in addition to extensive private improvement works.

Potterspurty (Mr. J. B. FAIRCILD, surveyor, sanitary inspector and inspector of nuisances to the rural district council).—Owing to the unsatisfactory state of the wells in Potterspurty Village, the council instructed Messrs. J. Treadwell & Son to prepare plans, &c., for a public water supply. On the advice of a

local water diviner a well has been sunk, and at a depth of 47 ft. a good spring was struck, producing over 100,000 gallons per day. The engineer's plans, together with an application to borrow £3,000, have been sent to the Local Government Board. With regard to its water supply, a similar state of affairs exist at Old Stratford, and the services of Mr. G. Roberts, engineer, have been obtained to advise the council as to the best means of providing a public water supply. When this is complete, six out of the twelve villages in this small rural district will have a public water supply.



Prestwich (Mr. SYDNEY H.

MORGAN, ASSOC. M. INST. C. E., engineer and surveyor to the urban district council).—On April 8, 1913, the council received the authority of the Local Government Board to prepare a town planning scheme, and the work of building up the scheme is steadily progressing.

Town planning will take an important place in the programme for 1914. The Polefield Hall estate, consisting of about 43 acres, will be developed under the scheme by a private company on co-partnership lines. The houses will not exceed twelve to the acre, and will vary in rental from £20 to £60 per annum. The Bury Old-road improvement, which includes the reconstruction of the surface with granite setts on a concrete foundation, and a system of surface-water drainage, will be carried out at an estimated cost of £11,043. A considerable length of single tramway track on the Bury Old-road will be converted into double track during the year. The first length, from Northwood to Park Hill, is estimated to cost about £2,092. It is anticipated that about £2,500 will be spent on the maintenance of highways in the district, and about £1,100 on public lighting during the year. An 18-in. sewer will be laid in George-street in January or February. During 1913 a large number of private streets have been made up under the Private Street Works Act, and it is estimated that during 1914 twenty-two streets will be constructed, at a cost of £4,700. Fairfax-road will be paved with granite rock asphalt at a cost of £700. The ward boundaries have been rearranged so as to obtain more equal representation, and the elections in April next will be the first on the altered register. Extensive additions to the stables and town's yard have been completed. An office, a harness-room, a two-stall stable, a loose box, a store, and about 90 yds. of open shedding have been added to the existing accommodation. Early in the year conveniences for men and women will be erected in the Clough. The most important matter concerning the welfare of Prestwich, which will probably be settled during 1914, is its very existence as a self-governing authority. Manchester Corporation have made an effort to amalgamate the district, and in addition to making application to the Local Government Board for a Provisional Order, have included a clause in the Corporation Bill for next year for this purpose. The Salford Corporation have also applied for a Provisional Order to include Prestwich within the borough. The council and ratepayers are opposed to amalgamation, and hope the general efficiency of the district, its historic name, and the low rate may be sufficient to warrant a continuance of its independence.



Pwllheli (Mr. CHAS. L. ROBERTS, borough surveyor and water engineer).

The year 1914 promises to see important developments of the housing question within the borough. The corporation are in communication with the Welsh Housing Association with a view to co-operation in the erection of cheap model dwellings for the poorer working classes. It is probable that a scheme will be adopted during the year for erecting houses on the land reclaimed by the corporation during the harbour operations. An application will be made to the Local Government Board for sanction to borrow money for enlarging the public slaughter-house, and new pig slaughtering and boiler chambers will be added. A large drill hall and caretaker's house will be built for the Territorial Association. A conference of adjoining harbour authorities is being arranged to co-operate if possible in the purchase or hire of a steam dredger for use along the coast, as all the authorities are more or less troubled with the silting of the harbour entrances and channels.



Ramsbottom (Mr. THOS. H. BELL, M.I.M. AND CO.E., engineer and surveyor to the urban district council).

—A scheme has been submitted to the council and approved for the reconstruction of a length of main road, known as Manchester-road, extending over a distance of about 1½ miles, commencing at a point almost opposite Fletcher Bank Quarries, and terminating at the district boundary at Bassfield. The increased heavy motor traffic has caused consideration to be directed to granite-sett paving on a concrete foundation, which is estimated to cost £14,152. A sub-committee has been appointed to bring the scheme to the notice of the county council, with the object of making arrangements to take up a loan to carry the proposals through. It is intended, during the early portion of the year, to purchase two additional railless cars to work in conjunction with the four already in use on the railless tramways, which were inaugurated last August. The contract which was entered into last year for pumping plant, new bacterial filter and detritus tank at the sewage works is to be completed by the council with direct labour. The widening of a portion of Bolton-street, the main thoroughfare in the town, has received consideration, and the plans and details have already received approval. The arrangements for the additional land which is required have been now satisfactorily completed. The scheme, which will embrace the erection of a concrete retaining wall faced with wall stones, with two flights of stone steps to give access to the land, is estimated to cost £1,250. An application is to be made to the Local Government Board for sanction to borrow money to proceed with the work.

Ramsgate (Mr. T. G. TAYLOR, borough engineer).—The works projected in Ramsgate during 1914 include the following: Scheme for town planning; shelter on the West Cliff; shelter on the East Cliff; lavatories (for ladies and gentlemen); street widening in the High-street and Boundary-road; sea-bathing pool and sea-bathing arrangements generally.

Rawmarsh (Mr. J. A. TONGE, engineer and surveyor to the urban district council).—This council have in hand or just completed enlargements to coal store, gasworks, several painting contracts, much road and sewer work, and many minor jobs. The contemplated works include new sewerage scheme for the low levels of the town to prevent flooding, refuse destructor, and enlargements and alterations to council offices.



Rawtenstall (Mr. J. JOHNSON, borough engineer and surveyor).—In addition to the usual works of maintaining the large mileage of roads and sewers, further new sewer and surface-water drainage work will probably be taken in hand, and several road improvements carried out. A scheme of main road reconstruction will also be taken in

hand. Private street improvements, estimated to cost £4,000, will be carried out under sec. 150 of the Public Health Act, 1875, and further works of house drainage will be completed.



Redditch (Mr. ARTHUR J. DICKINSON, A.M.I.E.E., engineer and surveyor to the urban district council).—A considerable length of tar-macadam has been laid during the past year, and it is proposed to add a similar quantity during the coming year. Practically

the whole of the roads will be tar-painted. Thirty-six cottages are being erected on the council's Ipsley estate at an estimated cost of £7,128, and the new recreation ground is being fenced. The surveyor has been instructed to report as to a desirable site for public conveniences for both sexes. The bridge in Windsor-road will be enlarged and the road widened, and it is probable that the new bridge over the river Arrow will be proceeded with at an estimated cost of £1,600.



Richmond, Yorks (Mr. H. W. MARSDEN, M.I.MUN.E., borough surveyor).—In addition to the ordinary routine in the surveyor's department, plans have been prepared for workmen's dwellings, and will be submitted to an early meeting of the town council. It is hoped that the erection of these houses will be commenced

during the year. Plans are also in course of preparation for public conveniences (one scheme underground)

fitted with the latest sanitary improvements. The improvements on the roads and footpaths will continue, and the present year will be a very busy one in Richmond.

Redcar (Mr. J. HOWCROFT, engineer and surveyor to the urban district council).—The works under consideration are—(1) Macadamising private streets; (2) paving back streets; (3) waterworks extension; (4) process for softening water.



Ripon (Mr. A. BARLOW, ASSOCIATION OF MUNICIPAL ENGINEERS AND SURVEYORS, city engineer and surveyor).—The work at the museum is progressing favourably, and the opening ceremony is expected to take place early in the New Year. New sewers and storm-water sewers will be taken in hand, and the relaying of 300 yds. of 15-in. sewer has been commenced. The council have

given instructions for a report on the footpaths of the city, and these will doubtless receive special attention. The roads have been kept in good order with tar painting, and this work will again be done next year. The sewage farm continues to pay its way from profits received from the crops, and more beds are to be underdrained.



Rochdale (Mr. S. S. PLATT, M.I.MUN.E., F.R.S.T., borough surveyor).—The town council, which completed last year, at an expenditure of about £32,000, the first portion of an extension of the sewage disposal works, will have under consideration the latter portion, consisting of thirteen percolating filter-beds, and other accessory works, at an

estimated cost of £22,000. They will also be extending the main sewerage in the north-western portion of this district, between Foot Mill and Caldershaw, in iron pipes principally up the bed of the river Spodden. Several other projects are under consideration, including extending the ferro-concrete covering over the river Roch, adjoining the site of the new G.P.O.; the covering of another portion of the river higher up, about 125 yds. in length; the acquisition of land and the provision of a sanatorium for tuberculous patients, and probably open-air school; the purchase of land for workmen's dwellings; the preparation of a second scheme of town planning, comprising 1,700 acres, 1,200 acres of which are in the borough, and the remainder within the areas of two adjoining authorities; the extension of the central baths, and main road widenings in connection with a promised grant in aid by the Road Board.

Rotherham (Mr. ERNEST B. MARTIN, M.I.MUN.E., borough and waterworks engineer).—The following works are contemplated by the corporation during the next twelve months: Waterworks.—Construction of a service reservoir; laying of 6 miles trunk main. Sewage Works.—Erection of detritus tanks, and relaying portion of the outfall sewer; pumping station for sewage works. Tramways.—Extension to carsheds, and laying of about 2,000 yds. of double track; extension of electricity generating station. Police Station.—Erection of a suburban station. Hospital.—Erection of administration block for the fever hospital.

Rushden (Mr. W. B. MADIN, engineer and surveyor to the urban district council).—The year 1914, like the two preceding ones, promises to be a busy year so far as municipal works are concerned. The following is a list of works for which plans and particulars have been prepared by the surveyor: Contract No. 1 of the new sewage disposal works, now in hand, at a cost of about £11,500, will be completed early in the summer. The second contract, relating to the erection of a house for the works manager, will be let at an early date. The council are also applying to the Local Government Board to borrow money for the erection of thirty-two workmen's dwellings on the Rectory estate, and it is fully expected these will be well on the way to completion before the end of the year. The council have decided to erect a disinfecting station, and plans for these will be put in hand shortly. In the new recreation ground, which was laid out last year, it is proposed to make two shelters, and provide further seats and extend the paths. In the highways department considerable lengths of bituminous-bound metalling have been laid on both main and district roads during the past few years, and it is intended to extend this system considerably. The council have already decided to make up Shirley-road under the Private Street Works Act, 1892.

Rutlandshire (Mr. J. RICHARDSON, county surveyor).—The county council contemplate making a culvert

over the ford between the parishes of Wardley and Belson, on the main road from Leicester to Uppingham, and strengthening the approaches thereto, at a cost of £325.

Ryton (Mr. JOHN P. DALTON, engineer and surveyor to the urban district council).—The council intend to carry out several works of private street improvement. It is proposed to erect a number of workmen's dwellings, and various highway improvements and sewer extensions are contemplated.



Salisbury (Mr. W. J. GOODWIN, ASSOC. M. INST. C. E., city engineer and surveyor).—So far as can be seen, the chief municipal works to be carried out during the year will be several road widenings and improvements. The approval of the Local Government Board has been obtained to the scheme for straightening

and widening the dangerous entrance to The Friary, involving the demolition and rebuilding of property on both sides of the road. This work is to be proceeded with at once. Three other schemes are being dealt with, and will no doubt be carried out during the year. Two are road widenings, and the other the formation of a loop road at the junction of two main roads, which at present meet at a dangerous acute angle. A new outfall surface-water sewer for the north-western district will be laid. This is necessary through the growth of that part of the city, but is chiefly required on account of the enormous quantity of clean water which will be discharged from the milk factory now being extended at a cost of several thousand pounds. The improvement of the roads will be continued by the substitution of tar-bound granite macadam for the old flint surface.

St. Albans (Mr. J. ASHURST, city engineer and surveyor).—The year 1914 is to be a very busy one at St. Albans. The extended area, comprising about 2,000 acres, is now being taken into the city. A new storm-water and sewerage scheme is to be put in hand to deal with this added area, at an estimated cost of about £40,000. Public conveniences, a new fire station and additions to the police station are projected, and it is hoped that a good many private street improvements will be carried out, and extensive main road works taken in hand. Amended by-laws will be considered, and it is hoped these will come into operation before the year is out.



St. Andrew's (Mr. WM. WATSON, burgh and water engineer).—The new waterworks at Cameron are now approaching completion, as is also the Fourth or Eden Golf Course, which is to be opened for play on June 1st next. The town council had under consideration the following schemes during the year—viz., the erection of a refuse de-

structor; the protection with rubble pitching of the foreshore near the links; the introduction of a gravitation scheme of water supply, with hydrants to each green on the four golf courses; the laying down of an additional eighteen-hole putting green on the Bruce Embankment; the further development of their pleasure grounds, including the provision of two lawn-tennis courts, and a public bowling green. The tar-spraying of all the roads within the burgh will be continued, and other minor improvements on the roads and streets are to be carried out.

St. Austell (Mr. E. D. GROVES, M. I. M. AND CO. E., A. R. SAN. I., engineer and surveyor to the urban district council).—A scheme prepared by the surveyor has received the sanction of the Local Government Board for the provision of twenty-two working-class dwellings. The contract has been let, and the erection of the cottages will be commenced at an early date. The council have received a munificent gift from Sir Charles Graves-Sawle, Bart., of a field in Truro-road, near the centre of the town, to form a recreation and pleasure ground, and Sir Francis Layland-Barrett, Bart., has promised a children's shelter for same. The work of fencing, planting and laying out this ground will be carried out by the council at an early date. The work of street improvements and road widenings will be continued. The first portion of the Duke-street improvement scheme will be completed at an early date. It is hoped to extend the main road widening and new footways on East-hill, and also complete the High Cross-street improvement. The cost of these improvements is estimated at £1,700.

The whole of the work will be carried out by the surveyor's department. New sewers will be laid in the Caroath district, and extended to take the drainage from the council's working-class dwellings. This work will be done by direct labour in the surveyor's department. The preparation of the scheme for the extension of the urban boundaries is nearly complete, and application will be put forward early in the new year.

St. Helens, I.W. (Mr. A. S. LILLEY, surveyor to the urban district council). The chief works that will be carried out by the council during the year 1914 will include the construction of a new concrete tube tank sewer, and cast-iron sea outfall and other drainage work, at a total estimated cost of £3,200, for which works contracts have already been let. Outside the ordinary administrative work, the council have also under consideration the question of road resurfacing improvement works, the provision of sanitary conveniences, and street improvement works.



St. Ives, Cornwall (Mr. SIDNEY PALMER, M. INST. M. AND CO. E., P. A. S. I., borough surveyor, waterworks manager and sanitary inspector).—The following schemes are being discussed by the council, but it is doubtful whether they will be carried out during the year—viz., new sea

wall and roadway from new pier and wharf around harbour, probable cost £3,000; extensive road widening, Stennack-road and Zemor-road, probable cost £600. The following will probably be done: New tanks at sewage outfalls at Westcott's Quay for retaining solid matter until suitable tides, probable cost £500, and extension to reservoir for supplying neighbouring districts, probable cost £600.

Saltash (Mr. W. W. HARVEY, surveyor to the urban district council).—Kerbing and channelling will be carried out in Fore-street and Silver-street, and the laying of footpaths with Dean stone. It is also intended to carry out improvements in the recreation field by providing lavatories and public shelters. The council have recently acquired some additional ground which commands one of the loveliest spots in the West of England, with a beautiful view of the river Tamar and the Dartmoor Hills.



Scunthorpe (Mr. HARRY W. SMITH, ASSOC. M. INST. C. E., borough engineer and surveyor).—The corporation are again adding to the attractions of their gardens in the north and south bays. In the north bay the works in progress include a café and public lavatories in Peasholme Park, and a match bowling green and three lawn and hard tennis courts in the Clarence Gardens. The remaining portion of the Promenade Pier is being demolished, which will greatly improve the appearance of the Royal Albert-drive, and a block of buildings containing shops, shelter, and lavatories is to be erected on the opposite side of the road. The Burniston-road is being widened and improved for a length of 400 yds. In the south bay the corporation are developing the South Cliff Gardens by the addition of rose gardens, terraces, footpaths, pergolas, and shelters. The construction of a large bathing pool is expected to be taken in hand. Lavatories for both sexes are to be constructed in these gardens for the use of the frequenters of the Esplanade.

Scunthorpe (Mr. C. CURTIS GRAY, surveyor and waterworks engineer to the urban district council).—The construction of a main sewer of 36-in. and 42-in. diameter through the centre of the town has just been completed, also the making up of several streets under the Private Street Works Act. The council have instructed the engineer to at once prepare a scheme for the extension of the waterworks, comprising the sinking of deep well and boreholes, the driving of adits, putting down new deep-well pumps, and the extension of the rising main and power cable. The provision of a refuse crushing plant is under consideration, also another depot for highway purposes, and swimming baths. Practically the whole of the streets will be tar-sprayed as usual; certain further street improvements and widening will be carried out, and a number of streets be made up under the Private Street Works Act. Several preliminary meetings have been held with a view to the adoption of the Town Planning Act, and it is probable that a scheme will soon be in course of preparation. Building operations are continuing rapidly, and a busy year is anticipated.

Seaton Delaval (Mr. ANTHONY DORIN, surveyor and inspector to the urban district council).—During 1913 extensive road improvements have been carried out at a cost of £800, including resurfacing with tar-macadam and the removal of a dangerous corner at Horton. A public shelter and a public convenience have been erected at the seaside at a cost of £300, and better provision has been made for life-saving. The first section of the scheme of lighting has been laid down at a cost of £300. The following works are projected for the year 1914: Urinal at Seaton sluice at a cost of £70; extension of lighting scheme, at a cost of £600; the provision of a recreation ground at Seaton Delaval; the laying out of Seaton sluice under a town-planning scheme in view of this part of the district being tapped by the North-Eastern Railway Company, and the provision of two railway stations, which, it is predicted, will open out this part of the area as an ideal watering place; the extensions of water mains and the laying of tar-macadam on all highways, and the provision of allotments, if suitable land can be obtained, at Seaton Delaval.

Seisdon (Mr. W. CANNAN, highway, sanitary and waterworks engineer to the rural district council).—During the year 1914-15 it is proposed to lay a considerable length of tar-macadam. The council have their own plant for making tar-macadam, which Mr. Cannan has designed and erected with his own staff. Considerable lengths of tar-painting will also be carried out. Several awkward corners will be removed, and the roads improved. It is anticipated that considerable improvements will have to be carried out on the roads, by widening and strengthening the surface, to meet the increased traffic to and from the stations on the new railway now being constructed through the district from practically end to end by the Great Western Railway Company. Considerable additions will be made to the distributing mains of the Kinver waterworks. A scheme for a supply of water to Pittingham village is under consideration. A new outfall sewage works for a portion of Wrottesley parish is also to be constructed soon.



Sheffield (Mr. C. F. WIKE, M. INST. C.E., city engineer and surveyor).—In addition to the usual routine work of the department, including sewage treatment, the scheme for the disposal of the Sheffield sewage (estimate £270,000) will probably be completed during the year. Several important street improvement schemes are to be taken in hand, at a probable estimated cost of £120,000, together with numerous smaller improvements, powers for which were included in the Sheffield Corporation Bill, 1912. A scheme (estimated to cost upwards of £250,000) is also in hand for the widening of two important thoroughfares, providing a large open square at the very busy junction of these streets. A portion of the river Sheaf is to be covered over in connection with this scheme. A considerable amount of work is in progress in connection with town planning, and will be proceeded with during the year. The total area of the town planning schemes at present in hand is about 6,000 acres. Negotiations are in progress for the widening of bridges over a railway and canal, which work may be commenced during the year (approximate estimate £15,000), and two other widenings of bridges are to be taken in hand at a probable cost of £14,000. Public conveniences are to be erected in various parts of the city, at an estimated cost of £2,000. The corporation are promoting a Bill in the next Session of Parliament for certain street widenings, tramways doubling, extension of city boundaries, and a scheme for the erection of a public abattoir. A tipping dock and railway sidings for the loading and transit of the town's refuse by rail is to be constructed, at an estimated cost of £2,000. In addition to the ordinary work in connection with parks and recreation grounds, a new park is to be laid out, and additional bowling greens and tennis courts will be laid down, in connection with which several pavilions will be erected. The corporation have recently purchased 65 acres of land for the provision of a cemetery, and plans for laying out are now in hand. It is expected that the execution of the work, and erection of lodges and offices in connection therewith, will be commenced during the year.

Sheffield (Mr. W. J. HADFIELD, surveyor of highways and deputy city surveyor).—The principal works likely to be taken in hand during the present financial year by the highway department, under the

supervision of Mr. W. J. Hadfield, surveyor of highways, are as follows: Highways.—At present the corporation are carrying out a special scheme for the improvement of highway surfaces at a cost of about £40,000; £17,000 has been granted by the Road Board, £3,000 will be paid out of revenue, and the balance has been sanctioned by the Local Government Board. Part of the work has been done, and the remainder will be done during the next financial year. For the general maintenance and upkeep of the 332 miles of adopted streets in the city, a sum of £64,000 has been voted. Private Street Works.—A large number of private streets will again form part of the highway department's work, and involve an expenditure of £30,000. Sewers.—The policy of reconstructing the old rubble and other defective sewers is to be continued; £25,000 will be spent upon this work during the year under sanction of the Local Government Board. The maintenance of the existing sewerage system will also entail a revenue outlay of about £11,000. Tramways.—It is expected that a sum of £40,000 will be expended on the upkeep of the tram tracks already existing and the construction of various new lines. To the above must be added the usual recoverable work, consisting of drainage, which the department is continually called upon to carry out, and which involves a sum approaching £20,000 per annum. The total estimate for the year is as follows: Highways (revenue), £64,000; Road Board grant (balance), £9,860; paving loans, £20,000; private street works, £30,000; tramways, £40,000; sewerage works, £36,000; recoverable work, £20,000; total, £219,860.

Sheringham (Mr. F. HALL SMITH, M.I.M. AND CO.E., P.A.S.I., M.R.S.A.N.I., engineer and surveyor to the urban district council).—1913 has been a very expensive year owing to the damage caused by the floods of August, 1912, so the council do not propose to do any work except ordinary routine work. Application is being made for a loan of £400 for sewerage of the Beeston Common estate.

Skelton and Brotton (Mr. R. S. MOON, surveyor to the urban district council).—During the last year several road widening schemes have been carried out, and owing to mine subsidence two of the sewers have been diverted at a cost of £2,500. The council are applying to the Local Government Board for sanction to a loan of £10,000 for lighting the district with electricity. A new sewer is being laid at Carlin How, to cost £1,200, and various private street works are to be carried out.



Somerset (Mr. H. T. CHAPMAN, county surveyor).—The following works of improvement will no doubt be continued with the aid of Road Board grants—viz.: Strengthening, widening, and surfacing with improved materials, in lieu of local limestone and flint, considerable areas of the most important main roads; surfacing with Tarmac about 4½ miles of the Bath to Bristol main road; strengthening and surfacing with local tarred limestone macadam about 40,000 super. yds. of main roads in the neighbourhood of Bristol; and surface tarring about 100 miles of main roads. The improvement of the East Brent-road, the southern approach to Weston-super-Mare, including diversions, widenings, strengthening and surfacing with granite at an estimated cost of £7,500, will be completed. An alternative and important access to Weston-super-Mare from the Bristol main road, near Worle, *via* Milton-road, will also be completed. Many bad junctions and dangerous turns will be improved by opening out the view. Several county bridges will probably be rebuilt. The council contemplate building six houses for roadmen engaged on the main roads, and also a depot for plant, tools, &c., in the Long Ashton rural district.



Southampton (Mr. J. A. CROWTHER, ASSOC. M. INST. C.E., borough engineer and surveyor and architect to the Education Committee).—Plans and estimates are being prepared for twenty private streets. Contracts have just been let for seven streets, and this work is now proceeding. One elementary school for 1,230 scholars is now in course of erection. The portion for infants (a separate building accommodating 430) was finished and occupied in August last; the portion for boys and girls,

accommodating 800, will be ready for occupation about Easter next. Plans for enlarging one of the smaller elementary schools are now before the Board of Education. Asphalt and Tar-macadamising.—A large area of carriageways was coated during 1913 with this class of paving. This type of road coating will be largely substituted for flint, gravel and ordinary water-bound macadam in the coming year. Disposal Works.—Tenders are being invited for reconstructing the quay-wall of the principal depot on the river Itchen. The wall will be constructed of ferro-concrete piles in substitution of the old wooden piling. The council have under consideration a scheme for modernising the treating of the sewage from one of the small suburban districts of about 360 acres, which is at present treated by broad irrigation. Refuse Destructor.—The Local Government Board have sanctioned borrowing the cost of a new destructor in one of the outlying districts, the plant to be provided being six cells, two boilers, and a chimney shaft. The council have under consideration the provision of another destructor in an outlying district, the requirement being caused by the rapid growth of the population during the last few years in that district. Isolation Hospital.—A tender has just been accepted by the council for additions to the administration block at this hospital; these consist of twelve bedrooms, bath-rooms, stores, dispensary and offices. Plans for a new pavilion to cost between £6,000 and £7,000 are before the Local Government Board. Tuberculosis Dispensary and School Clinic.—During 1913 these buildings have been provided and fitted up for their special requirements, and have recently been opened. Fire Station.—A small fire station has been erected in the suburbs, and is now ready for occupation. The mayor (Alderman W. Bagshaw) performed the opening ceremony on January 1st. Sewers.—There will be the usual extension of the sewers carried out in the coming year owing to the large amount of building work now going on and contemplated in the suburbs. The corporation have submitted a scheme to the Local Government Board for the prevention of flooding to one of the low-lying districts of the town (comprising 80 acres of fully built upon land), which is occasionally flooded with tide water, the greater portion of the land being very little above the level of high-water ordinary spring tide.



Southend-on-Sea (Mr. ERNEST J. ELFORD, M.INST.C.E., borough engineer and surveyor).—The area of the borough has been increased by 2,500 acres as the result of the Borough Extension Act of last Session, and now includes the whole of the Urban District of Leigh-on-Sea, and part of the Rochford Rural District. In April, 1911, when the borough

becomes a county borough, the administrative work of the department will be further increased by the addition of the main roads and county buildings. The new main sewerage and sewage disposal works and refuse destructor, costing £171,000, will be in operation early in the present year. Other works now being constructed, which will be finished during the present year, are the Western Esplanade extensions and Marine Gardens (£67,000), reinforced concrete commercial pier (£11,000), sea-water swimming bath (£11,000), Southchurch Boulevard and tramway extensions (£24,000). Improvement works on the existing promenade pier, including extensions of the outer head, additional siding and track accommodation on the pier tramways, refreshment room, lavatories, and slipway for motor boats (total cost £18,500) have been commenced, and will be completed during the year. Other work under construction includes extensions to sea water slipper baths, lavatories, and concert stand at Pier Hill Buildings (£3,100), Sutton-road improvement (£3,300), Hadleigh-road and Southchurch-road improvement (£5,500), and surface-water intercepting sewers (£1,100). Shelters costing £7,000 will be erected on the sea front during the year. A town planning scheme for an area of 2,400 acres is in preparation. Other schemes in preparation include the laying out and drainage of the West Cliffs, recently purchased by the corporation at a cost of £25,000, road improvement and tramway track doubling in Leigh Broadway (£10,500), road improvement and doubling tramway track in High-street and Southchurch-road (£7,000), the provision of a new highways depot, including stables, motor sheds, workshops, and stores. Private street works will proceed as usual, and the expenditure for this purpose will probably be

about £35,000. Considerable lengths of highways will be resurfaced with tar-macadam or bituminous material at a cost probably exceeding £20,000. Works under consideration include a new pavilion at the sanatorium (£3,400), tuberculosis hospital, recreation ground for Leigh, extensions to the pier pavilion and pier entrance, and the provision of a winter garden. The erection of a new town hall and municipal buildings is also under consideration, and cannot be much longer delayed.

Southport (Mr. A. E. JACKSON, ASSOC.M.INST.C.E., borough engineer and surveyor).—The works for the sewerage of Ainsdale and Birkdale are in course of construction, and also the first section of the laying out of the gardens in Lord-street. Borrowing powers are being obtained for the construction of a bathing lake and bungalows on the shore, together with shelter and café; also for construction of a sports pavilion in the Victoria Park. The council are considering a scheme for the remodelling of the municipal buildings, and for the construction of new buildings on the market hall site. They have under their consideration schemes for the town planning of Birkdale and Ainsdale, for which they have received authority to prepare a scheme, and also other parts of the town. The existing building by-laws have been revised, and the new by-laws will come into operation next year.



South Shields (Mr. LESLIE ROSEVEARE, A.M.I.C.E., A.M.I.MECH.E., borough engineer and surveyor).—The works in hand include a foreshore main drainage scheme with ejector pumping station, the reconstruction of main brick and concrete sewers in the centre of the town; a £1,300 lavatory and shelter, terracing a portion of South Marine Park to give added seating accommodation for band performances; a new bowling green, and the extension of municipal buildings for a tuberculosis dispensary.

Schemes to be carried out in the present year include further development of the foreshore by properly laying out about 5 acres of the North Marine Park; new shelters; lighting the Sea-parade with arc lamps; further main sewer and road reconstructions under loan; large extension to the electricity station; and in connection with the construction of the second largest dock on the Tyne, a scheme of sewer road diversions. Proposals before the council to be commenced this year include a new fever hospital of about 130 beds; diversion of the Newcastle-road; a new main road to Jarrow including a bridge over the river Don; a scheme of town planning, and an extension of the borough boundaries. A proposal for a tunnel under the Tyne, between South and North Shields, is before Parliament this Session.



Southwold (Mr. JAMES S. HURST, borough surveyor and inspector of nuisances).—During the past year a good deal of tar-paving and tar-dressing to roads has been carried out with satisfactory results. A new groyne has been erected on the beach to the north of the town, and the sea defence in front of the Gun Hill has been recon-

structed in concrete. Early in the New Year the workmen's cottages now in course of erection will be completed. These are twelve in number, and are built in three blocks of four cottages to each block. The contract price was £2,150. Among the works projected are laying out of two small garden enclosures, the reconstruction of the North-parade, works of sea defence, improvements to the town greens, and extensive tar-spraying of roads. The council are also at the present time considering the question of improvements at the sewage disposal works, owing to complaints regarding aerial nuisance arising from time to time. The Southwold Golf Company, whose links are on land leased from the corporation, are carrying out extensive alterations with a view to still further increasing the popularity of their course, and the cricket club, who also are tenants of the corporation, are improving their ground, and laying down a bowling green.

Sowerby (Mr. JAMES EASTWOOD, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—The following works are in contemplation here for this year in addition to the usual routine work: Completion of Wood Nook-lane and Gratrix-lane improvement; widening of Holmes-road at Mearclough; Beech-road improvement, and providing hand valves for the bacteria beds at the sewage works in place of the present automatic apparatus.



Stafford (Mr. WM. PLANT, ASSOC.M. INST.C.E., borough engineer and surveyor).—Sixty working-class dwellings now in course of erection will be completed early in the spring, and a further scheme for forty similar dwellings is now in course of preparation, and will be proceeded with shortly. The new Carnegie free library will be formally opened in February. A new 50-ft. road, nearly $\frac{1}{2}$ mile long, and raised 6 ft. above the surrounding ground, including a ferro-concrete bridge over the river Sow, and five ferro-concrete culverts, is now being constructed across the river valley, and will probably be completed during the year. An experimental plant for treating sewage on bacteriological lines is now being laid down, and a scheme is in course of preparation for treating the whole of the town sewage on this principle. The corporation are proceeding with the laying out of two estates to accommodate 750 houses. During the year the borough hall will be remodelled, and additional police accommodation will be provided at the Guildhall.



Stoke-on-Trent (Mr. A. BURTON, ASSOC.M. INST.C.E., F.S.I., borough surveyor).—The task of bringing into working order the administration of the federated area, which was formed in 1910 by the amalgamation of one county borough, three boroughs and two urban districts, has now become an accomplished fact. In addition to the ordinary maintenance of over 150 miles of roads, and the upkeep and repair of sewers, parks, cemeteries and other corporation properties, the corporation propose to carry out as many street improvement works as possible, and to make up a large number of private streets under the Private Street Works Act, 1892. Several important road paving works will be completed this year, and the council contemplate paving a further large area of main roads with granite setts on a concrete foundation. The construction of the Burslem storm-water drainage scheme, at a cost of £11,000, is being carried out departmentally, and during this year it is hoped that the greater portion of this work will be completed. Two town planning schemes are in progress under the Housing and Town Planning Act, 1909—one in the Burslem area, and the other in the Stoke area of the county borough. The borough surveyor has been instructed to prepare plan and estimate for the laying out of a park at Fenton, and a recreation ground in the Goldenhill district is under consideration. Building operations in connection with the provision of a public dispensary are well in hand, and alterations and additions are being considered in connection with the adaptation of the Stanfield hospital for sanatorium purposes. A police station is to be erected at Fenton, and alterations and additions to the police station at Burslem carried out. Another public convenience is to be erected at Hanley. The old town hall, Burslem, is to be reroofed, and alterations are contemplated in order to adapt this building for the purposes of a public library and district municipal offices. Provision is to be made for cold storage at the Hanley abattoirs, and it is proposed to erect a pavilion at Longton Park, a mortuary for the Stoke district, a new fire station at Hanley, new refuse destructor works for the Tunstall district, and carry out alterations to the Hanley Museum.



Stretford (Mr. ERNEST WORRALL, F.S.I., surveyor to the urban district council).—The extension of the town hall is nearing completion, following the opening of the adjacent new baths. The erection of a new reinforced concrete and masonry bridge and approaches 50 ft. wide over the Bridgewater Canal on the Chester (main) road is in hand, and should soon be completed. A new infants' school is being erected as an annexe to the Victoria Park schools, also a new mixed school in Trafford Park. The widening of Edge-lane—a thoroughfare to South Manchester—from 10 yds. to 18 yds. wide is in progress. In this road the forming of an elevated path behind to save a belt of mature trees has caused much favourable comment in the locality; and Manchester is acquiring powers in its pending Bill to extend the widening into the city. Seymour-grove, an arterial road at the Old Trafford end of the district, is also being widened from 16 yds. to 18 yds. The development in Longford Park of 70 acres, recently acquired, is in progress, and a portion of the hall is to be opened as a museum. The con-

struction of a storm-water sewer and channel, 1 mile long and 3 ft. to 5 ft. diameter, has been sanctioned by the Local Government Board, and will proceed forthwith; and a scheme for settling tanks of 1,000,000 gallons capacity, and a duplicate pumping set at the sewage farm is in preparation. The usual batch of private street works is scheduled and will be completed, besides several public streets repaving in granited rock asphalt. The council continues its pioneer work in the laying of this type of pavement. The lighting of the main roads by electricity is to be improved. The scheme under Part III. of the Housing of the Working Classes Act is to be completed by the erection of fifty additional cottages in semi-detached pairs on the acquired site. The continued growth in population and rateable value of the district involves a number of smaller items of improvement and increasing maintenance.

Suffolk (Mr. HENRY MILLER, M. INST.C.E., civil engineer and county surveyor).—The works to be executed in the present year include a new bridge over the river Waveney, jointly with Norfolk, near Haleston. The abutments will be in ferro-concrete. Considère system, with steel superstructure. The contractors for the abutments are Messrs. Malcolm Macleod & Co., and for the steelwork Messrs. Dawnay & Co. It is proposed to build some small houses for police constables in certain villages where suitable cottages are not available for the purpose. Plans for dispensaries for the treatment of tuberculosis are under consideration, also for the enlargement of certain schools.



Sudbury (Mr. WM. IRONSIDE TAIT, ASSOC.M. INST.C.E., P.A.S.I., borough and waterworks engineer).—The council propose during the current year to take out the existing steam plant and one pump at the waterworks pumping station, and to erect new suction-gas producers and engines, and new deep-well pump. A further length of Roemac road will be laid, and an increased area of tar-painting done during the summer. The question of building by-laws will also engage the attention of the council during 1914.



Sunderland (Mr. J. W. MONCUR, M. INST.C.E., F.I.S.E., borough engineer and surveyor).—The schemes that this corporation have in hand include the erection of a day training college and hostel for females; estimated cost, £30,000. Bede Collegiate School for Boys is to be erected upon a site that has recently been purchased on Low Barnes estate; the site and buildings are estimated to cost £25,000. Open-air salt-water baths are to be provided adjoining the new lower promenade at Roker from plans prepared by the borough engineer, estimated to cost £1,000. The Floral Hall, to seat 2,000, is to be built from plans prepared by the borough engineer; estimated cost, £4,000. Numerous street improvements will be carried out at an estimated cost of £7,000, and a scheme has been prepared for a new bridge, 90 ft. wide, to replace the existing bridge, 40 ft. wide, over the river Wear. The estimated cost is £120,000.



Sutton Coldfield (Mr. W. A. H. CLARRY, ASSOC.M. INST.C.E., borough engineer and surveyor). Tenders for a refuse destructor are now under consideration; this will be erected at an early date, and supply additional steam to the electricity central station. Plans are now in course of preparation for a boys' manual instruction school and girls' domestic service school, also for the extension of a girls' elementary school. A scheme for town planning 6,400 acres is being prepared, and will be submitted to the Local Government Board as soon as completed. Application is being made to the Road Board for a grant towards the cost of strengthening the foundations of the main roads, and it is hoped the work may be carried out during the year. It is also intended to carry out a number of widenings, rounding of corners, also sewerage and drainage work, besides the actual routine duties.

Sunbury-on-Thames (Mr. HAROLD F. COALES, ASSOC.M. INST.C.E., engineer and surveyor to the urban district council).—The new Shone ejector station,

erected at a cost of £1,650, will be completed early in the current year, and will prove a valuable addition to the sewerage system of Sunbury Common. The Metropolitan Water Board have obtained their Act of Parliament for power to construct a new conduit, filter beds, railway and incidental works; also giving power to the council to acquire land and execute widenings at Charlton, where a new reservoir is to be constructed. The widenings are to be proceeded with forthwith. The tar-painting of road surfaces will be greatly increased, and street watering proportionately reduced during the coming summer.



Sutton-in-Ashfield (Mr. WALTER BURN, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—The concrete tube sewer contemplated last year is now in hand, and will be completed early in the present year. It is proposed to enlarge and improve the sewage disposal works, at an estimated cost of about £10,000. Application is being

made to the Local Government Board for sanction to borrow £2,895 for carrying out private street improvement works in twelve streets. The public convenience for both sexes will be completed early in the ensuing year. During the year it is proposed to build a new fire station (in respect of which a Local Government Board inquiry was held) and a new post-office. More road widenings and improvements will be carried out, and it is intended to make extended use of tar-macadam and tar-spraying.



Sutton, Surrey (Mr. W. HEDLEY GRIEVES, surveyor to the urban district council).—During the past year various classes of road construction were inspected by the foreign delegates of the Third International Road Congress. The various roads were again tar sprayed. Several road improvements have been effected, and two streets have been made up under the Private

Street Works Act. A new departure was made in these roads in the matter of planting shrubs instead of the usual method of planting trees at stated intervals. This has proved successful. The Sutton (Garden Suburb) is now in course of development, and about fifty houses have been constructed or are in course of construction. The widening of Rose Hill main road will be proceeded with, the sewer for this purpose having already been laid. The town planning scheme will be further proceeded with. During the year the new public park—the sanction of the Local Government Board for the purchase having been received—will be thrown open to the public. A new secondary school for boys will be erected, and probably a secondary school for girls. At the sewage works a new 100-ft. sprinkler, humus chamber, and effluent channel have been constructed, and during the ensuing year important extensions will be made at the low level works. Parliament has extended the time for the construction of the Sutton to Wimbledon railway, and it is hoped that it will be commenced during the year. The London, Brighton and South Coast Railway are reconstructing the bridge carrying the main road over the Epsom Downs line. The extension of the electrification of the Brighton Railway Company's line from London to Sutton is also in progress, and, generally speaking, this important residential district is looking forward to a year of progress. Already the idea of applying for a Charter of Incorporation is being discussed.



Swindon (Mr. H. J. HAMP, ASSOC.M.INST.C.E., borough surveyor).—A Bill will be before Parliament in the ensuing Session for powers to take over that portion of the derelict Wilts and Berks Canal within the borough, including Coate Reservoir. Powers are also being sought to make Swindon a county borough. The promotion of these will entail considerable work in the borough engineer's department during the year. The Whitworth-road cemetery will be completed in the spring, at a total cost of £4,500, which includes subsoil drainage, boundary walls and fences, chapel, roads and paths. Additional engineering laboratories are to be built at the technical schools, at an estimated cost of £4,550. New public conveniences at Whale Bridge and Gladstone-street are to be provided, and extensions made at the Broome sewage works. A new approach road, 40 ft. wide, is to be constructed to the Imperial Tobacco Company's new factory site, at a cost of £1,350. Several private streets

and about three dozen back roads will be made up during the year. A 15-in. sewer, from Graham-street to Stratton-road, is to be constructed, at an estimated cost of £600.

Tarporley (Mr. S. GREENWAY, A.S.L., surveyor, inspector and assistant overseer to the urban district council).—The council, during the coming year, propose to carry out improvements on the main roads, to Tarmac several lengths, and tar-spray 10 ft. wide in the centre of such roads, except on the steepest gradients. It is intended to strengthen and improve the district road through Eaton village, which is now being used considerably by motors instead of the Tarporley main road; also to round-off a dangerous corner on the Delamer-road, near Stable-lane farm, Utkinton. The cost of these improvements is estimated at £1,200. Applications have been made to the Road Board for contribution towards the cost of the work.



Taunton (Mr. DAVID EDWARDS, ASSOC.M.INST.C.E., borough surveyor).—The town council have recently completed twelve workmen's dwellings in the East Ward of the town, at a cost of £143 per house, inclusive of sewers, electric light, streets and fencing, to let at a rent of 4s. per week inclusive. It is expected that

additional houses of this class will be provided in other parts of the town during the present year. The borough surveyor has been instructed to prepare plans for the erection of slipper baths on a site at the electricity works. This scheme may be supplemented on corporation property adjoining it at any time the swimming bath is to be erected. The construction of an overflow weir 200 ft. long will be carried out on the river Tone in substitution of the present penstock.



Tenby (Mr. B. MORLEY, M.R.S.A.N.I., borough surveyor, and water and harbour engineer).—A scheme is now under preparation for the erection of fourteen working-class dwellings at Broadwell Hayes. The construction of the new sewerage outfall, including tank sewer, is now in hand, and it is hoped to complete this work

during the year; the cost is about £18,000. The water supply will also receive attention during the coming year, and the council are considering the question of constructing new filter-beds. The erection of more shelters and lavatories will also be considered.

Tenterden (Mr. W. L. C. TURNER, borough surveyor).

During the year tenders will be invited for constructing new sewers and outfall works, and the building of cottages. The Local Government Board have sanctioned the loan of £14,000 for the above. It is proposed to extend the tar-painting of roads.

Tenterden (Mr. W. L. C. TURNER, surveyor to the rural district council).—It is contemplated during the coming year to extend the sewers in one of the parishes in the district, and to construct outfall works for treating the sewage of same. The question of building cottages in many parishes will probably receive attention during the year.



The Maldens and Coombe (Mr. REGINALD H. JEFFES, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council). The principal works upon which the council will be engaged will be considerable additions to the sewage disposal works, and the provision of a refuse destructor, both of

which projects have received the sanction of the Local Government Board. The additions to the council offices, comprising new council chamber and additional offices, now proceeding will be completed. The work of making up private streets will be continued. Further extensive sewerage operations are also contemplated. Application will be made to the Local Government Board for a loan for purchasing about 10 acres of land to be used for municipal allotments.

Thornton, Lancs (Mr. HENRY FENTON, engineer and surveyor to the urban district council).—The council, during the year, have applied to the Board of Trade for the necessary powers for the supplying of electrical energy in their district. Application is being considered by the Local Government Board for their sanction to borrow the sum of £6,000 for extensive additions to the council's gasworks, including the provision of

a new telescopic gasholder. It is proposed to make up, under the Public Health Act, a number of back streets, and also to tar-spray a considerable length of roads within the district. During the year the underground conveniences at Cleveleys for both sexes will be completed, and development is expected of several large building estates.



Tiverton (Mr. J. SIDDALLS, borough engineer).—The past year has been such a busy one that the present year will be chiefly occupied in finishing off various schemes of municipal enterprise already commenced. These include the construction of two concrete service reservoirs of 250,000 gallons and 70,000 gallons respectively, and other works of water supply, various improvements at the sewage works, and further progress with the first part of the municipal housing scheme. The complete scheme comprises 114 houses of three types—(a) containing parlour, large living-room, scullery, with three bedrooms, to cost £190 each, and let at 6s. 3d. per week; (b) large living-room, scullery and three bedrooms, £150 each, 5s. 3d. per week; (c) large living-room, scullery and two bedrooms, £120 each, 4s. 6d. per week, inclusive of rates in each case. The roads are 36 ft. wide, with 18-ft. carriageway, surfaced with tar-macadam, grass verge 4-ft., tar asphalt footpaths, 5 ft. wide. A new departure is to be made during the coming year by the council undertaking their own traction hauling of the stone for highways and the town refuse, for which purpose a 6-h.p. engine with four trucks is about to be purchased.



Todmorden (Mr. J. A. HEAR, borough surveyor and waterworks engineer).—The works projected during 1914 include the following: Completion of Burnley-road widening and granite paving; sewerage works; storm-water tanks; private street improvement works; bandstand; two bowling greens, and four shelters at the Centre Vale Park.

Tonbridge (Mr. FRANK HARRIS, engineer and surveyor to the rural district council).—The council will carry out schemes of lighting, heating and hot water supply for the wards and establishment blocks at Capel hospital. In connection with rural housing, schemes for the erection of cottages will be submitted for the following parishes: Brenchley, ten cottages; Hadlow, twenty-four; Hildenborough, four; Horsmonden, ten; and Pembury, sixteen. The building by-laws will be amended; the seven parishes now having the urban code will have the intermediate, and the four parishes now without by-laws will have the rural code. Hilden Park-road, Hildenborough, will be made up under the Private Street Works Acts. Schemes for improving dangerous corners are in preparation for submission to the Road Board. Water main and sewer extensions will be carried out in certain parishes. During the year about 200,000 yds. of surface tarring will be carried out, and about 5,000 cub. yds. of tarred rag macadam laid.



Torquay (Mr. H. A. GARRETT, ASSOC. M.INST.C.E., M.R.SAN.I., borough engineer, surveyor and harbour engineer).—In addition to the usual extension of sewers, new roads and paths, consequent on the natural growth of the borough, the chief works projected by the town council for 1914 are the construction of medical baths and a swimming bath, for which a tender has already been accepted in the sum of £14,942; an underground sanitary convenience at Castle-circus, at a probable cost of £2,000; alterations to the concert hall and shelters, and the erection of a new bandstand on the Princess Pier; the construction of a Marine-walk from the Bath saloons along the rocky face of the cliff to Meadfoot, a distance of about 1½ miles; and the construction of a cliff railway from the top of Babbacombe Downs to Oddicombe Beach, a length of about 600 ft., at a gradient of about 1 in 2½. An extensive scheme of street improvement in connection with a suggested sweeping away of the thickly populated area in the centre of the old part of Torquay, and a scheme for rehousing the people dispossessed is under discussion, and will probably take some definite form in 1914.

Tottington (Mr. LAWRENCE KENYON, surveyor and inspector to the urban district council).—During the year, in addition to the routine work, the sewerage of a portion of the district, and the remodelling of the sewage disposal works, will be commenced. The

scheme has been sanctioned by the Local Government Board, and the estimated cost is £21,000.

Tring (Mr. S. S. GETTINGS, ASSOC.M.INST.C.E., surveyor to the urban district council).—The chief work of the past year has been the making up of Longfield-road, including foul and surface water sewers, the paving costing £2,366, and the laying of sewers in Beaconsfield-road, Miswell-lane and Aylesbury-road costing £352. This work has recently been completed. In addition to the ordinary maintenance of main and other roads, Station-road has been strengthened and resurfaced throughout at a cost of about £1,100. A considerable quantity of tar-spraying has been executed departmentally during the past year, costing about £300, and the council have decided to allocate £400 to this work for the year 1914. Plans are now being prepared for a new sewer in Bunstrux-hill, and the work will be put in hand shortly. The Highway Committee have instructed the surveyor to include for tar-paving a considerable part of the Station-road and Park-road footpaths in the annual estimate, and also for the provision of kerbing and channelling for the New Mill district. The council have recently acquired a new tip for house refuse in the dry canal at Little Tring, and the necessary works of road making and fencing for the same is now in hand.

Tutbury (Mr. H. S. TEBBITT, M.I.M. AND CO.E., engineer and surveyor to the rural district council).—There are no large works projected in this district for the coming year. The dangerous corners are receiving the consideration of the council, and improvements in this direction will be carried out. A small extension of the sewerage scheme at Branstone, at a cost of £300, is contemplated.



Tyldesley with Shakerley (Mr. FRANCIS E. JONES, engineer and surveyor to the urban district council).—Sanction to a loan of £25,000 for a main outfall sewer and extensions to the sewage works has been granted, and it has been decided to carry this work out by administration. The provision of a new town hall, post-office, fire station, and stables is under consideration; a suitable site has been purchased, and plans are now in course of preparation. The council have in hand the conversion of 1,200 privies to water-closets. The further substitution of granite paving for macadam, and other paving will be carried out on the main and secondary roads, and a number of private streets will be made up.



Ulverston (Mr. C. TELFORD HAGUE, surveyor to the urban district council).—The council have under consideration two sewerage schemes. One for the town proper, includes the provision of two settling tanks to replace the existing obsolete tanks, two new storm-water tanks with overflow to adjacent stream, a relief sewer 15 in. diameter, and the replacing of the present 15 in. diameter outfall sewer to the tanks with a 21 in. diameter cast-iron pipe sewer. The total cost will be about £3,000. The other scheme consists of a pumping station and two storage tanks at the tidal outfall, which will make the sewers in that neighbourhood independent of the state of the tide. The cost of the scheme will be about £2,800. The Local Government Board have held an inquiry into an application of the council for sanction to borrow £2,890 for the purpose of widening and improving a portion of Priory-road. The council also propose to make up several streets under the Private Street Works Act. A committee has been working for some time in connection with a proposal to build a Coronation hall, part of the cost of which will be defrayed by public subscription. An inquiry has been held by the Local Government Board into an application by the council for sanction to borrow £3,000 to defray a portion of the cost of the building. The architects have prepared plans of the hall, and the total cost is estimated at £6,400 or thereabouts.

Upton-on-Severn (Mr. M. D. PRICE, surveyor to the rural district council).—It is anticipated that the sewerage and sewage disposal scheme carried out by Messrs. Law, of Kidderminster, at Kempsey, will be completed early in the year. House connections will follow. A similar remark will apply to the scheme for Powick, designed and carried out by the district surveyor. In the review last year it was reported that

Messrs. Willeox & Raikes had submitted their scheme for dealing with the sewage of Madresfield and Gnarlford, and that the council had adopted and presented it to the Local Government Board. Soon after the appearance of this report, Lord Beauchamp, the principal landowner of these parishes, instructed Messrs. Strachan & Weeks, engineers, London, to prepare an alternative scheme for dealing with the parishes separately. Their plans came before the council, with the result that the latter gave further instructions to Messrs. Willeox & Raikes to revert to one of the original schemes, which they presented to the council for consideration. The council then declined to adopt that piecemeal proposal, and resolved to approve of a comprehensive scheme on the grounds that they considered it undesirable and uneconomical to multiply sewage disposal areas. At the present time the council are reconsidering the whole matter. Upton-on-Severn Water Supply. The quantity tests of the yield from the borehole proved ample for the area proposed to be served. Application has been made to the Local Government Board for their sanction to a loan that will enable the council to complete the scheme. The board have promised an inquiry, and in doing so point out the fact that the loan now asked for, added to the existing debt of the contributory place, will be largely in excess of the borrowing powers of the parish. How to meet this difficulty was a subject discussed at the last meeting of the council held in 1913. The representatives of the parish of Upton-on-Severn appealed to the council to remove the difficulty by taking over the whole scheme and its financial responsibilities, and it was suggested that the council by doing so would then be in a position to supply the surrounding parishes with a wholesome supply, which was much needed. The council declined to adopt this course, so that the problem remains unsolved. The rates, at present, for the contributory place of Upton-on-Severn are within a small fraction of 10s. in the £. Housing of the Working Classes.—The council having adopted a scheme for building four cottages in the parish of Castlemorton, have applied to the board for sanction to a loan of £876. The inquiry has been held, and they are now waiting for the board's decision. Mr. T. W. Holds, architect and surveyor, Great Malvern, has been appointed the council's architect under the Housing and Town Planning Act.

Uttoxeter (Mr. JNO. B. HADFIELD, M.I.M. AND CO.E., surveyor to the urban district council).—During the past year several private streets have been made up, and are now being taken over by the council. New pumping plant has been provided at the waterworks. Alterations to the town hall are to be proceeded with, including the provision of additional dressing-rooms, emergency exits, heating apparatus, and improved ventilation. The auction ring in the Smithfield cattle market is to be roofed over, and additional conveniences provided for users of the market in inclement weather. A larger number of new buildings are now in course of construction than has been recorded at any one period for a long time past.



Ventnor, Isle of Wight (Mr. H. HUGHES OAKES, M.R.SAN.I., surveyor to the urban district council).—The year has been an extremely busy one for the Ventnor Urban District Council, and there is at the present time every possibility that 1914 will see many additional improvements. During the past year the new landing stage to the Royal Victoria Pier was constructed at a cost of over £6,000, and the Esplanade extended a considerable distance eastwards. This latter work has met with such hearty approval in the town that it is quite possible that the extension will be further proceeded with; in fact, the plans have already been before the council and approved, but the actual letting of the contract has been postponed. The council have recently advertised for tenders for the construction of a new groyne, and this will be commenced about April next. The type of groyne is different from those previously erected on the foreshore, and is being put down on the advice of the surveyor as an experiment, the cost being about one-third that of the old type. Should this prove the success anticipated, two further groynes will be constructed. The extension of the cemetery, which has been in hand for the past twelve months, will be further proceeded with, and it is hoped to finish the first section by about the middle of the year. Further lavatory accommodation will in all probability be provided, the surveyor having pre-

pared plans of several alternate schemes, and these will be considered at an early meeting of the council. Several minor road improvements have been suggested, also the extension of the tennis courts at the park, and it is more than likely that some of these will be carried out during the year under review. It is generally admitted on all hands that the last season was one of the best Ventnor has experienced for some considerable time, and the council are fully alive to the importance of keeping this well-known health and pleasure resort to the high standard for which it has always been noted. Extensive advertising is being done on the Continent, and it is confidently anticipated that the influx of foreign visitors into the town will be even greater than in previous years.



Wakefield (Mr. J. P. WAKEFORD, ASSOC. INST. C.E., city surveyor).

It is anticipated that the year 1914 will be an exceptionally busy one in the city of Wakefield. The widening of Wakefield Bridge, estimated to cost £25,000, is under consideration, while designs for thirty-six houses for the working classes are in the hands of the Local Government Board, and plans for a further seventy similar dwellings will be submitted as speedily as possible. A scheme for extensions and additions to the fever hospital is being prepared, and application will be made to the Local Government Board at an early date for the necessary borrowing powers for such work, which is estimated to cost £12,000. Application has been made to the Local Government Board in respect of the carrying out of a district drainage scheme for the western half of Sandal, an agreement having been entered into with the rural district council to treat the sewage of a portion of the adjacent parish of Crigglestone. The estimated cost of this work is £18,000. The repaving of several thoroughfares with granite setts will also be undertaken, a loan for this purpose, amounting to £14,000, having been sanctioned by the Local Government Board. The relaying of a portion of the sewer in Denby Dale-road will be carried out during the coming summer. The widening and improvement of Kirkgate, Castle-road, Sugar-lane, Barnsley-road, and Back Bond-street is contemplated, plans having been prepared, and in some cases negotiations entered into with the owners of the property required for the improvements. During the past year private street works have been carried out to the value of £1,300, and the council have given instructions for a number of other streets to be similarly dealt with. A scheme is in course of preparation for the demolition of an insanitary area in Westgate, known as Spawforth and Tidswell's yards, and the construction of a new street 40 ft. wide between Back-lane and Westgate. Alterations to the fire station are in hand in order to provide the necessary accommodation for the recently purchased motor fire engine. Instructions have been given for the provision of public conveniences in various parts of the centre of the city, and the building by-laws are in course of revision. The coupling up of the existing sewage disposal works at Agbrigg to the main outfall works at Calder Vale will be taken in hand, such work involving the construction of a syphon under the river Calder. The remodeling and extension of the sewage disposal works, which have been in progress for upwards of three years, was completed in October last. The works comprised the construction of 3½ acres of percolating filters, 6 ft. deep, upon which the distribution is effected by means of butt-jointed earthenware pipes laid upon the surface of the filters, and fed from dosing chambers fitted with automatic syphons, so that the liquid escapes from every joint of the pipes. Humus tanks, precipitating plant and buildings, storm-water tanks, and other appurtenant works have also been provided, the total expenditure amounting to £30,000.



Waltham (Mr. W. C. HOLLOWAY, ASSOC. INST. C.E.I., M.R.SAN.I., engineer and surveyor to the urban district council).—No works of any magnitude are contemplated during the year 1914. A loan will probably be raised for several road widenings on main roads, and the construction of slab footways. The mileage of tar-spraying will be considerably increased, and a further length of wood paving laid in the town. The strengthening of the

roads at High Beech to carry the motor-bus traffic to the centre of Epping Forest will be carried out, and the usual work of re-coating and maintaining the large mileage of roads will entail plenty of work. Several lengths of Tarvia A having been laid in the past two years, this material will again be used for grouting. A new code of by-laws of a less stringent character, enabling wooden buildings to be erected in the country area, is in course of preparation, and this should give a stimulus to the building of this class of house. The erection of a refuse destructor is in contemplation.



Wantage (Mr. JOHN W. HARRIS, engineer and surveyor to the rural district council).—In addition to ordinary routine work, the erection of four workmen's dwellings, together

with the extension of sewer, house drains and fencing in village of Harwell will be put in hand. A housing scheme for the erection of six workmen's dwellings in the village of Letcombe Regis is now before the Local Government Board with a view to sanction of a loan for carrying out the work. The council have under consideration a scheme for the extension of the sewerage and sewage disposal works in the parish of Harwell, at a cost of about £1,200, and have also under consideration a water supply scheme for the parish of Letcombe Regis.

Ware (Mr. H. FOX HILL, surveyor to the urban district council).—A scheme for the improvement of the pressure of the water supply in the higher parts of the district is contemplated. One of the Cornish boilers at the Musley Hill waterworks has recently been reset, and the resetting of the other boiler is contemplated. The widening of Star-street, the main road to Bishop's Stortford from Ware, will be carried out during the coming year. Plans for the same have been deposited with the Local Government Board, and a grant of £1,500 towards the cost of the works has been made by the Hertfordshire County Council. Two streets are to be made up under the Private Street Works Act. Further lengths of old cobble footway paving will be relaid with artificial stone paving, and there will be the usual road repairs and tarring of footpaths in the spring. Beyond this nothing is contemplated apart from the usual routine work.

Watford (Mr. D. WATERHOUSE, engineer and surveyor to the urban district council).—The principal work for the year will be in connection with a water scheme which is being carried out under Parliamentary powers, at an estimated cost of £114,000. The scheme comprises boreholes and wells, pumping station, softening works, a covered service reservoir of 2,000,000 gallons capacity, and 5 miles of 18-in. mains. Four 40-in. lined boreholes 350 ft. deep, and one 72-in. diameter well have been completed. The erection of the pumping machinery and the construction of the pumping station buildings and the softening works will be commenced during the year, and the work in connection with the service reservoir and mains will be put in hand. An electrically driven pumping plant of the Roturbo type to deal with the sewage of a portion of the Callow Land district is in course of construction, and will be completed with the buildings and tanks during the year. A comprehensive scheme of highway reconstruction, dealing with the main thoroughfares in the urban district, is being dealt with. The estimated cost of this work is £46,646. Several streets will be made up under the Private Street Works Act, 1892. The provision of public slipper baths, at an estimated cost of £2,100, is under consideration. Other works in hand include twenty-two working-class dwellings being erected under the council's housing scheme, at a cost of £4,000; the laying out and planting of the Waterfields Recreation Ground, and the construction of a pavilion and conveniences thereon; the provision of shelters on the Callow Land Recreation Ground; and the improvement of Watford Heath. The purchase of Cassiobridge Common has been completed, and the necessary protective works will be carried out. The council have made application for a large extension of their district in consequence of the development of the surrounding neighbourhood. It is anticipated that the new line of the Metropolitan Railway shortly to be constructed will cause a still more rapid growth of the town.

Wath-upon-Deerne (Mr. J. H. DREW, M.I.M. AND CO. E., M.R.SAN.E., engineer and surveyor and waterworks engineer to the urban district council).—The present

year will be an extremely busy one. The Local Government Board have approved a waterworks scheme estimated to cost £12,000, and 3 miles of 4-in. to 8-in. cast-iron and Mannesmann steel tube distributing mains have already been laid. Two covered service reservoirs having 624,000 gallons capacity will be constructed, together with 340 sup. yds. of new sand filters. After careful consideration it has been decided to abandon the air-lift system of raising water from the boreholes, and to instal a Hathorn, Davey & Co., Limited, high-class compound, surface condensing, differential waterworks pumping engine, with borehole and force pumps. After repayment of principal and interest on the loan borrowed for this plant, a saving of at least £350 per annum will accrue, in comparison with the cost of working the present system. When complete the waterworks undertaking will be easily capable of supplying 300,000 gallons per day, and there will be reservoir storage equal to three days' supply, or 900,000 gallons. The Local Government Board have held an inquiry into the council's application for a loan of £13,000 for sewage works extensions, which includes pumping machinery, screens, lime-mixing plant, gas engines, and suction gas plant, detritus chambers, precipitation tanks, percolating filters, humus tanks, shallow sand straining filters, and sludge drying beds. The main road will be further improved by strengthening foundations and surface covering with Tarmac, this being a continuance of the very satisfactory policy adopted during the past two summers. "Rocmac" has been tried where the gradients were not suitable for tar-macadam. Under pressure from the Local Government Board a committee will consider the necessity for a municipal housing scheme, and negotiations have been opened for the purchase of suitable sites. The greatest scheme proposed for the district is one of municipal tramways, conjointly with the urban councils of Wombwell, Bolton-on-Deerne, and Thurnscoe. This scheme is the outcome of the Wath Council's successful opposition to the Mexborough and Swinton Tramway Company's proposals to run railless cars in the district. Much interest was manifested in this Mexborough and Swinton Bill when before the Parliamentary Committee in June and July last, and the company only proposed to contribute at the rate of 3d. per car mile towards the cost of road maintenance, which would have been inadequate in proportion to the damage which would have resulted to the macadam roads. In addition to the tramways scheme an electric lighting order is being applied for to the Board of Trade. The estimated cost of the tramways is £151,891 (18 miles, 1 furlong, 69 chains), and electric lighting scheme £57,000. Considerable road improvement and widening schemes will be necessary before the tramways can be constructed along some of the routes. The engineer for the tramways and electric lighting schemes is Mr. Stephen Sellon, M.I.N.S.T.C.E., 36 Victoria-street, Westminster, S.W., and this gentleman is working in conjunction with the local surveyors in regard to highway improvements and details of construction.



Wednesbury (Mr. E. MARTIN SCOTT, borough engineer and surveyor).—Various private street works are contemplated, as well as important general street improvements. Main roads and other roads are to be treated with Tarvia grout. Considerable artificial stone flag pavement is to be substituted in place of blue bricks on footways. An important road diversion is also to be carried out. The housing question is also to have careful consideration. Improvements to existing open spaces will be proceeded with, consisting of tree planting and laying out convenient areas for athletic exercises. The new county Metallurgical Institute, now in course of completion in the borough, will be formally opened some time during the year. New public baths and enlarged municipal offices have recently been instituted and opened.

Wellingborough (Mr. E. Y. HARRISON, ASSOC. M.I.N.S.T.C.E., A.M.I.MUN.E., surveyor and water engineer to the urban district council).—Works projected during the coming year comprise several important street improvements, including widening of Cannon-street, Cambridge-street and Victoria-road. The properties are now in the hands of the council, and the pulling down and the neces-



sary street works are about to be undertaken. In the central space at the junction of the streets a partly underground public convenience is to be erected in a suitable enclosure. Workhouse-road is to be widened and a surface-water sewer laid throughout its length, the grammar school authorities receiving £75 for the land, and building a retaining wall along their frontage. Plans are before the Road Board for improvements of dangerous corners and the construction of a new road at Hobill's Mill, the latter application being a joint one with the rural district council. The Park-road storm-water scheme will be completed, and several lengths of foul-water sewers laid. The result of the new borings in the neighbourhood of Bushfields has been moderately successful, and a well is to be sunk from which it is expected that the available water at these works will be augmented by 300,000 gallons per week. Preliminary surveys are to be made in the immediate neighbourhood, and gaugings of the streams and springs in the valley are being taken with a view to estimating the yield of the area under consideration. The new bandstand, with enclosure and paving works, will be completed in Castle Fields early in the year, and the making up and levelling for bowling greens and tennis courts is proceeding. The new Wellingborough motor omnibus undertaking has proved a great success, and has been the means of linking up all the large towns and many of the villages with the town. It is proposed that a Central Boat and Shoe Institute for the county be erected in Wellingborough, it being generally considered the most accessible and convenient place for the students from all parts of Northamptonshire. The town generally is progressing favourably, the staple trades are flourishing, and building operations are not keeping pace with the increasing demand for new houses.

Wells-next-the-Sea (Mr. RICHARD G. COLES, A.R.S.T., M.I.MUN.E., surveyor and inspector, and port sanitary inspector to the urban district council).—The following works are contemplated during the present year—viz., culverting the Marsh Dyke, at a cost of £680; southern drainage scheme, £700; making up roads, at a cost of £300; a housing scheme under the Housing and Town Planning Act, 1909; the reconstruction of several insanitary areas; and the draining and paving of all the large public yards.



West Bromwich (Mr. ALBERT D. GREATOREX, M.INST.C.E., M.S.A., borough engineer and surveyor).—A Bill was successfully promoted in the last Session of Parliament, and powers obtained to carry out street improvements, and provide a service of trolley vehicles and motor omnibuses, among other works. Negotiations are nearly completed for the

purchase of the property in connection with these improvements, to cost £15,000, and these works will be commenced at an early date. The council have under consideration the provision of a trackless trolley vehicle service to two outlying districts, and it is expected that this scheme will be undertaken in the spring. Four acres of recreation grounds are being laid out, and the construction of new streets in connection with the Oakwood estate and several new sewers is proceeding. The new work contemplated for the coming year also includes two new schools, large extensions to sewage outfall works, reconstructing and strengthening several roads, the usual street widenings, and improving road surfaces. The council have under consideration the provision of a dispensary, alterations to hospital, and a town planning scheme. A fairly busy year is therefore to be expected.



West Hartlepool (Mr. NELSON F. DENNIS, M.INST.C.E., borough engineer).—The council has, during the past year, completed the erection of a new power station in connection with the utilisation of waste heat from the blast furnaces in the production of electrical energy, for, among other objects, the supply of current to the recently ac-

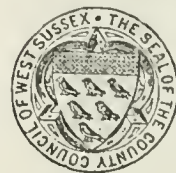
quired tramway system. The present generating station will be dismantled, and the new premises extended for car-shed accommodation. The extension of the Cameron Hospital, through the generosity of Alderman J. F. Wilson, J.P., from designs undertaken by the borough engineer, has also been completed, and there is in course of erection, emanating from the same designer, a large covered sea-water swimming bath of

reinforced-concrete construction near the foreshore, the munificent gift of Mr. Wm. Cresswell Gray, D.L. Plans have been approved for a new elementary school for Seaton Carew area of the borough. The two bowling greens laid down by the corporation are greatly appreciated, and have proved self-supporting upon the first year's working. Ornamental pavilions in reinforced concrete have been erected in connection therewith, the one at the Burn Valley Gardens being the gift of Alderman M. H. Horsley, J.P. There has also been erected at the Ward Jackson Park, of similar construction, a boathouse for the accommodation of the Model Yacht Club, and consideration is being given to the provision of a tennis pavilion in the same place. The municipal buildings are being extended to include a showroom for electrical appliances, and an extension is to be made at the public library in connection with the adoption of the "Open Access" system. The Stranton Garth is being laid out as an ornamental space, the same having been enclosed by a concrete wall surmounted with iron railings. The construction of a road across the Burn Valley Gardens, in extension of one previously formed, has been completed, and affords accommodation for all kinds of traffic from the west end of the borough proceeding southward, and there is now under consideration the construction of another road leading still further southward, to terminate at the Golden Flatts estate, near Seaton Carew Station, from whence traffic will have further access to the new road to Middlesbrough, which the council has so long urged. By the latter scheme, which has been commenced, the distance between the boroughs will be reduced by five miles. The other proposal for constructing a road from Horden to give access to West Hartlepool from the colliery districts northward has not received definitive sanction; but when both roads are completed, holding out scope for further developments, the aspect of the district will be very promising. Messrs. W. Gray & Co. have already acquired land on the Snooks for the establishment of a shipyard. The corporation are considering the question of extending the tramway system to the Snooks, also of town planning of a large area both within and without the borough boundary. The work of reconstructing the sewers in the older part of the town is in progress. The North-Eastern Railway Company have erected a footbridge over one of the level crossings, and are shortly entering upon the construction of a further bridge (length 800 ft.) for pedestrians over the main line level crossing. They are also effecting extensions to sidings and improvements to the dock accommodation to relieve the present congestion.

West Lancashire (Mr. R. ROWBOTHAM, surveyor to the rural district council).—It is intended to continue the tar-spraying of the more important secondary roads by direct labour; also to continue the conversion of grit setts to granite cubes, and the coating of secondary roads with tar-macadam. The rebuilding and widening of several bridges is also contemplated; also the acquisition of the necessary lands for widening out bends on the more important roads.

West Sussex (Mr. H. W. BOWEN, ASSOC.M.INST.C.E., county surveyor).—The programme of work contemplated in this county during the ensuing year will include extensive works of reconstruction and strengthening of foundations to weak roads and surfacing with tarred macadam, also grouting with pitch, Vianex, and other approved forms of up-to-date road-binding materials. In fact, the enormously increasing traffic over the whole of the county roads entails considerable additional work each successive year, and the question of reconstructing and maining certain of the heavily trafficked district roads in the county is now receiving careful consideration.

Whitley and Monkseaton (Mr. A. J. ROUSELL, ASSOC.M.INST.C.E., engineer and surveyor to the urban district council).—The following schemes will be carried out by the surveyor's department during the ensuing year—viz.: Completion of lower promenade and shelter, £4,000 (work now in hand); erection of thirty-eight cottages, with streets and sewers, at Hill Heads, £10,000 (commenced); enlargement of existing public conveniences and the provision of a new convenience for ladies; enlargement of main outfall sewers, for which plans are now being prepared (£14,000); a town planning scheme for the northern portion of the district, now under consideration; and the reconstruction of a further list of private streets, and various public improvements.





Widnes (Mr. JOHN S. SINCLAIR, ASSOC.M.INST.C.E., borough surveyor).—The town council have decided upon the provision of a refuse destructor at the depot, Moor-lane. Tenders have been invited, and are now under consideration for a three-cell back-feed destructor to be worked in combination with a tar-

macadam plant, stone breaker, and mortar mill. A bowling green, 45 yds. by 45 yds., is being laid out at Victoria Park, making three greens in this park. A recreation ground is to be laid out at Lower House-lane of a total area of 14.7 acres; the estimated cost of fencing and gates is £780. A further extension of the Victoria Promenade Gardens, fronting the river Mersey, and adjoining the Transporter Bridge, is contemplated, at an estimated cost of £750. The fencing and laying out of Pex Hill Common as a recreation ground adjoining the corporation reservoirs in the township of Cronton has been approved by the town council. The estimated cost of the work is £650. An extension to the borough accident hospital is to be proceeded with at an estimated cost of £1,500. The plans for the levelling and widening of Deacon-road, at an estimated cost of £4,400, towards which sum the county council contribute £1,500, has been approved by the Local Government Board. The substitution is contemplated of granite cube setts and tar-macadam for water-bound macadam on several of the roads used by the motor buses. The making up of several streets and passages under sec. 150 of the Public Health Act, 1875, is under consideration. Application has been made to the Local Government Board for the extension of the Netherly waterworks, at an estimated cost of £19,000. Mr. Isaac Carr, M.INST.C.E., gas and water engineer, is the engineer. During the past year the corporation's Transporter Bridge of 1,000 ft. span, connecting the towns of Widnes and Runcorn, and thus the counties of Lancashire and Cheshire, and forming the only roadway crossing over the Mersey between its mouth and Warrington, has been thoroughly overhauled and the method of working altered. In place of the direct-driven overhead carriage, which carried its own motors, a wire rope haulage system, of the main and tail rope type, has been adopted. The winch, electrically driven by two 40-horse power motors, either of which is capable of doing the work, and having two-speed gear, has been installed on a steel platform spanning the approach road on the Widnes side of the river. A new top carriage, little more than half the weight of the old one, has been erected, and from it the old car or travelling platform, considerably lightened, is suspended. The dead travelling load has been thus reduced by some 30 per cent, while the carrying capacity has not been in any way interfered with. The control is, as before, carried out from the car, the winch motors being started and stopped, reversed, and brakes applied by the movement of a handle in the driver's cabin. It is hoped that the results of these modifications will be greater economy in working and a more certain and reliable service to the pedestrian, horse, and motoring public of the district. The bridge was closed to the public from September 16 to December 8, 1913, and the reopening was performed by the Right Hon. Sir John Brunner, B.L. The work has been carried out to the designs of Mr. Basil Mott, M.INST.C.E., of Westminster, and his assistant, Mr. Robert Anderson, M.INST.C.E., by Messrs. Sir William Arrol & Co., Limited, of Glasgow, and at a cost of about £10,000.

Wigan (Mr. A. T. GOOSEMAN, borough engineer and surveyor).—The following work has been carried out during the past six months: The widening of a bridge 50 ft. span with steel girders, carrying Darlington-street over the river Douglas; alterations and additions to the market hall; alterations to underground conveniences; conversion of house into dispensary under the Insurance Act; alterations and additions to the pavilion in Mesnes Park; and the construction of roads of wood, granite, grit setts, and tar-macadam. Alterations and additions to Pemberton Hospital are now being carried out. The most important work to be commenced during the present year will be the sewage disposal scheme. The town council have this month sanctioned the borrowing of £50,638 for this work, which includes the laying of concrete pipe sewers, altering the existing screen chamber, and fitting the same with detritus elevator and sewage screen-raking apparatus, the building of preliminary settling tanks, and the construction of bacteria beds

for twenty-eight revolving sprinklers, each 80 ft. diameter, and ten of 33 ft. diameter. The average depth of the media will be 6 ft. The scheme also includes the building of two humus tanks with conical bottoms, altering and retraining the existing sludge beds, and providing new sludge beds. The sewage disposal works are situated 7½ miles from Wigan, and the storm water, from three to six times the dry-weather flow, will be treated at the Wigan end. It will be pumped from a suction well with three Rees Roturbo patent pressure chamber pumps, worked by electricity. The sewage will be pumped through a 24-in. rising main into four storm-water tanks, each 150 ft. by 40 ft., with an average depth of 6 ft., and a total capacity of 900,000 gallons. The storm-water tanks will be carried on a reinforced raft to assist in equal settlement in case subsidence should take place from mining operations. Other works to be carried out include a storm-water scheme for the Miry-lane district. The erection of a refuse destructor is being considered, and a large scheme for the conversion of pails and privies to the water carriage system. Sanction has been received from the Local Government Board for the reconstruction of the carriageway of Poolstock with granite setts at a cost of £2,973. The swimming baths will probably be extended. A large number of public and private street works will be carried out.



Winchester (Mr. WALTER V. ANDERSON, ASSOC.M.INST.C.E., city engineer and surveyor).—A site comprising 20 acres for a new cemetery was purchased last year, and is now in course of laying out. A lodge and offices are being erected. A contract for extensive alterations and additions to the Guildhall, public reading-room, and school of art buildings has been entered into. The work has been commenced and will be completed this year. A scheme for the erection of public baths has been approved by the council, and the working drawings are being prepared. After sanction to the loan has been given by the Local Government Board, tenders will be invited, and the work carried out during the present year. Designs for additions to the open swimming baths are being prepared. Additional shelters and other improvements at the new recreation ground will be carried out. The fencing and levelling of a site for a general depot is in hand. A Local Government Board inquiry has recently been held with reference to the purchase of the corn exchange and market place from a private company. A scheme has been prepared for paving with wood blocks a portion of the main Southampton-road.

Wokingham, Berks (Mr. C. W. MARKS, M.I.M. AND O.E., M.R.S.A.N.E., borough engineer and surveyor).—The council are applying for a Provisional Order to obtain powers for the purpose of extending the gasworks. Further improvements to main roads are in hand, and will probably be carried out during the year. The additional ejector station and compressing plant will be completed, and the extension of the sewers for the south-east portion of the borough, and the making up of a number of private streets under the Act of 1892, for which the sanction of the Local Government Board has been obtained, will be carried out. Further extensions of the contact beds at the sewage works will be executed during the coming year.



Wolverhampton (Mr. GEORGE GREEN, M.INST.C.E., borough engineer and surveyor).—The principal works contemplated include the widening and reconstruction of a narrow portion of Cannock-road, over the canal, which will necessitate the construction of a new bridge, at an estimated cost of £1,270. It is intended to demolish certain property in North-street, between Molineux Hotel and Wadham's Hill, enabling the setting back of the footway to be carried out, and the widening of the roadway at a point where the thoroughfare is congested and dangerous. The council have also purchased other properties and land in Dudley-road, Great Brickkiln-street, and Stubbs-road, for the purpose of improving these thoroughfares. The abolition of the pan system and the substitution of the water-carriage system will, it is expected, be an accomplished fact during 1914, if not over the whole of the borough in a great number of houses which at the present time have the pan system. Negotiations are in progress for the opening up of two estates under the Town Planning Act, besides which consideration will be

given to a scheme which the borough engineer is preparing for the erection of a ladies' swimming bath. In a borough such as Wolverhampton there are always improvements to streets and public buildings which cannot be ascertained at the commencement of the year, and it is safe to say that this borough will not be behind other years in considering and dealing with schemes in this direction other than those already enumerated which may come before the council from time to time during the year.

Wood Green (Mr. C. HOWES CROXFORD, engineer and surveyor to the urban district council).—The present year promises to be one of considerable activity, and several works of importance will be projected. The council will have under early consideration much-needed additions to the existing public baths, the provision of a pavilion at the White Hart-lane recreation ground, the provision of a new elementary school, and the construction of a new underground convenience. In addition to the above, further sections of Muswell Stream will probably be dealt with, the widening of Wolves-lane proceeded with, and additional private street works carried out. The council will also have under consideration the revision of their present by-laws. The general work of maintenance of high-ways and sewers will probably remain normal, with the exception that a further large amount of tar-spraying is likely to be done. The council are considering the question of town planning, and no doubt early applications will be made to the Local Government Board for permission to prepare a scheme. The new fire brigade station is nearing completion, and will shortly be opened.

Worcestershire (Mr. C. F. GETTINGS, county surveyor).—In the early part of 1913 a scheme for the reconstruction of some 53½ miles of main trunk roads, at an estimated cost of £127,000, was approved by the county council, and the work was commenced in April. It was proposed to spread the work over a period of five years, but in consequence of the motor traffic increasing so rapidly during the past twelve months, it will be necessary to complete the work in less time. The work chiefly consists of widening, strengthening and surfacing with bituminous-bound material, together with a considerable amount of surface-water drainage. The council also propose to tar-paint some 80 miles of roads during the ensuing season. The whole of the foregoing works will be carried out by direct administration. In addition to these special works it is anticipated that the ordinary maintenance estimates will be considerably increased. The county surveyor has received instructions to prepare alternative schemes for providing a bridge across the Avon near Evesham, and it is anticipated the cost will be at least £15,000. Considerable sums will also be spent on strengthening and improving various existing bridges in the county.



Worthing (Mr. FRANK ROBERTS, ASSOC. M.INST.C.E., borough engineer and surveyor).—The works in hand and projected by the corporation include the following: Surface-water drainage scheme, £4,000; additions to pumping station, pumps and new outfall, £8,000; winter garden, £20,000; and also extension of street widenings.



Wrexham (Mr. JOHN ENGLAND, borough engineer and surveyor).—During the year it is expected that the concreting of the remaining portion of the river bed will be completed, at a cost of £800, the portion completed having proved very satisfactory from a sanitary point of view. The laying out of the Parcian is being proceeded with, the children's playground, shelter, bowling pavilion, lavatories and stores being near completion, while the two bowling greens will be opened in the spring. Application has been made for permission to town plan 823 acres of the borough, and the usual inquiry has just been held. Several streets will be constructed under the Private Street Works Act, 1892, and an important section of the 18-in. storm-water drainage carried out. It is expected that a housing scheme will be commenced shortly owing to the local authority having been called upon to immediately provide thirty cottages.

Yorkshire, East Riding (Mr. ALFRED BEAUMONT, county surveyor and bridgemaister).—In addition to the ordinary direct maintenance of main roads and the

application of bituminous binders, the council are completing a steel drawbridge over the river Hull, at a cost of £10,000. Plans for another opening bridge, with 200-ft. span, are in course of preparation. A new divisional police station and court house is on the point of completion, and the alteration and improvement of other stations are in hand. The building of houses for the accommodation of roadmen, policemen and other officials is under consideration.

Yorkshire, West Riding (Mr. F. G. CARPENTER, county surveyor).—The county council have approved of an estimated expenditure of £245,380 in respect of the maintenance and repair of the main roads in the Riding. Among the special improvements to be carried out are: Surface tarring of main roads, £20,000; extensive road widenings in the Rotherham rural district, £9,350; and Early urban district, £5,200; reconstruction of Cottingham Bridge, £4,650; Carlton Bridge, £16,200; High Bridge, £6,900; Leppings Bridge, £7,080; Stock Bridge, £14,700; and Silsden Canal Bridge, £2,500.

THE WATERPROOFING OF CEMENT.

Messrs. Kerner-Greenwood & Co., the manufacturers of "Pudlo," have sent us a very interesting book, which deals with many points of interest to surveyors. We notice the firm claim that a concrete reservoir or bath can be perfectly waterproofed with a rendering composed of 3 and 1, with the addition of a very small percentage of their powder, if the work is done on the green concrete. They state that the cost only works out at about 1s. 3d. per super-yard for this class of work, though if the tanks are small the lining may be reduced in thickness, thus lowering the cost for Pudlo.

As our readers well know, a neat cement rendering is extremely liable to crack and craze, and it is rather expensive, and some surveyors have given dense concrete receptacles a very thin rendering, almost a skimming, of cement and Pudlo composed of 2 of sand, 1 of cement, and 5 per cent of Pudlo calculated to the cement.

Another important use which the book mentions Pudlo can be put to is the jointing of sanitary drain pipes. We have before us a very interesting table showing the comparative cost of jointing a drain pipe with neat cement, as against jointing a drain pipe with a Pudloed cement mixture of 3 parts of sand to 1 part of cement and 2 per cent of Pudlo. The saving on 400 lb. of weight amounted to 2s. 4d. in favour of the Pudloed cement joint, after paying for the Pudlo. The cement was calculated at 36s. per ton. It is obvious that if the cement to-day costs more, more money would be saved on the Pudloed proportions, for the simple reason that there would be less cement in the mixture than if a non-Pudloed mixture were used.

In addition to these two important uses, we see that tanks, manhole linings, and sewers can be rendered waterproof satisfactorily with this material.

Messrs. Kerner-Greenwood in their pamphlets make a very great point of the tests which they have had carried out by Messrs. Faija, Messrs. Kirkaldy, and the University College at Cork. We have seen copies of the results of these tests, and all go to show that an increase in tensile and compression strengths are shown for those cubes in which Pudlo is included. The gain is certainly satisfactory from the makers' point of view, and this proof that Pudlo does not adversely affect cement may induce those who have previously avoided a waterproofer to try its efficacy.

Road Construction and Surface Treatment.—Messrs. H. V. Smith & Co., Limited, of 20 Victoria-street, Westminster, S.W., are prepared to give quotations for, or information with regard to, the construction of roads with Trinidad asphalt macadam or surface treatment with Tarvia, Tareo, refined tar, or any other compound. We understand the company have laid Trinidad asphalt macadam roads in many districts, including Chelsea, Islington, St. Pancras, Hackney, Hornsey, Waltham-stow and Woodford. They have also carried out tar-spraying contracts in a very large number of districts throughout England and Wales, and it speaks well for the efficiency in which the work is carried out that some of the councils have entrusted their tar-spraying work to Messrs. H. V. Smith & Co. for four and five years in succession.

UNITED STATES STEEL SHEET PILING.

Shortly described, this is a simple, plain, rolled section ready for use as it comes from the mill. Each piece is complete in itself, and all pieces of the same width are interchangeable. The strength of the section is uniform throughout, and each pile of the same



TEST PILES AT NEWPORT, MON.

weight per foot is as strong as any other. In its profile, the makers state, it incorporates the advantages of the ball and socket joint, with sufficient clearance in the interlock for ease of driving and sufficient space for the use of a packing substance between its adjacent edges to insure watertightness. The section

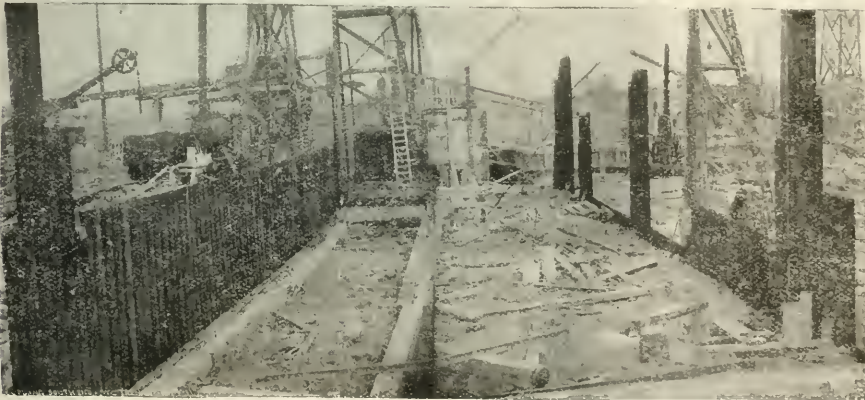
cofferdams, and so forth, such flexible joints allow distances to be gained or lost by longitudinal displacement in the joints themselves, or by slight deflections from line. They are also an aid in bringing the piling back to its vertical alignment in either direction after a departure from it caused by meeting obstructions or careless driving. The clearance in the interlock between the ball and the socket is such as to insure ease in driving and pulling, but at the same time this clearance has been kept down to the minimum so as to make the section as nearly watertight as possible.

Tests under identical conditions and experience in use have proved the ease with which United States steel sheet piling is driven and pulled. The reason for this is believed to be the absence of a leading groove, combined with the line contact obtained in the joints.

United States steel sheet piling is furnished in the following sizes and weights—namely, 12½ in. by 33 lb.; 9 in. by 16 lb. The 12½ in. section cannot drive less than 12½ in.; it may drive 13½ in., and will average about 13½ in.; 91 pieces should drive 100 ft. of wall. The 9 in. section cannot drive less than 9 in.; it may drive to 9½ in., and will average about 9½ in.; 130 pieces should drive 100 ft.

It is pointed out to us that a further distinctive feature of United States steel sheet piling is the fact that while it is rolled as nearly watertight as other rolled types of piling, provision is made in the interlock for insuring more perfect watertightness in quite a simple way, and in a way which does not depend for its success upon absolute accuracy in the process of manufacture. In clear water the piling may be made watertight with wooden packing strips which are assembled with the sections of the piling before driving. These packing strips swell in contact with the water, close the joints, and effectually prevent leakage. Experience with them has demonstrated that they in no way interfere with the driving of the piling, as they act rather as a lubricant.

These packing strips may be half round or rectangular in form, the latter being the better, for the reason that contact is made with the inner surface of the interlock by lines rather than by surfaces, and the friction of driving is also smaller. Packing strips for 12½ in. by 33 lb. piling may be 1½ in. half round, or 1½ in. by ¾ in. They need not be ordered to any specified length, but may be used in random or ordinary stock lengths, pieces being inserted on top of each other until the desired space is filled. Packing strips for 9-in. piling may be made of shingling laths. The size of packing strips should be verified for each



TRENCH IN COURSE OF CONSTRUCTION, NEWPORT, MON.

has been designed on a scientific basis; contact between the head and the socket is made by lines and not by surfaces, so that wedging action is prevented and the maximum strength is secured to resist forces in both lateral and longitudinal directions.

The joints are flexible, and permit the entrance of silt and clay into the interlock to aid in securing watertightness. They permit also the easy passing of boulders, old logs, and other obstructions encountered in driving, and the construction of circular or irregularly shaped pockets without the use of specially bent or fabricated pieces. In making closures for pockets,

lot of material used so as to conform to unavoidable irregularities in rolling and jaw openings. They should be of very dry, tough wood, preferably spruce, or wood with similar grain that will swell readily to a much larger volume when water-soaked.

The example illustrated recalls the collapse of the west wing wall trench of the New Dock at Newport, Mon. Running sand caused the disaster, and to insure the safety of subsequent operations steel sheet piling was used. Before deciding what section to employ, the contractors, Messrs. Easton, Gibb & Son, tested samples of three different makes. The result

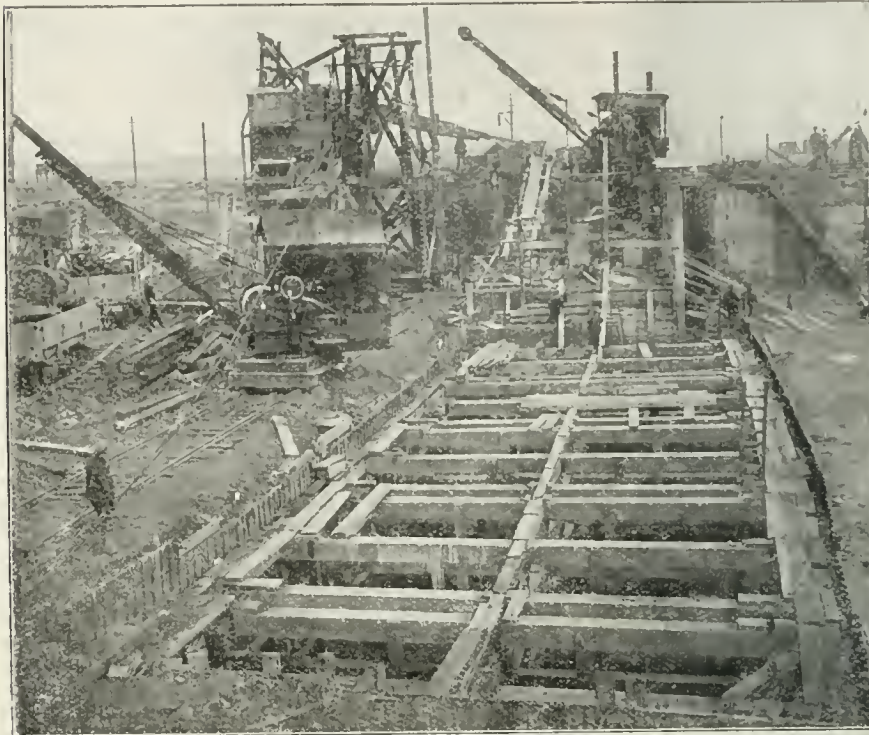
was an order for United States steel sheet piling. The first view is indicative of the success which attended the driving of the three test piles. The second shows the trench in course of construction, the third and fourth show the trench after the piles had been driven to their full depth.

A treatise on the properties and uses of United States steel sheet piling, issued by the makers, will be found most useful to engineers and contractors for reference purposes. Applications for copies of this

ROAD MAINTENANCE IN CORNWALL.

Mr. A. E. Brookes, county surveyor of Cornwall, in his report to the Cornwall Main Roads Committee, expresses regret that, after very careful consideration of the present condition and requirements of the roads, he had no alternative but again to recommend increased expenditure, amounting for maintenance only to £2,538 in the eastern division and £953 in the western in excess of last year's estimates. The total estimates totalled £28,341, as against £25,802 for the previous year, in the eastern division, and £26,365, against £25,412 in the western division. Added to this would be an estimated expenditure on the general account of £2,000; sanctioned works and improvements, £50; directing posts, £2,800; county bridges, £3,962; Development and Road Improvement Funds Act, 1909, county contribution, making a grand total of over £63,500, as against £56,750.

In recommending the extension of tar surface treatment, Mr. Brookes says he is of opinion

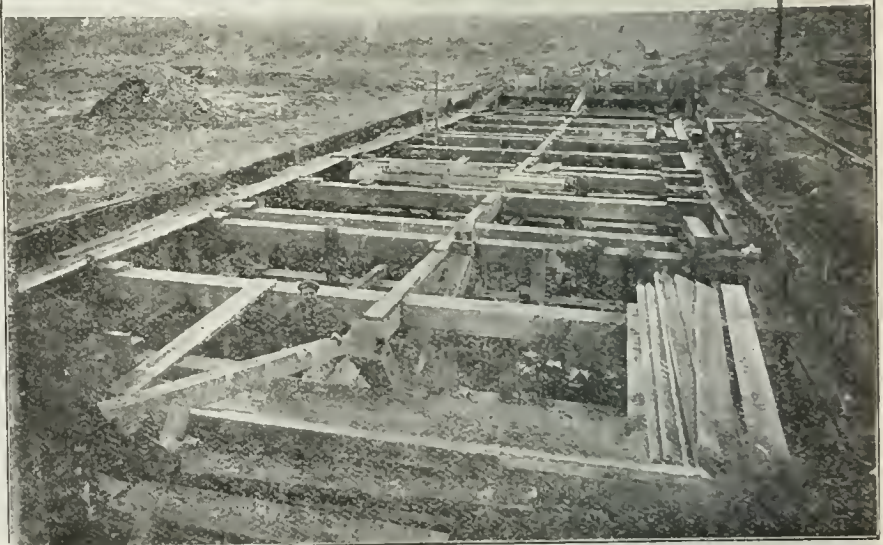


work, together with complete information, should be addressed to the United States Steel Products Co., 36-38 New Broad-street, London, E.C.

Flashlights on Roads.

—A Scottish reader asks for the name and address of the firm interested in the "Aga" flashlight, which, as stated in our issue of last week (p. 127), has been installed at Ruxley-corner, Sidecup, as a warning to night motorists to proceed cautiously. From the description we gave of the lamp our correspondent thinks the idea "sounds excellent." We suggest that he should communicate with the Gas Accumulator Company, 2 Norfolk-street, Strand, W.C.

Spokane's Great Apple Road.—Good roads have been given much attention in the country round Spokane, the second largest city in the State of Washington (says the *Times* "Pacific Coast Number"). A notable piece of road building is called the Great Apple Way—a smooth piece of gravel-bound macadam highway running east from Spokane to the Idaho State line, a distance of 18 miles. Ultimately the road will be extended through Idaho, and its sides planted with apple trees. Spokane's street improvements have kept pace with the expansion of the city, which has an area of 39½ square miles, there being 63 miles of paved streets, 386.2 miles of graded streets, 142 miles of sewers, 127.5 miles of gas mains, and 369 miles of water mains. The water supply of the city is drawn from an underground flow reached by deep wells 4 miles east of the business district.



STEEL SHEET PILING AT NEWPORT DRIVEN TO FULL DEPTH.

that this, provided it is properly carried out, not only protects the road from injury by wet, but helps to increase the life of the surface stone. The county surveyor adds: "I have, following the same course as last year, recommended the allocation of the whole of the proposed grant to strengthening roads, making up low quarters, and widening carriageways, after providing for tar surface treatment, and a tentative allocation of three sums for improvements in urban districts. While admitting the desirability of providing a more durable road surface than that of the ordinary water-bound macadam, such as tar, asphalt, or other bituminous macadam, I am strongly of opinion that until we have got through more of the work of strengthening these roads, which, due to their weakness, are being most seriously affected by heavy traffic, it is the best economy to devote all available funds to that class of work, finishing the surface with the water-bound macadam."

The Legal Precedents of 1913 in Relation to Municipal Engineering.

By J. B. REIGNIER CONDER, a Solicitor of the Supreme Court.

By far the greater number of the decisions which we have to note relate, as will be seen, to highway matters, comprising questions of dedication, fencing, repair and control, obstruction, extraordinary traffic, private street works, and accident cases. Next in point of numbers come cases connected with the important subject of water supply. The remaining decisions deal with points relating to buildings, contracts, officers of local authorities, the seashore, sewers, drains, and sewage disposal. There are eight decisions of the House of Lords, fifteen of the Court of Appeal, twelve of the Divisional Court, ten of Chancery Judges, eight of King's Bench Judges, two of County Courts, one of the Railway and Canal Commission, and one of the Irish Divisional Court.

Among the statutes which have received elucidation are the Harbours Act, 1814 (sec. 21); the Highway Act, 1835 (sec. 23); the Waterworks Clauses Acts, 1847 (secs. 6, 28 and 53) and 1863; the Telegraph Act, 1863 (sec. 12); the Public Health Act, 1875 (secs. 112, 150, 155); the Water Companies (Regulation of Powers) Act, 1887 (sec. 4); the Public Health (Buildings in Streets) Act, 1888; the Public Health (Ireland) Acts Amendment Act, 1890 (sec. 19); the Private Street Works Act, 1892; the Burgh Police (Scotland) Acts, 1892 to 1903; the London Building Act, 1894 (secs. 22 and 31); the Local Government Act, 1894 (sec. 26); the Public Health Acts (Amendment) Act, 1907 (secs. 30, 31 and 51); the Metropolitan Water Board (Charges) Act, 1907 (sec. 25); and the Housing and Town Planning Act, 1909.

Among the localities affected may be mentioned Above Derwent, Andover, Ayr, Bolton, Bristol, Bishop Auckland, Chorley, Colchester, Croydon, Edinburgh, Folkestone, Finchley, Great Crosby, Heaton Norris, Hollywood, Hendon, Ledbury, Lye and Wollescote, Morpeth, Manchester, Nenagh, Nuneaton, Paignton, Rhyl, Spitalfields, Southampton, Swansea, Sharpness, Sidmouth, Sunderland, Tenby, Watford, Walton-on-Thames, and Windlesham.

Buildings.

The first three cases to be noted have reference to the subject of building lines.

In *Sunderland Corporation v. Charlton* (77 J.P., 126) the owner and occupier of a house within the district of the corporation, without their consent, placed in front of the entrance door a porch on wheels, constructed of wood and glass, with a felt roof, and projecting 6 ft. 6 in. beyond the front main wall of the house. The corporation summoned him for contravening sec. 3 of the Public Health (Buildings in Streets) Act, 1888, but the magistrates dismissed the summons on the ground that the porch did not constitute an addition to the house. It was held by the Divisional Court that in so deciding the magistrates had not gone wrong in law, and that therefore their decision must stand.

In *Attorney-General v. Parish* (vol. xliii., p. 604) a plan was signed by the chairman of the Lye and Wollescote Urban District Council, showing a building line passing through the site of a house about to be taken down and rebuilt. Mr. Justice Joyce was of opinion that this was not a sufficient prescription of a building line under sec. 155 of the Public Health Act, 1875; and that in any case compensation should have been paid or tendered to the owner before he began to rebuild. He refused to make an order for the pulling down of a new building erected by the defendant in front of such building line. This decision, however, was reversed by the Court of Appeal (vol. xlv., p. 113), who held that the signed plan was a sufficient prescription of the building line, and that there is nothing in the section requiring the tender or payment of compensation to be made at any particular time. A mandatory injunction was therefore granted for the pulling down of the new house.

It will be remembered that sec. 22 of the London Building Act, 1894, prohibits the erection of buildings beyond the general line of buildings in a street without the consent of the London County Council. Sec. 31 of the Act, however, provides that nothing in the earlier section shall affect the exercise of any powers

conferred upon any railway company by any special Act for railway purposes. The Metropolitan Railway Company's special Act incorporates the Railways Clauses Act, 1845, by sec. 16 of which the company may erect and construct such buildings and other works and conveniences as they may think proper. In *Metropolitan Railway Company v. London County Council* (1913, 2 K.B., 249), it was held that the company were entitled to erect an accumulator shed, for use in connection with electric signalling, in front of the general line of buildings, without the consent of the council.

Another interesting decision under the same Act is that of the House of Lords in *Barry v. Minturn* (vol. xlv., p. 370)—viz., that where differences arise between adjoining owners (in the metropolitan district) as to proposed works to a party wall, and there is an appeal to the County Court from the award made by surveyors under the Act, the County Court Judge cannot take into account the past history of the wall, but must have regard solely to its existing condition.

Questions are constantly arising as to whether a particular structure is a "building" within the meaning of by-laws. In *James v. Tudor* (77 J.P., 130) the defendant occupied two vans as a dwelling-house for three years. He then removed them, and after building a low wall, replaced them, partly on the wall and partly on wooden blocks (making a mortar joint), built a chimney stack into the side of one of them, and again occupied them as a dwelling-house. It was held that there was evidence that he had erected a building, and that the vans constituted a dwelling-house.

Building Contract.

A most important decision for builders and architects, and also for dealers in building materials, is that in *Ramsden & Carr v. Chessum & Sons* (vol. xlv., p. 771; 58 Solicitors' Journal, 66). By instructions of the architect of a cinematograph palace in Oxford-street, which the defendants were erecting for the London Cinematograph Company (1909), Limited, the plaintiffs supplied certain door fittings, which were used by the defendants in the building in accordance with the terms of their contract. It was held by the House of Lords (overruling the Court of Appeal) that the defendants were liable to the plaintiffs for the price of the fittings.

Contract with Local Authority.

The question of the liability of a local authority to pay for work done in spite of the absence of a sealed contract has frequently arisen. In *Douglass v. Rhyl Urban District Council* (vol. xlv., p. 66), the plaintiff, an engineer, was appointed by resolution of the council to make a valuation of Rhyl Pier, and estimates of the cost of repairing and widening it, upon the terms of a letter from him to the council. The scheme for which the valuation and estimates were prepared was not proceeded with. It was held that the plaintiff was entitled to recover his fees from the council, notwithstanding the absence of a contract under seal.

Highways and Bridges.

(a) ACCIDENTS.

In *Huntrod v. Above Derwent Parish Council* (vol. xliii., p. 256), the plaintiff sustained injuries when crossing a stile erected by the parish council on a public foot-path in 1908, a step of the stile having given way when he trod on it. The learned Judge of the Keswick County Court held that the council were not liable, there being no evidence either of any want of care in the original construction of the stile, or that the fact of its being out of repair had been brought to the notice of the council.

In *Newcombe and Another v. Croydon Rural District Council and Yewen* (vol. xliii., pp. 370, 388), the plaintiffs were respectively the widow and daughter of a commercial traveller who was killed by falling into an unprotected trench left in a highway by the council's contractor. The jury awarded the plaintiffs £1,000 and £200 damages respectively. The contractor was

bound by his contract to indemnify the council against loss or damage arising by reason of accidents to third parties; but it was contended, on his behalf, that this stipulation was void as being contrary to public policy. Mr. Justice Darling, however, did not accept this view, and made a declaration that the council were entitled to the indemnity, and that it included the costs of the action.

In this case, it will be observed, the council did not deny their liability to the plaintiff, but merely sought to enforce the contractor's indemnity; but in the case of *Thurlstone v. London Electric Railway and Another* (29 T.L.R., 514) the company attempted to shift their responsibility on to a contractor, who was employed by them to build a superstructure over a railway station adjoining a public street. During the progress of the works the plaintiff, while walking along the street, was injured by falling timber. The jury found that the accident was caused by negligence, there being no sufficient protection to the public. It was held by Mr. Justice Scrutton that there was a duty on the company to safeguard the public during the building operations on their premises, and that they did not fulfil that duty by delegating it to an independent contractor. Judgment was given against both the company and the contractor.

(b) DEDICATION.

In *Brockman v. Folkestone Corporation* (76 J.P., 443) it was held by the Court of Appeal that a certain road laid out in 1827 by the then Earl of Radnor was a highway repairable by the inhabitants at large. The road was used principally as a means of access to houses erected on building plots leased by the Earl, but it had been used by the public to some extent from 1831, tolls being levied for horses and vehicles (but not for foot passengers), and notices being fixed prohibiting the passage of motor cars, cattle and sheep, and describing it as a "private road." Since 1836 it was kept in repair by the Earl or his lessees, and it had never been repaired by the local authority, and had never been formally dedicated under sec. 23 of the Highway Act, 1835. Nevertheless, the majority of the Court were of the opinion that there was sufficient evidence of the user of the road as a highway prior to 1836 to justify the conclusion that there had been a dedication by Lord Radnor, and that he had acquiesced in such user.

Another interesting decision involving a question of dedication is that of the Divisional Court in *Openshaw v. Pickering* (77 J.P., 27). In 1852 a piece of land adjoining a highway was leased for 999 years. Cottages were erected on the land, and a cobblestone footway was constructed in front of them. Upwards of twenty years ago flags were substituted for the cobblestones in that half of the width of the footway which was nearest to the road. The cobbled half was repaired by the leaseholder until about 1897, when flags were substituted for the stones by the urban authority, who from that time repaired the whole of the footway. The public had had the use of the entire footway from 1852 to 1890. In the latter year the cottages were converted into shops, and from that time the appellant (the occupier of one of the shops) had had a showcase standing on the footway. He was convicted for causing an obstruction, and the conviction was upheld on the ground that the user of the footway by the public for about forty years was evidence of dedication, and that such user had been so notorious that the lessor must be presumed to have acquiesced in the dedication.

In *Cababé v. Walton-upon-Thames District Council* (vol. xliii., p. 256) an old private brideway and footway became a public highway by user some time after 1835. There was no record of compliance with the formalities required by sec. 23 of the Highway Act, 1835, and the road had never been repaired at the public expense. The Court of Appeal held (1) that the section applied not only to a road made by an owner with the intention of dedicating it, but to cases where the dedication was only a presumption raised by user; (2) that there was no evidence to justify a presumption that the section had been complied with; and (3) that the road was not repairable by the inhabitants at large.

In *Bell & Sons v. Great Crosby Urban District Council* (77 J.P., 37) the owner of land abutting on a street erected a new building thereon, and shortly after its completion he inserted five stone pillars along the site of an old garden wall, leaving a space between the building and the street, unenclosed save for these pillars. A portion of this space was asphalted, and the public passed and repassed over the whole of it without let or hindrance. The council having commenced proceedings, under the Private Street Works

Act, 1892, for the making up of the street, wooden rails were placed between the pillars, and other rails were placed across the space to the house. The local authority never acquiesced in the fixing of the pillars and rails, and it was held by the Divisional Court that there was sufficient evidence that the land in question formed part of the street.

The next case is of interest as showing that dedication is not always to be presumed merely from the fact that the public have been permitted to use a new road—*Kibby v. Paignton Urban District Council* (vol. xliii., p. 438). In 1906 the owner of a building estate bounded on the north by private land and on the south by an old road constructed a new road (a *cul-de-sac*) leading from the old road to the northern boundary of the estate, with proper sewers, kerbs and footpaths. Gas and water mains were laid in the road, and no steps were taken to exclude the public from using it. In 1910 two building plots at the extreme north end of the estate, and on the east side of the new road, were sold to the plaintiff together with the piece of road (about 90 ft. in length) on which they abutted. Mr. Justice Neville held that there had been no dedication of the new road to the public, and that the plaintiff was at liberty to build a wall enclosing the bit of road in question.

Disputes frequently arise as to the respective rights of landowners and the public in those grassy borderlands between the metalled road and the wayside hedge, which are so characteristic of many parts of the country. In *Attorney-General v. Lindsay-Hogg* (76 J.P., 450) a landowner enclosed three such strips, partly overgrown by trees and underwood, and separated from his land by a steep bank with an old irregular hedge at the top. The other side of the road was bounded by a straight artificial hedge. The highway authority relied upon the legal presumption that the entire space between the two hedges was dedicated to public use. They also called evidence to show that the strips had been used by the public, and that gravel had been taken therefrom for road repairs. The defendant, on the other hand, proved numerous acts of ownership by himself and his predecessors in title, and he also relied upon tithe, ordnance and other maps. It was held by Mr. Justice Eve that the old hedge, having been originally planted naturally, had no connection with the laying out of the road, and that therefore the usual presumption that the two hedges constituted the road boundaries did not arise. His lordship also held that the defendant's evidence as to acts of ownership outweighed the evidence as to public user, and that the action therefore failed.

(c) EXTRAORDINARY TRAFFIC.

In *Windlesham Urban District Council v. Seward and Others (Eveleigh, Third Party)* (77 J.P., 161) the defendant, Seward, engaged a contractor to deliver bricks by traction engine at a building estate. The contractor sub-contracted with Eveleigh for the cartage of the bricks, and, damage having been done to a certain road, the council claimed extraordinary traffic expenses from the owner of the original contractor, the sub-contractor being joined as third party. The original contractor knew the size and weight of the engines to be used, but he did not determine the particular road to be traversed. It was held by the Divisional Court that the original contractor was a person "by or in consequence of whose order" the traffic was conducted. Mr. Justice Scrutton expressed the opinion that there is no reason why two or three persons should not be held liable in respect of the damage done to a particular road. The words "by whose order" bring in the contractor, and the words "in consequence of whose order" bring in the building owner. And Mr. Justice Ridley considered that the sub-contractor would also be liable.

A rather more complicated case is that of *Colchester Corporation v. Gepp (King, Third Party)* (76 J.P., 37). The defendant was sued as the clerk to and as representing the visiting committee of a county lunatic asylum, consisting of twenty members, seventeen of whom represented the county and three represented the plaintiff corporation. King contracted with the committee (represented by their clerk) to erect a lunatic asylum on land conveyed to the committee by the corporation, and to indemnify them from liability for extraordinary traffic. In carrying the building materials extraordinary traffic took place, and the corporation claimed expenses from the committee, the contractor being joined as a third party. It was held by Mr. Justice Channell (1) that neither the fact that some members of the committee

represented the corporation, nor the fact that the land had been conveyed to the committee by the corporation estopped them from bringing the action; (2) that the committee were persons "in consequence of whose order" the traffic was conducted, and were therefore liable; and (3) that the contractor was liable to indemnify the committee. His lordship, in the course of his judgment, expressed the opinion that in fixing the amount payable by a person liable for extraordinary traffic the following deductions should be made: (a) For the ordinary expenses of repair, ascertained by taking the average cost of repairing the road in question and similar roads in the district; and (b) for "betterment"—i.e., the extent to which the structure or general condition of the road is improved as a result of the repairs (such as, e.g., the fact that the road has been "granited," or widened, or provided with a thicker crust).

Having regard to the rules laid down by the learned Judge in the foregoing case, the interlocutory decision of the Court of Appeal in *Morpeth Rural District Council v. Bullock's Hall Colliery Company, Limited* (57 Solicitors' Journal, 373) is instructive. The council claimed £801 extraordinary traffic expenses in respect of coal haulage by a traction engine and trailer along a road called Bullock's Hall Road. The company applied for an order for particulars of (a) the average expense for the past five years (stating the cost of labour, establishment charges, and nature and amount and cost of materials) of the highways in the neighbourhood; (b) the extraordinary expenses, showing (1) how the £801 was arrived at, and (2) the average expense of Bullock's Hall Road for the past five years (stating the cost of labour, &c., as above). The council were ordered to give the particulars (a) and (b) (1), but not of (b) (2), on the ground that the latter related rather to the defence than to the claim.

Another case of interest in regard to the method of calculation to be adopted in adjusting claims for extraordinary traffic expenses is *Ledbury Rural District Council v. Colwell Park Quarries Company, Limited* (77 J.P., 198). In this case damage had been done by the cartage of stone by steam tractors over an ordinary agricultural road resting on clay, metalled (in the middle only) to a depth of from 4 in. to 6 in., with a gradient at one part of 1 in 6. The surveyor certified that £770 10s. 2d. was due in respect of extraordinary expenses of repairing the road, but the council only claimed in respect of damage to one part of it. It was held by Mr. Justice Scrutton: (1) That the surveyor was not bound to specify the exact parts where the damage was done; (2) that allowance should be made for the fact that the road was dearer to maintain than the other roads in the district, and that the average cost of repairing the particular part of the road should be taken into account; (3) that the company should pay the excess of the amount actually spent in repairing the damaged part over the amount which would have been spent in repairing the damage done to the same section by the other traffic which actually used it during the period in question, making due allowance for (a) the weather; (b) the fact (if it was the fact) that the ordinary expenditure in repairs had been rising; (c) the "betterment" of the road.

(d) FENCING.

In *Upjohn v. Willesden Urban District Council* (77 J.P., 174) the owner of vacant land adjoining a street appealed from the decision of the magistrates ordering him to pay the amount spent by the council in fencing the land. Sec. 32 of the Willesden Urban District Council Act is somewhat similar to sec. 31 of the Public Health Acts Amendment Act, 1907. Where land is, owing to the absence or inadequate repair of a fence, a source of danger, or is used for any immoral or indecent purpose, or for any purpose causing inconvenience or annoyance to the public, sec. 31 of the Public Act empowers the local authority to recover from the owner the cost of fencing it. In the local Act, however, the words "in the opinion of the council" are inserted after the words "where land is." In the present case the council were of opinion that this land was causing inconvenience or annoyance to the public owing to the absence of a proper fence, but although they were prepared to give evidence that such was the case, the magistrates thought this unnecessary, and no evidence was called. The Court of Appeal held that the words "in the opinion of the council" applied only to the first part of the section (as to the land being a source of danger), and not to the latter part (as to inconvenience or annoyance), and that as to this the facts must be

proved by evidence. The case was remitted to the magistrates for rehearing.

In *Jenkins v. Great Western Railway Company* (81 L.J., K.B., 525), the plaintiff (a child, aged 2½) got through a post and rail fence separating the company's property from a highway, strayed on to the line, and was injured. Between the fence and the line there were a siding and a pile of sleepers. The company's servants knew that children were in the habit of playing on the sleepers, but not that they were in the habit of getting on to the line. The jury found that the fence was not a reasonably fit fence for separating a railway from the high road, that children played on the sleepers by leave and licence of the company, and that the latter were guilty of negligence in not taking some sufficient means of preventing the children from getting on the line. But it was held by the Court of Appeal that the leave and licence (if any) to play on the pile of sleepers was confined to that spot, that there was no duty on the part of the company to fence off the sleepers from the line, and that they were not liable.

(e) OBSTRUCTION.

In *Attorney-General v. Horner* (57, Solicitors' Journal, 498), the Court of Appeal, affirming the decision of Mr. Justice Warrington, held that the lessee of Spitalfields Market was not entitled to obstruct traffic by holding an overflow market in adjoining streets, except on Thursdays and Saturdays—the days mentioned in the charter granting the franchise. The lessee alleged that he and his predecessors had from time immemorial held the market every weekday, and contended that the court ought to presume a lost grant, or a dedication of the streets subject to a reservation or an easement, justifying the daily market; but these arguments did not prevail.

In *Thornhill and Another v. Weeks and Others* (77 J.P., 231) the defendants, in order to assert an alleged public right of way, broke open the entrance gates to a drive through the Drayton Estate, Southampton, and walked over the drive through the estate. The plaintiffs (who were respectively the owner of the estate and the tenant of the drive) brought this action claiming an injunction to restrain the defendants from trespassing. The Andover Rural District Council passed a resolution (in accordance with sec. 26 of the Local Government Act, 1894) that the council should assist the defendants in defending the action, and instructed their clerk to take all necessary steps. It was held that the plaintiffs were entitled to join the council as defendants in the action.

In *Lyons, Sons & Co. v. Gulliver* (29 T.L.R., 428) the defendants were the proprietors of the Palladium Theatre, Argyll-street, at which three daily performances were given. People waited for the doors to open in a queue, frequently extending some distance past the plaintiffs' business premises, situate about 40 yds. from the theatre. The defendants paid for two extra police constables to regulate the crowd, and they kept first one and afterwards two gaps, one opposite the plaintiffs' premises. It was held by a majority of the Court of Appeal that the queue was an obstruction, and a nuisance to the plaintiffs for which the defendants were liable.

In the Scottish case of *Glasgow and South-Western Railway Company v. Provost, &c., of Burgh of Ayr* (50 Sc.L.R., 9) the company asked for a declaration that a strip of ground purchased by them for "extraordinary purposes" in 1899, and forming half of a street, was not subject to any of the provisions of the Burgh Police (Scotland) Acts, 1892 to 1903. The company made no use of the ground until 1908, when they laid down a double line of rails on it. The ground had never been made up as a road or metalled, but it had been used by the public as a right of way for all purposes since 1841. It was held by the House of Lords that the road was not part of the railway, but must be regarded as a private street, and that the rails must be removed as obstructions.

(f) PRIVATE STREET WORKS.

It was decided in 1906 that, under sec. 150 of the Public Health Act, 1875, the authority of one district cannot charge the owners of premises situate in another district with private street works expenses, even where such property abuts on a street situated in the former district (see *Hornsey Borough Council v. Birkbeck Freehold Land Society*, 79 J.P., 140). In the recent case of *Bishop Auckland Urban District Council v. Alderson* (76 J.P., 347) it was held by the Divisional Court that the same rule applied to proceedings under the Private Street Works Act, 1892, and that such premises cannot be included in the provisional apportionment.

A dispute of a rather unusual kind was determined in *Denman v. Finchley Urban District Council* (76 J.P., 405). On November 17, 1911, the council served the plaintiff with notice under sec. 150 of the Act of 1875, requiring him to make up the private street in front of his premises, and, among other things, to make connections with the sewers within six weeks. Another street (the only access to which was through the street in question) was being made up at the time, and the plaintiff (having informed the council of the fact) waited until about March 16, 1912 (when those works were completed), before commencing the work on his street. The council, however, refused to supply the levels, or to co-operate unless the plaintiff would sign an agreement to pay a fee for the supervision of the work, which he refused to do. The works were ready for the connections with the sewers on May 1st, but the council refused either to let him make the connections or to make them themselves; and when he started to make them the council had them removed. He therefore brought this action, claiming an injunction. An arrangement was come to, under which the connections were made, and the case came on to decide the question who was to pay the costs of the action. Mr. Justice Joyce held that the plaintiff had *bona fide* endeavoured to comply with the notice, that there had been no unreasonable delay on his part, that he was entitled to have the connections made, and that the council must pay all the costs of the proceedings.

An important question as to the time within which proceedings can be taken to recover private street works expenses was decided in *Bolton Corporation v. Scott* (77 J.P., 193). The Bolton Improvement Act, 1872, provides that private improvement expenses shall be recoverable either as a debt in any court of competent jurisdiction or by distress after summoning the owner. In this case the corporation gave notice to the defendant of apportionment of the expenses of making up a street in February, 1906, and made a demand for payment in June, 1906. In August, 1911, they took summary proceedings to recover the amount, but these were dismissed as being out of time. In March, 1912, they brought an action for the amount in the Salford Hundred Court. It was held by the Court of Appeal that the six months' limit for summary proceedings did not apply to an action, which could be brought within six years from the date of the demand. Judgment was therefore given for the council for the sum claimed.

(g) REPAIR AND CONTROL.

An important decision under sec. 30 of the Public Health Acts (Amendment) Act, 1907, is that of the Divisional Court in *Cheshire Lines Committee v. Heaton Norris Urban District Council* (10 L.G.R., 972). That section (so far as material to this case) provides that if, in any situation fronting, &c., on any street or public footpath, any stream, dam or bank is, for want of sufficient repair, &c., dangerous to persons lawfully using the same, the local authority may enforce its repair, &c. In this case the committee were the owners of parts of the bank of the river Mersey, over which an ancient footpath ran; but they were not liable to repair the footpath *ratione tenuræ*. By the action of the weather and by erosion portions of the bank were washed away, portions fell into the river, and other portions threatened to fall. The council served the committee with a notice to repair and protect the bank; but it was held by the Divisional Court that the section did not apply to such a case, and that the committee were not bound to comply with the notice.

The extent of a canal company's liability to repair the bridges over its canal was considered in *Sharpness New Docks, &c., Navigation Company v. Worcester Corporation; Attorney-General v. Sharpness New Docks, &c., Navigation Company* (77 J.P., 121). The company's local Act, passed in 1791, provided that they should not make the canal across any highway until they should at their own cost have made such bridges over the canal, of such dimensions and in such manner as the commissioners appointed under the Act should adjudge proper. The canal was made in 1812, and bridges were constructed by the company to carry several highways over it. A question having arisen as to the repair of the bridges, it was held by Mr. Justice Phillimore that the company were only liable to keep them in a state of repair sufficient to bear such traffic as was ordinary on the highways at the time of their original construction.

In *Postmaster-General v. Hendon Urban District Council* (vol. xlv., p. 370) it was held by the Railway and Canal Commissioners, following *Redhill Gas*

Company v. Reigate Rural District Council (1911, 2 K.B., 563), that the council were not the "body having the control" of certain public roads not repairable by the inhabitants at large within the meaning of sec. 12 of the Telegraph Act, 1863; and that they could not therefore consent to the erection of telegraph poles and wires in these roads.

Housing, Town Planning, &c.

An extremely important decision as to the powers of the Local Government Board under the Housing and Town Planning Act, 1909, is that of the Court of Appeal in *Rex v. Local Government Board, ex parte Arlidge* (58 Solicitor's Journal, 10)—viz., that, on an appeal by the owner to the board from the refusal of a local authority to determine a closing order, the appellant has a right to be heard, and to see the inspector's report on the public inquiry held by him, and that the board have no power to decide solely on the report of the inspector and the written evidence. This was the decision of the majority of the Court of Appeal (Lords Justices Vaughan, Williams and Buckley), Lord Justice Hamilton dissenting.

Nuisances.

An important decision as to the powers of local authorities with respect to offensive trades is that of the Divisional Court in the case of *Butchers' Hide, Skin and Wool Company, Limited v. Seacome* (77 J.P., 219). It will be remembered that by sec. 112 of the Public Health Act, 1875, penalties are imposed on any person who, after the passing of the Act, should establish within the district of an urban authority, without their consent in writing, the trade of a blood boiler, bone boiler, fellmonger, soap boiler, tallow melter, tripe boiler, or "any other noxious or offensive trade, business or manufacture." In districts in which sec. 51 of the Public Health Acts (Amendment) Act, 1907, has been applied, the earlier enactment is varied by substituting for the words "any other noxious or offensive trade," &c., the words "any other trade, business or manufacture which the local authority declare, by Order confirmed by the Local Government Board and published in such manner as the board shall direct, to be an offensive trade." In this case it was decided that the later section is not retrospective, and does not apply to a trade established before the coming into operation of the Order.

In *Charing Cross, West End and City Electric Supply Company v. London Hydraulic Power Company* (29 T.L.R., 649) the defendant company, acting under statutory powers, placed in certain streets mains containing water at high pressure. The statutes contained a provision that nothing therein should exempt the company from proceedings in respect of any nuisance caused by them. The mains were fractured by subsidence of the soil caused by heavy traffic, with the result that the water escaped and damaged the plaintiff company's electric cables. There was no negligence on the part of the defendant company, but Mr. Justice Scrutton held that, having for their profit brought into the road a dangerous thing—viz., water at high pressure—they were liable for the damage caused, apart from any question of negligence.

Officer of Local Authority.

In *Forsyth v. Manchester Corporation* (29 T.L.R., 15) a gas inspector employed by the corporation attended at the house of the plaintiff's father to inspect an automatic gas meter which was out of order. He tried to put it right with his penknife, but, not succeeding, went off for some tools, leaving the knife in the room, where the plaintiff (a small boy) found it and injured his eye with it. At the trial before Mr. Justice Bray and a jury, the jury found (1) that the inspector ought not reasonably to have anticipated that if he left the knife where he did some such accident might result; (2) that he was negligent in leaving it where he did; (3) that the accident was caused by his negligence; (4) that he was acting in the course of his employment in attending to the meter; (5) that those in charge of the child were not negligent. And they awarded the plaintiff £125 damages. But it was held by the Court of Appeal that there was no evidence to support finding (4), and judgment was therefore entered for the corporation.

Seashore.

In *Lake v. Smith* (76 J.P., 71) the plaintiff, who was surveyor to the Sidmouth Urban District Council, summoned the defendant for unlawfully taking shingle from the foreshore contrary to an Order of the Board of Trade. The proceedings were taken under sec. 21 of the Harbours Act, 1814, which provides that half the penalty shall go to the informer and half to the

Crown. On behalf of the defendant it was contended that the council, being a corporation, could not sue for the penalty unless they were expressly authorised by statute; but it was held by the Divisional Court that as the surveyor and not the council was the informant the proceedings were in order.

Sewers, Drains, and Sewage Disposal.

A novel and important point in connection with the subject of combined drainage in the London area was decided by the Divisional Court in *Kershaw v. Alfred John Smith & Co., Limited* (77 J.P., 297). The local authority made an order for the draining of a group of houses by combined operation, but the builder, in carrying out the work, surreptitiously connected the drains of two other houses with the combined drain, thereby making it a "sewer." The defendant bought the house under which the drain passed without notice of the builder's wrongful act. The local authority subsequently, after notice to the builder, disconnected the two unauthorised drains, and a nuisance having arisen in the combined drain, the question arose as to who was liable to repair it. It was held by the Divisional Court (Mr. Justice Pickford dissenting) that as soon as the unauthorised drains were disconnected the combined drain ceased to be a "sewer," and became a "drain," and that the defendant was liable. The Court distinguished this case from *Vestry of St. Leonard, Shoreditch v. Phelan* (1896, 1 Q.B., 533), which has heretofore been looked upon as an authority for the maxim "Once a sewer always a sewer." In that case the owner of two houses drained by a combined system disconnected his drain, and it was held that the combined drain continued to be a "sewer," notwithstanding that it only drained the one remaining house. The maxim must therefore henceforth be accepted with caution.

Another important decision on this subject (which, however, only affects Ireland) is that in the case of *Hollywood Urban District Council v. Granger* (1913, 2 Ir.R., 126)—viz., that a pipe with which are connected the drains of several houses belonging to different owners, and which has been constructed on private ground, is not a "sewer" vested in the sanitary authority, but a "single private drain" within the meaning of sec. 197 of the Public Health (Ireland) Acts Amendment Act, 1890.

In *Hanley v. Edinburgh Corporation* (vol. xliii., p. 872) the House of Lords (reversing the decision of the Court of Session) held that the corporation were liable for damage done to the pursuer's market garden by the overflow from a burn into which sewage from the city of Edinburgh was discharged. The overflow was due to the inadequacy of the culvert to carry away the water in time of spate, and the House were of opinion that the corporation were guilty of negligence in not providing a proper culvert. The decision of the Lord Ordinary, awarding the pursuer £150 damages, was therefore restored.

In *Phillimore v. Watford Rural District Council* (vol. xlv., p. 332) an injunction was granted to restrain the council from permitting the discharge of the effluent from their sewage farm into an agricultural ditch constructed by an adjoining landowner for the sole purpose of draining his land. It was held that the ditch was a sewer made for profit, and hence was not vested in the council.

In *Rees v. Tenby Corporation* (vol. xlv., p. 470) the plaintiff's land was flooded owing to a wooden trunk, constructed by the corporation in continuation of a stone culvert conveying water and sewage having become choked and rotten. The corporation were under no obligation to construct the trunk, but the Judge of the Tenby County Court held that, having done so, they were bound to maintain it in such a manner that it should not be injurious to the adjoining land. Judgment was given for the plaintiff for £27 damages with costs.

Water Supply.

In *Metropolitan Water Board v. Avery* (vol. xlv., p. 332) it was held by the Court of Appeal that water used for cooking, washing up, &c., in connection with a catering business carried on at a public house was water supplied for "domestic purposes" within the meaning of sec. 25 of the Metropolitan Water Board (Charges) Act, 1907. This decision has been affirmed by the House of Lords. The *ratio decidendi* was that, to hold that every use of water for a trade was a use for non-domestic purposes, would lead to such astounding results as to be flagrantly in conflict with common sense, and would render liable to the trade rate every shopkeeper who used a damp sponge to clean dusty goods.

In *Harpur v. Swansea Corporation* (vol. xlv., p. 470) the corporation, as water authority, laid a main in a highway. The work was done to the satisfaction of the highway surveyor, but the road subsequently subsided, and it cost the highway authority £87 10s. to make it good. It was held by the House of Lords that this was not a case of damage done by the corporation in the execution of their statutory powers within the meaning of sec. 28 of the Waterworks Clauses Act, 1847, but a case of "land injuriously affected by the construction or maintenance of the works" within sec. 6.

In *Metropolitan Water Board v. Bunn* (77 J.P., 156) it was held that the limitation of six months imposed in respect of the recovery of water rates in a summary manner before justices does not apply to an action in the county court.

In *Metropolitan Water Board v. Johnson & Co.* (29 T.L.R., 203) the defendants were erecting an addition to barracks at Hounslow under the instructions of the Secretary of State for War. The board supplied water to the barracks by meter, and the water necessary for the building operations was taken by the builders from the barracks free of charge (in accordance with the terms of their contract). The board sued the builders for a sum calculated at the rate of 7s. per £100 on the probable cost of the building; but the Court of Appeal (reversing the Divisional Court) held that they could not recover, the builders never having "required a supply" from them. The Court also expressed the opinion that the board cannot pass a general resolution that no builder shall be supplied by meter, but must pay 7s. per £100 on the probable cost of the work. They must take the circumstances of each case into consideration for the purpose of deciding what deductions they shall allow.

In *Bristol Guardians v. Bristol Waterworks Company* (76 J.P., 273) the Court of Appeal had to reconcile two incompatible clauses (one being contained in a local Act, and the other in a public Act), or, rather, to decide which of the two should prevail. Sec. 68 of the Bristol Waterworks Act, 1862, obliges the company to furnish a supply of water for domestic use at the request of the owner or occupier of a "private dwelling-house." The Act, however, incorporates the Waterworks Clauses Act, 1847, which, by sec. 53, requires a supply to be furnished at the request of the owner or occupier of a "dwelling-house" (omitting the word "private"). The guardians having requested a supply for certain workhouses, offices and homes for children at the domestic rate, it was held that these were not "private dwelling-houses" within the meaning of the special Act, and that the Act of 1847 must be read subject to the provisions of such special Act. The claim of the guardians to be supplied at the domestic rate therefore failed.

In *Liverpool Corporation v. Chorley Union Assessment Committee* (77 J.P., 185) the House of Lords affirmed the decision of the Court of Appeal (noted in vol. xxxix., p. 373)—viz., that the corporation were liable to be rated in respect of a large tract of moorland used as a gathering ground for their waterworks.

An important point as to the powers of a water authority to cut off water was decided in *South-West Suburban Water Company v. Hardy* (77 J.P., 283). The company were authorised to supply water by a special Act (which incorporated the Waterworks Clauses Acts 1847 and 1863), and by an Order of 1878, which empowered them to make reasonable regulations for preventing waste, and to prescribe the apparatus suitable for supply; also, if the regulations were not observed, to cut off the supply. One of their regulations was that no service pipes should be so arranged as to supply more than one house. The defendant was the owner of seven houses supplied by a single service pipe, and by agreement with the company he was liable for the water rate. The board cut off the supply, and refused to restore it until he put in a separate service pipe for each house. The Water Companies (Regulation of Powers Act), 1887, sec. 4, provides that when the owner is liable for the rate, no water company shall cut off the supply for non-payment. The question was whether, notwithstanding this enactment, the company were entitled to enforce the regulation as to separate service pipes by cutting off the water. The Divisional Court held that they were not.

A somewhat complicated question was decided in *Stanley Brothers, Limited v. Nuneaton Corporation* (77 J.P., 89). The plaintiffs were the owners of a colliery and some brick and tile works. In 1900 an agreement was made by which, in the event of the plaintiffs not being able to obtain sufficient water for the purposes of their works from their own sources of supply, the corporation agreed to supply them with water at cost

price, not exceeding 2d. per 1,000 gallons. Before this agreement the plaintiffs had taken water from the corporation at 8d. per 1,000 gallons, and they continued (apparently through inadvertence) to pay at this rate after the date of the agreement until the year 1910. Their attention was then called to the agreement, and they thereupon claimed a return of 6d. per 1,000 gallons on the amount supplied during the preceding ten years as money paid under a mistake of fact. The Court of Appeal held that the money was paid under a mistake not of fact, but of law, and that, in any event, it was irrecoverable, because the right to demand a supply at the lower rate never arose, the company never having given notice that their available supplies were exhausted.

In *Postmaster-General v. Nenagh Urban District Council* (1913, 1 I.R., 238) the council were the water authority in their district, and the plaintiff occupied a post-office not entered on the valuation list and not rated. It was held that the council were bound to furnish a supply of water to the premises for domestic purposes without prepayment of water-rate, subject to the plaintiff complying with the council's rules and regulations, and on payment of the value of the water supplied.

SEWER VENTILATION IN LONDON.

MAIN DRAINAGE COMMITTEE'S REPORT.

At the meeting of the London County Council on Tuesday an important report on the ventilation of sewers was presented by the Main Drainage Committee *apropos* of a difficulty which has arisen between the council and the Greenwich Borough Council with respect to the existence of an alleged nuisance in the Greenwich area.

"For a long time past," the committee report, "correspondence has taken place between the council and the Greenwich Metropolitan Borough Council with regard to smells issuing through the surface ventilators of the main sewers in that borough. The length of main sewers under the council's control in Greenwich is, approximately, 12 miles, and for the proper ventilation of these provision was originally made at ninety-nine points, nearly all in the highway. Owing to complaints, as many as sixty-one of these surface ventilators have been entirely closed, thirty have been sealed and connected to ventilating columns or stack pipes, and eight only, including two at penstock houses belonging to the council, now remain open. Notwithstanding the efforts made by the council to avoid inconvenience owing to the emanations, the borough council persisted in its demand for the closing of the surface ventilators, and a deputation from the borough council attended before the committee in 1908 in support of its contention. It was then intimated that if the borough council would provide suitable sites, the committee would be prepared to recommend the council to erect ventilating columns. In reply to this suggestion, the borough council furnished a list of five places where the owners would be prepared, upon payment, to allow the council to erect stack pipes against the walls of houses, but the committee could not see their way to agree to this proposal. The sewers in Greenwich, they point out, comprise among them some of the largest in London, and ventilation pipes, if provided, require to be of the most ample dimensions, and to be erected in the most favourable positions. Their intention was that the borough council should provide sites for shafts on the highways, but this the latter refused to do on the ground of alleged serious obstruction and inconvenience to the public. The borough council subsequently complained to the Secretary of State for the Home Department, and asked him to inquire, under the provisions of sec. 31 of the Metropolis Management Amendment Act, 1858, into what it stated to be the 'failure of the London County Council to comply with its statutory obligations.'

"The problem to be solved is first," the committee observe, "to provide a sufficient number of inlets for fresh air, to distribute them properly, and to ensure that they will not act as outlets, and, secondly, to provide outlets that will extract foul air without creating a nuisance, and so to distribute them that all parts of the sewer will be ventilated.

"The closing of any particular surface ventilator intensifies the smell at adjacent gratings which are left open, and leads to complaints which otherwise might not have been made. Were all the surface ventilator gratings unsealed, doubtless a better condition of affairs would obtain, and such a course might re-

ceive support in some boroughs. We fear, however, that the difficulty of obtaining general support is too great for such a course to be advocated. The suggestion previously put forward that every houseowner should provide a ventilating pipe on the sewer side of the interceptor on the house drain, or, as an alternative, and partly for other reasons than ventilation, that the interceptor itself should be abolished, would undoubtedly go a long way towards the solution of the ventilation problem, as a system of shafts which would serve both as inlets and outlets would thereby be established. . . .

"The council has from time to time erected tall ventilating columns on the highways when permission has been obtained from the metropolitan borough council concerned. These columns allow the air from the sewers to escape, and a supply of fresh air finds its way into the sewers through surface gratings which must be retained for this purpose and, to a small degree, by way of house connections. The use of a large number of ventilating columns would diminish the emanations through the surface gratings, but under certain weather conditions the circulation of the air becomes reversed, and the surface ventilators would act as outlets. The usual height of the columns put up by the council is 42ft., this being the greatest height which can safely be erected without support. This is lower than many buildings, and complaints would undoubtedly arise of smell entering the upper windows. The cost of erecting one of these columns has in the past varied from £30 to £100, and the wholesale erection of such columns would mean a very large expenditure. In order that the columns may be effective, they must be erected in the most suitable positions, as nearly over the top of the sewer as possible. This points to their erection in the centre of the roads or on the footways, and we can hardly suppose that the erection of columns in many of the principal thoroughfares would long remain unchallenged.

"As we have before pointed out, in certain cases use has been made of stack pipes against houses. The cost of one of these is about £25, and apart from the difficulty of securing permission from property owners to attach them to houses, they are not very efficient. They can only be of small section, must be at some distance from the sewer—necessitating a length of connecting pipe—and, in many cases, have to be made with bends and elbows so as to clear projections on the building. All these things tend to impair their efficiency as ventilators.

"The difficulty concerning emanations from sewers is not confined to London, and in many provincial towns the question has been under consideration. In Manchester, in particular, the corporation has conducted a costly series of experiments extending over a period of four or five years. The experiments were made with various mechanical contrivances, and the report of the corporation issued in 1906 stated that none of the systems under consideration could be recommended for use in the Manchester sewers. In view of these experiments there appears to be little to be learned in London by further experiments on these lines.

"The council will realise that the problem which lies before it is one of extraordinary difficulty, and that there is at present no scheme for sewer ventilation which can be considered satisfactory from all points of view. We are unable, from the facts which have been placed before us, and which we now submit, to advise any departure from the existing practice of considering each case of complaint on its merits, and, if it is possible, to remedy the defect. It may even be necessary, in the interests of the council or its employees, to reopen some of the surface gratings which have been temporarily closed."

It is recommended, in conclusion, that a copy of the report should be forwarded to the Secretary of State for the Home Department.

Buildings for Small Holdings.—A paper on this subject will be read by Mr. A. A. Hunt at a meeting of the Society of Architects on the 12th prox.

Disappearing Footpaths.—A motorist member at a recent meeting of Marlborough Rural District Council protested against the widening of the main London-Bath road for motorists by the absorption in some places of the footpaths at the side of the road. He said the footpaths were the only protection the pedestrians had, and even now they had to spring into hedges and run the risk of being blinded by thorns or covered with mud. It was decided to call the attention of the county authorities to the matter.

A Prospect of Municipal Engineering in 1914.

A QUITE IRRESPONSIBLE FORECAST.

(By a Correspondent.)

Retrospects are good things in their way, and have their undoubted uses. They tell us what has been done, and in any study of the past an inkling of the future lies for him to read who can. But mankind is not built on one intellectual plane, and while the few are fertile in imagination and quick of apprehension, the many are uncompromisingly dull and slow-witted. What is set down in plain, homely language may be absorbed by the majority without much trouble. They read the cold print as it is set, line by line, oblivious of the fact that the lines themselves are of little importance in comparison with that which lies between them. To the average man a million is a row of seven figures—a one and six noughts, with two commas interposed to avoid confusion in reading. Beyond that his intellect cannot go, and yet he will read on with a complacent smile, possibly rolling the figures on his tongue in an occasional burst of admiration, and yet having as much appreciation of their value as a cow has of the calculus. In the same way (although in adverse direction), when he is told that every cubic centimetre of a gas contains 20,000,000,000,000,000 molecules, or that the rate of expansion for Portland cement concrete is some 0.00067 per degree Fahrenheit, he gasps for a moment at the figures and then passes on—just about as wise as if he had never seen them. It is the poet alone, not the mathematician, who can realise the values of such formidable arrays of numerals, ciphers and “damn’d little dots,” and in precisely the same way it needs a poet (or at least a man of imagination) to evolve the future from the past, or, in other words, from the dead bones of a last year’s retrospect to create a warm, living, flesh-and-blood prospect for the year that is.

What, then, are the prospects of municipal engineering and of the municipal engineer in the year 1914? Three weeks of that year have now gone without any alarming developments, although it is gratifying to us to record that Mr. Smith has not only been promised a rise in his salary of £20 (by annual increments of 15s.), but is, on the 31st of the present month, to have the additional 1s.3d. actually added to his cheque. Another instance well worth recording is that of an assistant in a Midland office whose salary was doubled last year, with a prospect of parallel munificence in the present. He is one of that large class known as *volontaires*, a fact that may detract somewhat from the generosity of his employers. Still, these cases, trifling as they may seem, have their meed of encouragement, and augur well for a possible rise all round before the year ends.

The question of security of tenure of office has hitherto offered a wide field for conjecture, and yet, if the happenings of last year may be taken as aught, attainment of the long-desired is practically assured ere the sun of December 31st sets. One of the merry retorts of childhood runs somewhat as follows: “Those who ask shan’t have, and those who don’t ask don’t want.” And this infantile excuse for greed precisely fits the present situation of security of tenure. That it has been asked for none can deny, but then those who have so far interested themselves as to ask for the most part really don’t want it. They are the top dogs, and they practically have it. As for those who haven’t asked, it may be assumed that they, for the most part, don’t want it. Now, logically, the man who gets a thing that he wants and the man who doesn’t get a thing that he doesn’t want are in the same position. The double affirmative is equal, in such a case, to the double negative. The “askers” for the most part not wanting it, and the “non-askers” for the most part not wanting it, both may be said to have got it. It only remains now for the residue to get it, and everyone will be satisfied.

The year 1913 witnessed the superannuation of quite a number of municipal engineers. In order to make the matter quite clear, it will be well for the reader to understand that the verb “to superannuate” has two primary meanings: (1) To impair or disqualify by old age or infirmity, (2) to pension off on account of old age and infirmity. So it will be seen that impairment or disqualification by reason of old age and infirmity is, indeed, a form of superannuation, and stands first in the dictionaries. It is perfectly clear, then, that a number of municipal engineers were orthographically and orthoëpically superannuated during the past year.

Hence, reasoning analogically, a number also will be orthographically and orthoëpically superannuated during the present year. Old age and infirmity are the common lot, and are the sure precursors of superannuation; hence, superannuation is the common lot, and all get it who live long enough. Definition (2) may therefore be ruled out of the argument as entirely superfluous.

Mutual defence funds have been well to the fore during the past year, but there no longer remains the need for them. Aggression is the order of the day, for only by aggression can amicable relations be preserved between councillors and engineers. Fresh in the minds of our readers will be the remarkable case of the municipal officer who pulled the nose—or inflicted some such indignity upon the person—of one of his council. Reward and honour have been his since, and 1914 will inevitably see many such cases. Councillors will necessarily retort, pulling the noses and otherwise maltreating their officers, and a reign of peace and goodwill will be inaugurated. The road to mutual defence has, strangely enough, been made possible by methods the most aggressive, and funds—save such as are subscribed for as a testimony to the personal worth of the aggressor—may now be entirely dispensed with.

Turning to matters technical, the fewest of words must suffice. The problem of cheap street lighting is well on the way to solution, and possibly before the year ends there will be a return in the form of profit, the greater the cubic feet or units consumed the greater being the profit. The gas companies have demonstrated clearly that gas only costs half as much as electricity, while the electrical companies have proved quite as incontrovertibly that electricity costs only half as much as gas. Hence, by a continuation of this halving process the figures work out practically to *nil*, and it only requires the least improvement in the method of manufacture or distribution to ensure the profit already referred to.

The sewage disposal problem is also well on the way to solution, for it is obviously a waste of time and money to worry about such a detail when the sewage may be deposited in a convenient corner of the house, where it will give off a pleasant gas far and away more pure than the air of some wretched seaside town or insanitary plain. The year 1914 will possibly see the installation of a sanitary bin, with perforated top, in every decent sitting-room, and around this the family may sit the long evenings through, inhaling the purity and fragrance which are now said to be such a feature of decomposing sewage.

Space does not allow of further dealing with the technical advance that is foreshadowed in the retrospect of 1913. Suffice it to say that in every department great and beneficent changes are working, and the chemist and the bacteriologist are receiving their due meed of reward. Of the share of the municipal engineer in these developments there is not, perhaps, much to say, as he has for the past year been devoting what energy and genius he has to the making of a satisfactory road crust. This finally completed and done to a turn, he may be free to bestow more of his time on the consideration of other problems. The ratepayer cannot live on road crust alone.

Reclamation of Tidal Lands.*—The author has done good service by bringing together in this handy booklet the scattered information contained in various books and papers dealing with the part played by vegetation in the reclamation of tidal lands. A large part of this is drawn from the remarkable observations made by Prof. F. W. Oliver during his long-continued work on the physiography and plant ecology of maritime regions, especially at Erquy, in Brittany, and at Blakeney Point, in Norfolk, with reference to the stabilisation of drifting sand and shingle by means of vegetation. As these and other observations summarised in this booklet clearly show, there are large areas of foreshore in this country which might profitably be planted with suitable vegetation and subsequently reclaimed from the sea.—*Nature*.

* “The Use of Vegetation for Reclaiming Tidal Lands.” By Gerald O. Case. (Reprinted from *Engineering*.) London: St. Bride’s Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.

The Legislation of 1913 in Relation to Municipal Engineering.

Thirty-eight public general statutes received the Royal Assent in 1913, but a very small proportion only of this number are even remotely concerned with municipal engineering or local government matters. It is a matter for satisfaction that the various enactments relating to the preservation of ancient monuments have been consolidated, with amendments, into a single Act. It is to be hoped that the practice of thus consolidating the law on particular subjects will be continued and extended. Among the amendments contained in this Act is one remitting the relaxation of local by-laws where their enforcement would hamper the erection of artistic buildings. The Local Government (Adjustment) Act lays down certain rules and regulations for financial adjustment between areas on alteration of boundaries, and these will be found stated in detail below. The other Acts noticed are those relating to the Consolidated Fund, Expiring Laws Continuance, Public Buildings (Expenses), Public Health (Prevention and Treatment of Disease) and Public Works Loans.

Ancient Monuments.

The *Ancient Monuments Consolidation and Amendment Act*, as its name implies, consolidates, with certain alterations, the existing law relating to the acquisition, guardianship and protection of ancient monuments. An Ancient Monuments Board is to be constituted by the Commissioners of Works, consisting of members representing the Royal Commissions on Historic Monuments in England, Scotland and Wales respectively, the Societies of Antiquaries of London and Scotland respectively, the Royal Academy of Arts, the Royal Institute of British Architects, the Trustees of the British Museum and the Board of Education, and such other members as the Commissioners of Works may appoint. Inspectors of ancient monuments are also to be appointed with the consent of the Treasury.

Where it appears to the council of a borough or district that the erection of buildings of a style of architecture in harmony with other buildings of artistic merit is impeded by by-laws, they may, with the consent of the Local Government Board, relax the by-laws, provided that the buildings can be erected with due regard to safety from fire and to sanitation.

Expiring Laws Continuance.

The *Expiring Laws Continuance Act* continues until December 31, 1914, various Acts which would otherwise have expired with the year 1913, including (among others) the Locomotives Act, 1865, and the various amending Acts, the Municipal Elections (Corrupt and Illegal Practices) Act, 1884, the Local Government (Elections) Act, 1896, and the Motor Car Act, 1903.

Local Government.

The *Local Government (Adjustment) Act* makes sundry changes in the law as to the adjustment of financial relations between local government areas on the alteration of boundaries, &c.

Adjustments of Local Taxation Licences, Estate Duty Grant, and the residue under sec. 1 of the Local Taxation (Customs and Excise) Act, 1890, are to be carried out in accordance with rules contained in Part I. of the Schedule to the present Act, and provision is to be made for payment to authorities of such sum as seems equitable according to rules contained in Part II. of the Schedule, in respect of any increase of burden thrown on the ratepayers as a consequence of alteration of boundaries or other change.

The rules in Part I. of the Schedule are to the following effect:—

(1) Local Taxation Licences and Estate Duty Grant are to be apportioned between the councils between which an adjustment is to be made, on the following basis: (a) To the council of the county from which an area is severed, amounts equal to the average annual compulsory payments and transfers made by that council in accordance with sec. 24 of the Local Government Act, 1888, for five years ending 31st March preceding the appointed day, less the portions of such average attributable to the separated area, which are to be paid to the council of the other county; (b) out of any balance the council of the first-mentioned county is to receive amounts equal to the average

compulsory payments and transfers made by them in accordance with sec. 26 of the Act of 1888 for the same five years, less the portions of such average attributable to the separated area, which are to be paid to the council of the other county. (Sec. 24 of the Act of 1888, we may remind our readers, provides for the payment by county councils of half the salaries of medical officers and nuisance inspectors previously paid by the Treasury, and sec. 26 provides for an annual grant by county councils for the cost of poor-law officers and district schools.) (c) Out of any balance the first-named county council is to have half the average cost during five years preceding the appointed day of the maintenance of main roads (including interest on and repayments of loans), less half the proportion of such cost attributable to the severed area, which is to be paid to the council of the other county; but if the first county council have failed to declare any roads to be main roads which ought to have been so declared, or *vice versa*, appropriate adjustments are to be made in the calculations by the inclusion or exclusion (as the case may require) of the cost attributable to such roads. (d) Any balance is to be divided between the two councils in proportion to the respective rateable values of the first-named county and the severed area. (e) Any difficulty in calculating any item for the purposes of rules (a) or (b) is to be solved by attributing to the severed area a portion of such item proportionate to its rateable value. (f) If the amount available is insufficient, the amounts apportionable are to be reduced proportionately.

(2) The residue under sec. 1 of the Local Taxation (Customs and Excise) Act, 1890, for the area of the first-named county is to be divided in proportion to the respective rateable values of the county less the severed area, and that area.

(3) In the foregoing rules "county" includes a county borough, "appointed day" means the day fixed for the transfer of the severed area or the later date at which such transfer is to be deemed to take effect, and "rateable value" means (unless otherwise agreed) the rateable value as determined by the valuation list or (if there is no such list) the last poor-rate.

The rules in Part II. are to the following effect:—

(1) Regard is to be had to (a) the difference between the burden on the ratepayers which will be incurred by the authority in executing any of their powers and duties, and the burden which would have been incurred if no alteration of area or other change had taken place, and (b) the probable duration of the increased burden. But no alteration of income consequent upon an apportionment under Part I. is to be taken into account.

(2) The sum payable (or the capitalised value of the instalments or annuity payable) to an authority in respect of increased burden is not to exceed fifteen times the average annual increase of burden.

(3) Any sum payable in respect of maintenance of main roads is to be payable by way of annuity.

Public Health.

The *Public Health (Prevention and Treatment of Disease) Act* makes certain alterations in the public health laws relating to the prevention and treatment of disease, and the powers of county councils, sanitary authorities and joint boards in connection therewith.

Sec. 281 of the Public Health Act, 1875, provided that on the constitution of a joint board the local authorities of the component districts should cease to exercise any powers, or perform any duties which the joint board was authorised to exercise or perform; but that the joint board might delegate any of its powers or duties to the authority of a component district. The present Act empowers the Local Government Board (notwithstanding the section cited), by order, to authorise a local authority having jurisdiction in any part of a united district to exercise, in relation to that part, any of the powers of the joint board, subject to such conditions and restrictions as may be imposed by the order.

Under sec. 130 of the Act of 1875 the Local Government Board have power to make regulations for the treatment of persons affected with cholera, or any other epidemic, endemic or infectious disease, and for

preventing the spread of such disease, and to declare by what authorities such regulations are to be enforced. The present Act gives the board power to declare that one of the authorities to enforce the regulations shall be the council of a county; but the board are not (except in case of emergency) to require a county council to enforce the regulations without the consent of such council.

Sec. 3 empowers county councils and sanitary authorities to make such arrangements as may be sanctioned by the board for the treatment of tuberculosis.

Expenses incurred under the Act are in the case of a sanitary authority to be defrayed as expenses incurred in execution of the Public Health Acts, and in the case of county councils as expenses for general county purposes, or (if the board by order so direct) for special county purposes charged on such part of the county as may be provided by the order.

Public Works Loans.

The *Public Works Loans Act* authorises the issue by the National Debt Commissioners of £6,000,000 for the purpose of loans by the Public Works Loan Commissioners, and of £600,000 for loans by the Commissioners of Public Works in Ireland. The amounts

"DEXINE."

"Dexine" is the name and registered trade mark in Great Britain, its Colonies, and foreign countries, of a patent compound, the owners and sole manufacturers being Dexine, Limited, whose extensive works, fitted with specially designed plant, rolling and moulding mills, are situated at Abbey-lane, Stratford, London, E. "Dexine" was discovered some eighteen years ago, after years of experiment and research, and is, briefly, a composition of vulcanised india-rubber and other ingredients manipulated by a special process, the resulting material being of an exceedingly tough and frictionless nature, capable, we are given to understand, of withstanding extreme temperatures and quite impervious to the deleterious action of acids, oils, gases, ammonia, or grease.

As a high pressure steam jointing it possesses undoubted advantages. It is claimed that it does not blow, burn, or squeeze out; does not in any way injure faced flanges as metal joints do; retains its normal elasticity indefinitely, and can, with care, be used several times over.

In addition to the sheeting, which is usually made in rolls 36 in. wide, any length or thickness, the company do a large and ever-increasing trade in joints cut to template.

This is an obvious economy, as they can be made to any shape or size ready for fixing.

In the form of manhole and mud-hole door joints, "Dexine" has proved its efficacy, and it would seem to be peculiarly adapted for the manufacture of conical gauge glass rings, as it does not melt and run down the glass, or harden, crack, and consequently blow. It will also retain its normal shape and elasticity under a steam pressure of 300 lb. to the square inch. Waterworks engineers, both at home and abroad, will find many

useful applications for this material, which has, in fact, already established its value in connection with waterworks plant.

London Tramway Shelters.—It is proposed by the Highways Committee of the London County Council, in order to deal more promptly with the rush-hour traffic at the Blackfriars Bridge end of the Victoria Embankment, to erect a second tramway shelter 88 yds. westward of the existing structure. As designed, the shelter would be 105 ft. in length and 7 ft. in width. The present one is 190 ft. in length.

Property Owners and Tar-macadam Roads.—At Swansea Police-court last week, in a case in which the Swansea Corporation sought to recover costs of street works against certain property owners, it was urged against the claim by Mr. Ed. Harris that the policy of the corporation was too sweeping, and that too great expense had been incurred. The town clerk said the whole point of the objection seemed to be against the requirement of tar-macadam for the roads, but he argued that the difference caused by that was infinitesimal. It was adopted by the corporation to remedy the almost disgraceful state of the streets. The corporation were prepared to keep up the road after it was made. The deputy surveyor (Mr. Swarbrick) gave particulars of the cost. The Bench, after hearing Mr. Harris and retiring, said it was reasonable to have front roads made in the way advised, but it was unreasonable to deal with back roads in the same way. The case was adjourned for a month, in order that both sides might consider this decision.



FORMING "DEXINE" ARTICLES FOR MOULDING DEPARTMENT.

are to be issued during a period ending on the day on which a further Act granting money for the purposes of these loans comes into operation, and in accordance with the provisions of the National Debt and Local Loans Act, 1887. Portions of certain local loans are written off, the only one in England being a loan of £10,000 to the Eyemouth Harbour Trustees (of which £200 is written off), and the others being in Ireland.

The Training of Road Engineers.—A number of resolutions have been received by the Roads Improvement Association in support of its suggestion that means should be provided to enable potential road engineers to receive special training in modern methods of road construction and maintenance, and the Institutions of Municipal Engineers, Mechanical Engineers and Automobile Engineers have already intimated their willingness to co-operate on the small committee to develop the proposal. At the last meeting of the council of the Institution of Municipal and County Engineers, the Roads Committee reported that they had carefully considered representations on this subject made by the Roads Improvement Association. They pointed out that the question of training of engineers in highway construction, both practical and theoretical, had always engaged the attention of this institution, and inasmuch as the institution were at the present moment carefully reconsidering the whole question of special training of engineers in highway construction, they were not prepared meantime to recommend that the institution join the association in the movement proposed.

Sewage Disposal Appliances.

MANUFACTURERS' REPORTS.

The following notes relating to the activities of manufacturers of sewerage and sewage disposal appliances show that this branch of engineering business has shared in the general trade prosperity of the past year. The reports are also interesting in demonstrating that makers are not standing still, but are continually bringing out new patterns as well as improving existing types with advantage to themselves as well as to engineers who are always ready to consider new ideas.

AMES CROSTA SANITARY ENGINEERING COMPANY, LIMITED.

This firm report that the past year has shown a steady increase in business all round. Sewage disposal specialities have been in good demand, and a large number of installations of both rotary and travelling sprinklers have been carried out. Among the most important works may be mentioned the opening of the sewage disposal works at Halifax, Yorkshire, in which twenty-four of their large patent "Simplex" rotary sprinklers are installed. The patent "Simplex" travelling sprinklers have now been adopted, and are giving great satisfaction at a number of sewage works, and the economical value of these machines has been fully demonstrated. About five years ago an installation of these sprinklers was installed at the Cole Hall sewage works, Birmingham, and they were naturally gratified to receive an order recently from the engineer to the Birmingham, Tame and Rea Drainage Board for a further six machines, which are now being installed at the same works.

These machines give a uniform distribution, and automatically deal with large and small flows. They are very substantially built with the best materials and workmanship, and are of a light type which reduces wear and depreciation to a minimum. All moving parts are fitted with ball bearings, and the driving power developed will keep the machines moving during the strongest head gales. Each machine is fitted with an automatic control brake, which prevents the machines from racing when gales are blowing in the direction of travel. These sprinklers are specified for a number of important sewage works about to be carried out, and it is anticipated the present year will show a largely increased demand.

The new auto-dose valve for intermittently feeding sewage to the sprinklers has proved very satisfactory, and the demand for this valve is steadily increasing. An increased business has been done in sewage screens and sludge elevators; among the larger installations we may mention one just completed for the borough of Nelson (Lanes), in which electrically driven screening and sludge elevating machinery of the latest type has been installed. A good business has also been done in tiles for the floors of filter-beds, all kinds of ordinary sewage ironwork, sluice valves, penstocks, stoneware pipes with patent joints, &c.

A portion of the large order for sewage ironwork for the new sewage disposal works now being carried out at Leeds has been entrusted to this firm, consisting of large and heavy balanced grit doors and special fittings. The "Fieldhouse" patent sedimentation tank is giving excellent results, and has now been adopted, and is in course of construction at several important sewage works.

Business in other sanitary specialities has been well maintained. The Crosta patent double-trapped surface-water gully is supplied to leading sanitary authorities throughout the United Kingdom. Large orders are now being executed to contractors carrying out work at the London Docks under the Port of London Authority. The "Crosta" gullies have been in use at the London Docks for many years past, and have satisfactorily withstood the exceptionally heavy wear incidental to dock traffic. The sales of the Ames' patent "Adaptable" road broom are still on the increase, and the same may be said of the patent "Grip-mac" manhole covers for macadam roads, the economy and advantages of these being now appreciated by sanitary engineers.

Among new specialities they are putting upon the market may be mentioned the "Cross-field" patent manhole cover. This is a light and cheap type of cover combining special features desirable in a cover for use on sewers crossing fields, or in places not subject to heavy vehicular traffic. Another speciality is the "Essex" patent recorder for street watering vans.

This ingenious instrument should be on every watering van, as all operations of the van are accurately and automatically recorded, whether standing still, filling, emptying, or travelling full or empty; the records obtained are extremely interesting and valuable, and should enable important economies to be effected in street watering.

CAMPBELL GAS ENGINE COMPANY, LIMITED.

The Campbell Gas Engine Company, Limited, of Halifax, have supplied a number of their oil and gas engines for sewerage and drainage purposes, including three 175-b.h.p. vertical gas engines driving direct-coupled Cochrane centrifugal pumps, for the London County Council, and one 92-b.h.p. crude-oil engine, and direct-coupled pump capable of raising 80 tons of water per minute for the Methwold and Feltwell Drainage Commissioners.

JONES & ATTWOOD, LIMITED.

Messrs. Jones & Attwood, Limited, Stourbridge, have engaged the services of Mr. J. A. Coombs to superintend the design and installation of pneumatic sewage ejectors, air compressors, pneumatic lifts, sewage aerators and pneumatic apparatus of all kinds. This firm's business in the "Janda," or Fiddian, water-wheel type of distributor has continued to grow, and orders have been booked during the year for upwards of seventy-seven of this type for circular and rectangular filters, and for beds with circular ends. Many of these distributors are of large size capable of sprinkling any quantity up to 400 gallons per minute, and covering areas up to $\frac{1}{4}$ acre under one distributor, and $\frac{1}{2}$ acres in one installation. These are for works for H.M. War Office, the Governments of Russia, Holland, and Western Australia, Messrs. Baldwin Latham, M.INST.C.E., Sidney R. Lowcock, M.INST.C.E., Gilbert Thomson, M.INST.C.E., Crouch, Hogg & Easton, M.M.INST.C.E., and many other well-known engineers. Other business carried out by this firm's hydraulic department includes many installations of their "Crown" type of sewage sprinkler with fixed pipes, and of their sewage aerating plants, of which much more is likely to be heard in the near future. Their business in general sewer ironwork has also made much progress.

PULSOMETER ENGINEERING COMPANY.

A branch of the Pulsometer Engineering Company's business which is interesting to municipal engineers relates to the "Stereophagus" centrifugal pump manufactured by them (Hon. R. C. Parsons' patents). This pump has been specially designed for dealing with unscreened sewage, thus saving the cost of screens and, what is perhaps more important, the constant labour required for cleaning screens. Although the "Stereophagus" pump has only been placed on the market recently, the Pulsometer Engineering Company have already supplied several important installations for the following authorities: Riceall Urban District Council (Barlby pumping station), Evesham Urban District Council, Chingford Urban District Council, Rossington sewage (Doncaster Corporation). Other pumps have been ordered by the Glastonbury Urban District Council, the Harpenden Urban District Council, the Corporation of Southend-on-Sea, and the Wanstead Urban District Council.

J. STONE & CO., LIMITED.

Messrs. J. Stone & Co., Limited, of Deptford, S.E., report that their drainage and waterworks department has carried out many important contracts last year, both in this country and abroad, among which the following are the most important. Crown Colony of Fiji, Suva Main Drainage.—This scheme was referred to in our last year's special issue, and is a complete installation of six ejectors, oil engines, air compressors, air receivers, &c. The whole installation was erected at their works and tested under working conditions by the inspecting engineers to the Crown Agents for the Colonies before transhipment. In addition to the above, all the sewerage ironwork for this scheme, comprising special manhole covers, vent columns, floating arms, disc and sluice valves, was supplied by the same firm. London General Omnibus Company, Limited, Walthamstow Works.—This installation comprised one pair of Stone's patent pneumatic ejectors, capable of working alternately and independently, electrically driven air compressors

driven by d.c. motors with reducing gear, and fixed on the same bedplate. Automatic starting panels start and stop the motors when the air pressure in the receiver reaches predetermined limits. At Fort Blockhouse, Haslar, a pair of Stone's patent ejectors, embodying new features, has been installed, while at Fort Cumberland, Eastney, Portsmouth, an improved lift has been supplied and erected, both to the order of the Admiralty. The lift is operated by the direct pressure of water from an ordinary supply main, controlled by a ball valve so that the power water will not be running unless the flow of sewage demands a supply of compressed air. The only moving parts other than the ball valve are the inlet and outlet reflux valves; consequently the efficiency is maintained with certainty for an indefinite period.

This firm's well-known patent sewage distributors are reported to continue to give excellent results, as proved by the repeat orders received. These comprise rotary, reciprocating, fixed pipe and nozzle and power-driven sprinklers for operating any type of bacteria bed. In the case of power-driven reciprocating distributors, one electric motor may be used to drive any number of machines by means of ropes, or separate motors may be fixed on each machine, and provided with trolley arms. If the electric current is not available, a paraffin engine may be mounted on the distributor, or placed in a cabin to operate a rope drive. Two methods of distribution may be adopted—(a) where the filter is of great length, the distributor may discharge across the entire width of the filter, when the rest and spray interval are alternately long and short, and (b) where the filter is of normal length, the distributor may discharge across half the width of same, in one direction, and the other half on the return journey. In the latter case the rest and spray intervals are equal. If desired, a combination of these two methods may be employed, so that the rest and spray intervals may be equal with a normal flow, and alternately long and short in storm time, the distributor automatically adjusting itself to the sewage flow. This firm also supply power-driven distributors which have no small holes to choke.

Messrs. J. Stone & Co., Limited, further report that they are making a speciality of domestic sewage purifiers, and they have just issued a descriptive pamphlet dealing with these appliances. They state that a copy of this will be forwarded on request. The apparatus is sent out complete ready for work, and the orders in hand and contemplated provide evidence of the great utility of this purifier. Large orders for Stone's patent flushing syphons have been executed during the past year. Fifty syphons have been shipped to Colombo for the Crown Agents for the Colonies, and a quantity are in hand for Madura Tuticorin drainage to the order of the India Office. Cesspool emptying cylinders, working on the vacuum principle, are manufactured by Messrs. J. Stone & Co., Limited, and embody all the latest improvements. With these cylinders there is no nuisance from smell when emptying the cesspool. The vacuum is formed by a pump, driven by hand, or from a road wheel of the vehicle, or by an independent oil engine. The cylinders are mounted on suitable trolleys with strong axles, the road wheels being suitable for travelling on soft ground.

Orders from all parts of the world have been received for this firm's well-known sewage and water valves and fittings, in which they have specialised for upwards of seventy years.

TUKE & BELL.

Messrs. Tuke & Bell, of 599 High-road, Tottenham, London, N., report a year of increased activity. The main increase in their work appears to have been in the raising of sewage by means of ejectors and by direct air lifts. They have in the past twelve months completed important contracts of this kind for the Hornsey Borough Council, the Oldham Corporation, Hayes Urban District Council, and several others. They have also been very successful as regards their special patent apparatus for small sewage disposal schemes, such as for villages, sanatoria, and other isolated buildings, special attention having been devoted to the production of an apparatus which requires the minimum of attention. This effort on their part has been much appreciated by engineers of several sewage schemes in country districts where their apparatus has been fixed.

THE STODDART DISTRIBUTOR.

As previously announced, the manufacture and sale of this appliance is now in the hands of Mr. Charles Walker, of 20 Denmark-avenue, St. Augustine's,

Bristol, Mr. F. Wallis Stoddart, the original patentee, having reverted to his original practice as consultant on matters of sewage disposal and water supply. Mr. Stoddart has now no financial interest in the business, and Mr. Walker reports that he has experienced a very successful year in the sale of the Stoddart distributor, as well as other sewage appliances. Quite a large proportion of the business has been done in the Colonies, especially South Africa and Canada, while the business done in Great Britain has been encouraging, and shows great promise for the future.

There are now over 700 places in Great Britain and the Colonies where these distributors have been installed, and are, so far as can be ascertained, giving satisfaction.

DIBDIN'S SLATE BEDS.

Among other schemes for sewage purification carried out by Messrs. Dibdin's biological slate beds during the past year mention should be made of the completion of the slate beds for treating the sewage and storm water of Faversham, the slate beds for the Harpenden works, and a complete installation of six slate beds, two slate storm-water beds, humus beds, and six clinker beds, formed with slate slab construction, including slate paths, copings and channels, at the Borstal Institution, Rochester, for the Prison Commissioners. The new works for the Blean Rural District Council consist of eight slate beds, seven humus beds, and eight clinker beds, with slate paths, copings and channels. The slate bed installation at Bitterne Manor, Southampton, has been completed.

The slate bed scheme for Park Prewett Asylum has been approved by the Local Government Board, and the contract for this scheme is let. Similar schemes for Crediton, Devon, Gravesend, and the Redruth Rural District Council have been adopted, and will shortly be laid before the Local Government Board, and the High Wycombe slate bed extension scheme is now before the Local Government Board.

Numerous tenders for slate bed installations in various parts of the country are now awaiting formal acceptance, and this firm seems to have a full programme for the present year.

ADAMS-HYDRAULICS, LIMITED.

Messrs. Adams-Hydraulics, Limited, of York, have been uniformly busy in all departments during the year, and at the present time have many large contracts in hand, including no less than nineteen ejectors. Early in the year the local corporation passed plans for large extensions to their engineering works, including new pattern and erecting shops. These have been carried out, and will enable them to produce the largest and heaviest class of penstocks and valves. To further economise floor space in the works, the motors by which all the machines are driven have been removed, and now occupy overhead positions. The number of revolving sprinklers for percolating filters supplied during the past year by this firm has been more than in any previous year, and this applies also to the sale of their patent conical "Mota" man-hole and lamphole covers.

MANLOVE, ALLIOTT & CO., LIMITED.

Messrs. Manlove, Alliott & Co., Limited, of Nottingham, have carried out a considerable amount of work in connection with sewage disposal during the past year. A large sewage plant, consisting essentially of sludge pumps, water pumps, centrifugal pumps, lime mixers, gas and oil engines, &c., for the city of Bath, is now practically completed. A sewage ejector plant capable of dealing with 3,600 gallons of sewage in two hours, with a maximum lift of 40 ft., is being built by Messrs. Manlove, Alliott & Co., Limited, for the Rushden Urban District Council. The plant consists of one of their automatic pneumatic ejectors, air compressor, air receiver, piping, &c. The ejector will be arranged with special automatic valves, so that when once the air pressure has been turned on, the ejector will work continuously and automatically. This firm have also supplied filter-pressing plants for dealing with sewage sludge to the corporation of Nelson, Lancashire, also to the Stalybridge and Dukinfield Joint Sewerage Board.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

Literature of Municipal Engineering in 1913.

[Any book included in this summary will be forwarded, post free, on application to the St. Bride's Press, Limited, 24 Bride Lane, Fleet Street, E.C. The published price must be enclosed.]

In accordance with our usual custom, we publish below a summary of the books dealing with subjects of interest to municipal engineers which have been issued during the past year. In doing so we would again direct the attention of our readers to the Book Department carried on in connection with THE SURVEYOR, through which technical books, issued by various publishers, may be obtained from a single source with the minimum amount of trouble. Orders by post receive careful and prompt attention, and particulars and lists of books on any desired subject may be obtained upon application. The references in brackets are to the volume and page of THE SURVEYOR in which a review has appeared.

Annuals and Year-books.

- "Hazel's Annual, 1913." Edited by Hammond Hall. Price 3s. 6d. nett. London: Hazell, Watson & Viney, Limited. (Vol. 43, p. 49.)
- "Mechanical World' Pocket Diary and Year-book for 1914." Price 6d. Manchester: Emmott & Co., Limited. (Vol. 44, p. 783.)
- "The Englishwoman's Year-book and Directory, 1913." Edited by G. E. Mitton. Price 2s. 6d. nett. London: A. & C. Black. (Vol. 43, p. 49.)
- "The Gasworks Directory and Statistics for 1913-14." Price 10s. 6d. nett. London: Hazell, Watson & Viney, Limited. (Vol. 44, p. 872.)
- "The International Whitaker." Price 2s. nett. (Vol. 43, p. 49.)
- "The Municipal Year-book for 1913." Price 15s. nett. London: The Municipal Journal, Limited. (Vol. 43, p. 577.)
- "The Social Guide, 1913." Edited by Mrs. Hugh Adams and Edith A. Browne. Price 2s. 6d. nett. London: A. & C. Black. (Vol. 44, p. 35.)
- "The Writers' and Artists' Year-book, 1913." Edited by G. E. Mitton. Price 1s. nett. London: A. & C. Black. (Vol. 43, p. 107.)
- "Whitaker's Almanac, 1914." By Joseph Whitaker, F.S.A. Price 1s. (paper) and 2s. 6d. (half bound). London: J. Whitaker & Sons, Limited. (Vol. 44, p. 977.)
- "Whitaker's Almanac, 1913." Price 2s. 6d. (cloth). 1s. (paper). (Vol. 43, p. 107.)
- "Whitaker's Peerage, Baronetage, Knightage and Companionship, 1913." Price 5s. nett. (Vol. 43, p. 49.)
- "Whitaker's Peerage, Baronetage, Knightage and Companionship, 1914." Price 5s. nett. London: J. Whitaker & Sons, Limited. (Vol. 44, p. 977.)
- "Who's Who, 1913." Price 15s. nett. London: A. & C. Black. (Vol. 43, p. 49.)
- "Willing's Press Guide, 1913." Price 1s. London: James Willing, Limited. (Vol. 43, p. 260.)

Applied Mathematics.

- "Elementary Graphic Statics." By J. T. Wright, A.M.I.MECH.E. Price 4s. nett. London: Whittaker & Co. (Vol. 44, p. 977.)
- "Elements of Hydraulics." By Mansfield Merriman. Price 4s. 6d. nett. London: Chapman & Hall. (Vol. 43, p. 414.)
- "Four-place Tables of Logarithms and Trigonometric Functions." By E. V. Huntington. Price 3s. nett. London: E. & F. N. Spon, Limited. (Vol. 44, p. 173.)
- "Graphics and Structural Design." By H. D. Hess, M.E. Price 12s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 44, p. 782.)
- "Strength of Materials." A Text-book for Secondary Technical Schools. By Mansfield Merriman. Price 4s. 6d. nett. New York: John Wiley & Sons. London: Chapman & Hall. (Vol. 43, p. 414.)

Architecture and Building.

- "Builders' Quantities." By W. E. Ballard, ASSOC. M. INST. C.E. Price 2s. 6d. nett. London: Longmans, Green & Co. (Vol. 44, p. 273.)
- "Building Supervision." By George W. Grey, L.R.I.B.A. Price 2s. 6d. nett. London: E. & F. N. Spon, Limited. (Vol. 44, p. 554.)

"Fire Prevention and Fire Protection as Applied to Building Construction." By Joseph Kendall Freitag. Price 17s. nett. New York: John Wiley & Sons. London: Chapman & Hall. (Vol. 43, p. 113.)

"Fire Protection in Buildings." By Harold G. Holt, A.R.I.B.A. Price 8s. 6d. nett. London: Crosby Lockwood & Son. (Vol. 44, p. 173.)

"Laxton's Price-book, 1913." Price 4s. London: Kelly's Directories, Limited. (Vol. 43, p. 260.)

"Lockwood's Builders' Price-book for 1913." Edited by F. T. W. Miller, A.R.I.B.A. Price 4s. London: Crosby Lockwood & Co. (Vol. 43, p. 260.)

"Modern Technical Drawing." By George Ellis. Price 5s. nett. London: B. T. Batsford. (Vol. 44, p. 912.)

"Structural Details of Hip and Valley Rafters." By C. T. Bishop, C.E. Price 7s. 6d. nett. New York: John Wiley & Sons. London: Chapman & Hall, Limited. (Vol. 43, p. 260.)

"The Elements of Heating and Ventilation." By A. M. Greene, junr. Price 10s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 43, p. 504.)

"The Public Works Calculator." By a Public Works Officer. Second Edition. Price 2s. 6d. nett. London: Crosby Lockwood & Son. (Vol. 44, p. 912.)

Coast Protection.

"Coast Erosion and Protection." By Ernest R. Matthews, ASSOC. M. INST. C.E., &c. Price 10s. 6d. nett. London: Charles Griffin & Co., Limited. (Vol. 44, p. 488.)

"The Use of Vegetation for Reclaiming Tidal Lands." By Gerald O. Case. Price 2s. nett. London: The St. Bride's Press, Limited. (Vol. 44, p. 783.)

Electricity.

"Bells, Indicators, Telephones, Fire and Burglar Alarms, &c." By J. B. Redfern and J. Savin. Price 1s. 6d. nett. London: Constable & Co., Limited. (Vol. 43, p. 414.)

"Electric Furnaces in the Iron and Steel Industry." By W. Rodenhauser and I. Schoenawa; authorised translation and additions by C. H. Vom Baur. Price 15s. nett. London: Chapman & Hall, Limited. (Vol. 43, p. 818.)

"Essentials of Electricity." By W. H. Timbie. Price 5s. 6d. nett. New York: John Wiley & Sons. (Vol. 43, p. 377.)

"Switchgear and the Control of Electric Light and Power Circuits." By A. G. Collis, A.M.I.E.E. Price 1s. nett. London: Constable & Co., Limited. (Vol. 44, p. 872.)

"The Practice of Electrical Wiring." By D. S. Munro, A.M.I.E.E. Price 3s. nett. London: H. Alabaster, Gatehouse & Co. (Vol. 43, p. 167.)

Heat Engineering.

"Elements of Heat Power Engineering." By C. F. Hirschfeld and W. N. Barnard. Price 21s. nett. London: Chapman & Hall, Limited. (Vol. 43, p. 679.)

"Heat: A Manual for Technical and Industrial Students." By J. A. Randall. Price 6s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 43, p. 747.)

"The Working of Steam Boilers." By E. G. Hiller, B.Sc., &c. Fifth edition. Price 1s. 6d., cloth 2s. Manchester: Taylor, Garnett, Evans & Co., Limited. (Vol. 44, p. 783.)

Highways.

"Asphalt Construction for Pavements and Highways." A Pocket-book for Engineers, Contractors and Inspectors. By Clifford Richardson, M.A.M. soc. C.E., F.C.S. Price 8s. 4d. nett. London: The Hill Publishing Company, 6 Bouverie-street, E.C. (Vol. 43, p. 967.)

"English Local Government: The Story of the King's Highway." By Sidney and Beatrice Webb. Price 7s. 6d. nett. Longmans, Green & Co. (Vol. 43, p. 459.)

- "Prospective Opportunities for Highway Engineers in a National Highways Department." By C. H. Davis, President of the National Highways Association, United States. (Vol. 44, p. 414.)
- "Public Road Systems of Foreign Countries and of the Several States [United States]. Prepared under the direction of the Hon. Jonathan Bourne, junr., chairman of the Joint Committee on Federal Aid in the Construction of Post Roads, United States. (Vol. 44, p. 294.)
- "Specifications for Street Roadway Pavements: With Instructions to Inspectors on Street-paving Work." By S. Whinery, M.A.M.SOC.C.E. (Second Edition.) Price 4s. 2d. nett. New York: The McGraw-Hill Book Company. London: The Hill Publishing Company, Limited, 6 Bouverie-street, E.C. (Vol. 43, p. 911.)
- "Text-book on Highway Engineering." By Arthur H. Blanchard and Henry B. Drowne. Price 19s. nett. New York: John Wiley & Sons. London: Chapman & Hall, Limited. (Vol. 44, p. 628.)

Hygiene, Public Health, and Sanitation.

- "Chloride of Lime in Sanitation." By Albert H. Hooker. Price 12s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 43, p. 963.)
- "Disinfection and Disinfectants." By M. Christian. Translated from the German by Charles Salter. Price 5s. nett. London: Scott, Greenwood & Son. (Vol. 44, p. 273.)
- "Modern Sanitary Engineering and Plumbers' Work." By A. Herring-Shaw and H. F. V. Newsome. Vol. I., price 2s. nett. Vol. II., price 2s. 6d. nett. London: Longmans, Green & Co. (Vol. 44, p. 35.)

Legal.

- "Local Government, 1912-1913. Comprising Statutes, Orders, Forms, Cases and Decisions of the Local Government Board." Edited by Alexander Macmorran, M.A., one of His Majesty's Counsel, and Kenneth M. Macmorran, M.A., LL.B., of the Middle Temple and Western Circuit, Barrister-at-Law (Editors of "Local Government, 1908-1912; Statutes, Orders, Forms, Cases, Decisions.") Price 20s. nett. London: Butterworth & Co., Bell-yard, Temple Bar; Shaw & Sons, 7 and 8 Fetter-lane, E.C. October, 1913. (Vol. 44, p. 758.)
- "The Land Transfer 'Scandal.'" By J. S. Rubenstein. Third edition. Price 2s. 6d. London: Sweet & Maxwell, Limited. (Vol. 44, p. 526.)
- "The Law and Practice of Town Planning." By R. A. Glen, Barrister-at-Law, and Arthur D. Dean. Price 15s. London: Butterworth & Co. and Shaw & Sons. (Vol. 43, p. 413.)
- "The Law of Extraordinary Traffic on Highways." In eight parts. By Bernard Lailey, Barrister-at-Law, of the Middle Temple and South-Eastern Circuit. Price 7s. 6d. nett. London: Sweet & Maxwell, Limited. (Vol. 43, p. 26.)
- "The Law Relating to Highways." By H. Hampton Copnall, solicitor, clerk of the Notts County Council, author of "The Law Relating to Locomotives on Highways," "The Law Relating to Infectious Diseases and Hospitals," &c., &c. (Second Edition.) Price 21s. nett. London: Charles Knight & Co., Limited. (Vol. 43, p. 49.)
- "The Law Relating to Town Planning." By Harry Barlow, Esq., Barrister-at-Law. Price 6s. 6d. nett. London: Eyre & Spottiswoode, Limited. (Vol. 44, p. 554.)
- "Tithe Rent-charge Table, 1913." By P. W. Millard, LL.B. Price 1s. London: Shaw & Sons. (Vol. 43, p. 260.)

Materials.

- "A Manual of Cement Testing." By W. A. Richards and H. B. North, D.Sc. Price 6s. nett. London: Constable & Co., Limited. (Vol. 44, p. 35.)
- "Cement, Concrete and Bricks." By Alfred B. Searle. Price 10s. 6d. nett. London: Constable & Co., Limited. (Vol. 44, p. 782.)
- "Natural Rock Asphalts and Bitumens: Their Geology, History, Properties and Industrial Application." By Arthur Danby. Price 8s. 6d. nett. London: Constable & Co., Limited. (Vol. 43, p. 967.)
- "Paint and Painting Defects: Their Detection, Cause and Cure." By J. Cruickshank Smith, B.Sc., F.C.S.

Price 3s. 6d. London: The Trade Papers Publishing Company, Limited. (Vol. 43, p. 747.)

- "Portland Cement: Its Manufacture, Testing and Use." By D. B. Butler, ASSOC.M.INST.C.E. Price 16s. nett. London: E. & F. N. Spon, Limited. (Vol. 44, p. 628.)
- "Practical Stone Quarrying." By Allan Greenwell, ASSOC.M.INST.C.E., and S. V. Elsdon, D.Sc. Price 12s. 6d. nett. London: Crosby Lockwood & Son. (Vol. 44, p. 783.)

Miscellaneous.

- "All about Engineering." By Gordon D. Knox. Price 6s. London: Cassell & Co., Limited. (Vol. 44, p. 783.)
- "Books that Count." Edited by W. Forbes Gray. Price 5s. nett. London: A. & C. Black. (Vol. 43, p. 26.)
- "British Rainfall, 1912." By H. R. Mill, director of the British Rainfall Organisation, assisted by Carle Salter, chief assistant. Price 10s. London: Edward Stanford, Limited. (Vol. 44, p. 449.)
- "Computations for Marine Engines." By C. H. Peabody. Price 10s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 44, p. 273.)
- "Engineering as a Profession." By A. P. M. Fleming, M.I.E.E., and R. W. Bailey, WH.Sc. Price 2s. 6d. nett. London: John Long, Limited. (Vol. 44, p. 554.)
- "Forest Physiography." By Isaiah Bowman. Price 21s. nett. New York: John Wiley & Sons. (Vol. 43, p. 818.)
- "Gas and Fuel Analysis for Engineers." By Augustus H. Gill, S.B., PH.D. Price 5s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 44, p. 173.)
- "National and Municipal Finance." By Walter Jones, J.P., M.I.MECH.E. Price 1s. nett. London: Frank Palmer. (Vol. 44, p. 35.)
- "Our Village Homes: Present Conditions and Remedies." By Hugh Aronson, M.A., Barrister-at-Law. Price 2s. 6d. nett. London: Thomas Murby & Co. (Vol. 43, p. 747.)
- "Report on Coal and Power Investigation, for the Board of Highway Commissioners, Saskatchewan." By R. O. Wynne Roberts, M.INST.C.E. (Vol. 44, p. 872.)
- "The Art and Craft of Garden Making." Fourth Edition. By Thomas H. Mawson. Price £2 10s. nett. London: B. T. Batsford. (Vol. 43, p. 26.)
- "The Improvement of Rivers. A Treatise on the Methods Employed for Improving Streams for Open Navigation, and for Navigation by means of Locks and Dams." By B. F. Thomas and D. A. Watt. Second Edition. Price 31s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 44, p. 758.)
- "The New English System of Money, Weights and Measures, and of Arithmetic." By Engineer Rear-Admiral Elbow, R.N. Price 1s. nett. London: P. S. King & Son. (Vol. 43, p. 1,019.)

Reinforced Concrete.

- "Cassell's Reinforced Concrete." Edited by Bernard E. Jones, assisted by Albert Lakeman and a staff of Specialist Writers. Price 15s. nett. London: Cassell & Co., Limited. (Vol. 43, p. 413.)
- "Continuous Beams in Reinforced Concrete." By Burnard Geen, ASSOC.M.INST.C.E., M.S.E., M.C.I. Price 9s. nett. London: Messrs. Chapman & Hall, Limited. (Vol. 43, p. 773.)
- "Estimating for Reinforced-Concrete Work." By Major T. E. Coleman. Price 4s. nett. London: B. T. Batsford. (Vol. 43, p. 26.)

Sewerage and Sewage Disposal.

- "Drainage and Sanitation." By E. H. Blake, F.S.I. Price 10s. nett. London: B. T. Batsford.
- "Trade Waste Waters: Their Nature and Disposal." By H. Maclean Wilson, M.D., B.Sc., and H. T. Calvert, M.Sc., PH.D., F.I.C. Price 18s. London: Charles Griffin & Co., Limited.
- "Water Purification and Sewage Disposal." By Dr. J. Tillmans, director of the chemical department of the Municipal Institute of Hygiene, Frankfort-on-Main. Translated by Hugh S. Taylor, M.Sc. (University of Liverpool). Price 7s. 6d. nett. London: Constable & Co., Limited. (Vol. 44, p. 75.)

Structural Engineering.

- "A Treatise on Wooden Trestle Bridges and their Concrete Substitutes." Fourth Edition. By Wolcott C. Foster. Price 21s. nett. London: Chapman & Hall, Limited. (Vol. 44, p. 591.)
- "Earthwork Haul and Overhaul." By J. C. L. Fish. Price 6s. 6d. nett. London: Chapman & Hall, Limited. (Vol. 43, p. 1,019.)

Surveying.

- "Land and Mining Surveying." By G. L. Leston. Price 6s. nett. London: Crosby Lockwood & Son. (Vol. 43, p. 260.)
- "Records of the Survey of India." (Vol. II., 1910-1911. Prepared under the direction of Colonel S. G. Burrard, C.S.I., R.E., F.R.S., Surveyor-General of India. Price 6s. (Vol. 43, p. 704.)
- "Survey of India: General Report on the Operations during the Survey Year 1911-1912. Prepared under the direction of Colonel S. G. Burrard, C.S.I., R.E., F.R.S., Surveyor-General of India. Price 2 rupees (3s.). Survey of India Office, Calcutta, and agents. (Vol. 44, p. 753.)
- "The Field Engineer's Handbook." By G. Carveth Wells, A.C.G.I., and Arundel S. Clay, B.Sc., A.C.G.I. Price 7s. 6d. nett. London: Edward Arnold. (Vol. 43, p. 841.)

Topography.

- "Northampton." By S. S. Campion, J.P. Price 3d. London: The Homeland Association, Limited. (Vol. 43, p. 107.)
- "Northwood (Middlesex)." By Arthur Henry Anderson. Price 3d. London: The Homeland Association. (Vol. 44, p. 943.)

Valuation.

- "Valuation of Real Property." By C. A. Webb, F.S.I. Third Edition, revised and enlarged by Arthur Hunnings, F.S.I. Price 7s. 6d. nett. London: Crosby Lockwood & Son. (Vol. 44, p. 526.)
- "Valuation Tables." By Richard Parry, F.S.I., & C. Price 7s. 6d. London: The Estates Gazette, Limited. (Vol. 44, p. 912.)

Water Supply.

- "Catskill Water Supply of New York City." By Lazarus White. Price 25s. 6d. nett. New York: John Wiley & Sons. (Vol. 44, p. 590.)
- "Elements of Water Bacteriology." By S. C. Prescott and C. E. A. Winslow. Third Edition. Price 7s. 6d. nett. New York: John Wiley & Sons. (Vol. 44, p. 591.)
- "Modern Pumping and Hydraulic Machinery." By Edward Butler, M.I.MECH.E. Price 18s. nett. London: Charles Griffin & Co., Limited. (Vol. 43, p. 704.)
- "Transactions of the Institution of Water Engineers, Vol. xvii., 1912." Edited by Percy Griffith, M.INST.C.E., F.G.S., secretary. (Vol. 44, p. 173.)
- "Underground Waters for Commercial Purposes." By Frank L. Rector, B.S., M.D. Price 4s. 6d. nett. London: Messrs. Chapman & Hall, Limited. (Vol. 44, p. 782.)
- "Waterworks Directory and Statistics." Price 10s. 6d. nett. London: Hazell, Watson & Viney, Limited. (Vol. 44, p. 872.)

Pocket-books.

- "The American Civil Engineers' Pocket-book." Second Edition. Edited by Mansfield Merriman and others. Price 21s. nett. London: Chapman & Hall, Limited. (Vol. 43, p. 377.)
- "The Civil Engineers' Pocket-book." By Albert J. Frye. Price 21s. nett. London: Constable & Co., Limited. (Vol. 43, p. 818.)
- "The Engineer's Year-book of Formulae, Rules, Tables, Data, &c." A compendium of the Modern Practice of Civil, Mechanical, Electrical, Gas, Marine and Mine Engineering. By H. R. Kempe, M.INST.C.E., with the collaboration of eminent specialists. Price 12s. 6d. With over 1,250 illustrations specially engraved for the work. London: Crosby Lockwood & Son. (Vol. 43, p. 377.)
- "Molesworth's Pocket-book of Engineering Formulae." Twenty-seventh Edition. Price 5s. nett. London: E. & F. N. Spon, Limited. Vol. 44, p. 554.)

New Schools for London.—The London County Council Education Committee on Wednesday arranged to build ten new elementary schools in Bethnal Green and Hackney at a cost of £260,000.

WATER IN MACADAM ROAD CONSTRUCTION.**SILICATE BINDING AT SHEFFIELD.**

Prof. W. G. Fearnside, M.A., F.G.S., Sorby Professor of Geology at Sheffield University, last week repeated before the Sheffield Society of Architects and Surveyors the address on "The Part Played by Water in Macadam Road Construction," which he delivered at a recent meeting of the Surveyors' Institution in London. [See THE SURVEYOR, November 28th and December 19th last.]

In the course of the discussion which ensued, a letter from Mr. W. J. Hadfield, surveyor of highways for Sheffield, was read.

Mr. Hadfield wrote that whereas five years ago water-bound macadam constituted about 66 per cent of the material used for Sheffield's macadamised roads, and tar-macadam about 33 per cent, during the last two years tar-macadam represented more than 80 per cent, and water-bound macadam less than 20 per cent. Water had also become a less important factor in macadam roads which were not made of tarred materials. "We are now binding the macadam of some of our important roads," said the writer, "with silicate. This kind of work has been done here for three or four years with excellent results. . . . Slag, properly used, is a most excellent material for surfacing and foundations. Our trouble is to get sufficient of the right quality."

Commenting on the letter, Prof. Fearnside said he thought Mr. Hadfield would admit that there was such a thing as a foundation for a road, and unless he was prepared to replace all foundations by concrete or some other very strong material, Mr. Hadfield must at least deal with the water as it came up from below and in from the side. Binding with silicate was a very interesting process. Although silicates were very efficacious in keeping down the dust for a considerable portion of the year, there did at times come a very terrible reaction, and that wanted looking into. He thought the use of silicates on the average was generally good. He agreed with Mr. Hadfield's allusion to slag, but he would underline the words "right quality."

NEW SESSIONS HOUSE FOR LONDON.**ARRANGEMENT OF THE BUILDING.**

The new sessions house at Newington will, states a report of the Local Government Committee of the London County Council, contain four floors.

The lower ground floor will be occupied chiefly by the cells and other accommodation for the prisoners, the remaining space being used for storage rooms, records, and for the public refreshment room. On the principal floor, which is about 6 ft. above the courtyard level, there will be a large public waiting hall, two courts for criminal business, and one for civil business, a reference library, rooms for the chairman and deputy chairman of quarter sessions and various officials, and offices for licensing, assessment and other business. On the first floor will be rooms for the grand jury and the jury in waiting, and a committee room and other offices. On the second floor there will be common rooms for the justices, the bar and the solicitors, and kitchen and office accommodation. The rooms on the upper floors will be served by passenger lifts. The fronts to the principal forecourt and Union-road will be faced with Portland stone, and all the walling at the back and the remaining flank will be finished with plain stock brick. The roofs will be slated. Internally the finishings will be simple and substantial. Panelling will be introduced in the courts and in some of the more important rooms, but generally the walls will be plastered.

Having regard to the size and character of the building, the committee suggest that only selected firms of known capacity should be invited to tender for the work, and as the building is required to be provided with the least possible delay, they recommend that alternative prices for completing the work in twelve, sixteen and twenty-one months should be obtained.

Sewage Disposal at Rothesay.—Mr. J. B. Brodie, consulting engineer, has prepared a scheme of sewage disposal which, with an alternative scheme, is now under the consideration of the Rothesay Town Council. Under the alternative scheme the work is divided into three sections, the estimated cost being £24,000.

Water Supply Works in 1913.

MANUFACTURERS' REPORTS.

The reports received from manufacturers this year are of particular interest.

PURIFICATION PLANT.

Messrs. Mather & Platt have carried out a large number of works in which their mechanical filters and coagulating plant have been installed. The Sheffield Corporation possesses a plant capable of dealing with 7,000,000 gallons a day, the filters being thirty-two in number and 8 ft. in diameter. This has been working regularly during the past year giving excellent results, which fact has induced the Sheffield Corporation to order a further installation of 8-ft. diameter filters, twenty-four in number, which is to be set up at Rivelin. More filters have been installed for the Rhymney and Aber Valleys Water Company, making the total sixteen 8-ft. diameter filters. These are all now in working order, and are giving most excellent results. Similar installations have been fixed at Fraserburgh, the South Staffordshire waterworks, and at many other places.

The "Turn-Over" Filter Company, of Belfast, reports that a great deal of work is being done in connection with the purification of river waters for industrial purposes. They have also completed some interesting works in connection with public baths, notably one for the Bradford Corporation and another for Brighouse. In the case of Belfast, an analysis was made of the town water just before the plant was started, and a sample of the bath water was analysed after the bath had been in constant use for six months; both gave practically the same results, and were pronounced by the county analyst as being passable drinking waters. The town water used in the pond was so brown and peat-stained that the bottom of the pond could not be seen; but two days after the plant had been at work the water was transformed into one brilliantly clear and colourless. The process of purification consists of chemical treatment and filtration, lime water being used as a steriliser.

The Kennicott Water Softener Company, of Wolverhampton, have lately put on the market an entirely new type of water-softening plant which has no valves or cups for proportioning the lime used for softening, thus eliminating a serious source of trouble. It is also equipped with a means for entirely removing the whole of the sludge from the bottom of the main settling tank without emptying out the plant, and, further, it is the only plant on the market which provides mechanical agitation for this purpose without employing any outside power, the power of the incoming water being used. During the past year this company have installed plants for the corporations of Bootle, Ashton-under-Lyne, Hull, Swindon and Manchester, and at Mexborough on the Great Central Railway, and they have erected the latest water-softening plant installed on any railway in the United Kingdom. The Kennicott Water Softener Company have also supplied large plant to the South Australian Government and to the South African Government, and plant for various industrial concerns throughout the country.

During the past year Messrs. The Ransome-verMehrs Machinery Company, Limited, have installed filter plant for the Merthyr Tydfil Corporation at their reservoirs at Torpantau, for the North Pembroke-shire Water and Gas Company at their Fishguard works, for the city of Toronto at the Lake Shore pumping station, for the Fisheries Department of the Canadian Government at Collingwood, and they have in course of completion at the present time filters for the Antofagasta (Chili) and Bolivia Railway Company, Limited, and for Recife, South America. The largest and most important plant is a battery of ten filters with a capacity of 3,000,000 gallons per day for supply through the Crown Agents for the Colonies to the city of Kingston, Jamaica.

There is no doubt whatever that the Lassen-Hjort Softener owes its widespread adoption to its distinctive devices for the rigidly accurate measurement of both the hard water and the chemical required to treat it. The plant is designed so that the water to be treated (no matter how large a quantity) may be first measured automatically in small definite parcels, and then mixed—also automatically—with the exact

amount of chemicals required to soften it completely without there being any excess of chemicals allowed to remain in the treated water as it passes from the softener. This mechanism is exceedingly simple and accurate, possessing few moving parts, and all these readily accessible. A salient feature is the employment of a positive chemical measuring valve which enables the user to exercise absolute control over the quantity of chemical delivered into the water, and admits of the most delicate adjustment. A large number of important contracts have been carried out by Messrs. Lassen & Hjort during 1913, among the most noteworthy of these being the water softening installation for the Middlesex County Council at their Napsbury Asylum, the completion of the installations for treating the entire supplies to the towns of Walton-le-Dale, Lancashire, and Brumby and Frodingham, Lincolnshire, and the erection of huge water softening plants for the English Sewing Cotton Company, and Messrs. Fox Bros., Wellington, Somerset. Other large installations include the Rossington Main Colliery Company, Limited, 400,000 gallons per day; Thomas Owen & Co., Limited, Ely Paper Mills, Cardiff, 300,000 gallons per day; Denby Iron and Coal Company, Limited, Denby, 150,000 gallons per day; John Spencer & Sons Limited, Newburn, Newcastle-on-Tyne, 100,000 gallons per day. It is interesting to note that negotiations have been concluded between Messrs. Lassen & Hjort and Messrs. Water Softeners, Limited, under which the two firms will henceforth operate as a joint concern under the title of the United Water Softeners, Limited. Messrs. Water Softeners, Limited, are the proprietors of the recently introduced "Permutit" regenerative process. The "Permutit" process reduces a water, however hard, down to zero, whether the water is of a changeable character or not, and is the only method other than distillation by which the hardness of water may be so reduced. The advantages of a completely softened water are very great in trades such as dyeing and bleaching, wool scouring, laundry work, &c.

The Candy Filter Company, of Westminster, have recently installed a large battery of their oxidising and aerating filters for removing iron without the use of chemicals for the Biggleswade Water Board; another battery for the same purpose for the Nuneaton Corporation, and for the Baddesley Collieries Trustees, who supply the towns of Tamworth and Atherstone. Cromer has also adopted Candy oxidising filters for removing the iron from the public supply, a filter plant of the compound type for dealing with 40,000 gallons per hour having just been completed for that town. De-Clor filter plants have, during the last year, been supplied to towns in the United Kingdom, as also shipped to South Africa, Madeira, China, Japan, the Malay States. The Candy Filter Company's works are also busy with orders from Australia, New Zealand and elsewhere abroad. One of the largest butter-making firms in the world purifies all the water used in its dairies by the De-Clor system, in order to ensure the absolute bacterial purity of the water used in its manufacturing processes. In our issue of December 19th we described the improved method of water softening and iron removing plant erected by the Candy Filter Company for dealing with the public water supply of the town of Stowmarket. This installation includes what the Candy Filter Company term their "Compound" mechanical filter, which is found especially valuable for dealing with waters that have been treated chemically prior to filtration, or for any waters containing an unusually large amount of suspended matter, such as river or flood waters, turbid or muddy supplies generally. One of the many advantages claimed for the Candy "Compound" filter is that it combines in one cylinder two separate and distinct filters, one being a pre-filter, and the other a fine bed filter; this arrangement enables the filter to work for a much longer period without being put out of operation for cleansing than the ordinary mechanical filter. Among other filter plants supplied by the Candy Company in 1913 are a set of pre-filters for the West Hampshire Water Company, extensions and chemical plant for the Pontypridd and Rhondda Joint Water Board, the completion of a filter installation for the South Molton Corporation, and filters for many

other places, including Barnoldswick, the towns of Chippenham, Guisborough, Yorkshire, &c. &c.

SPECIAL TREATMENT.

Messrs. Royles, Limited, of Irlam, Manchester, have supplied an automatic filter with a capacity of 10,000 gallons per hour to the Swan Lane Collieries, Limited, of Wigan. This is used for filtering ochre water from a mine, which was previously discharged into a local stream. This discharge caused trouble with firms lower down the stream who utilised the water for boiler feed and for manufacturing purposes. The filter was put down to get over this difficulty, and the water now enters the stream perfectly clear and free from all trace of iron. This firm has also provided a very large number of plants of various kinds for large institutions and firms at home and abroad, softening plants, hardening plants, and filters too numerous to record in detail, not the least interesting of which is the large plant supplied to the Manchester Royal Infirmary for the prevention of rust and corrosion of the pipes.

The economical production of pure water from brine has been a branch of the Multiple Effect Evaporator business which the Mirreles Watson Company, Limited, of Glasgow, have developed largely and successfully for a number of years. Among their output for 1913 may be noticed a number of Sextuple Effects, whose guaranteed production is rated at 36 lb. of gained water per 1 lb. of fuel consumed, a figure which in actual work is generally exceeded by 20 per cent or more. Two such plants, one of large and one of moderate size, have been erected in the East for the Ottoman Government. A larger installation than the latter has been sent to the Italian Government for their Red Sea service, while in Southern Spain a leading railway company has installed the largest of all. The Peruvian Legation has been supplied with a small but highly interesting apparatus, designed for easy transport, being self-contained and accompanied by its own locomotive boilers. Another installation has gone to Australia.

PUMPS.

During the year that has closed the Pulsometer Engineering Company, Limited, of London and Reading, have carried out many important and interesting pumping installations for public authorities. Electrically driven turbine pumps for increasing the pressures in water mains to supply high-level districts now form a very convenient method of overcoming the difficulties so often experienced by municipal engineers in rapidly growing localities, and the Pulsometer Engineering Company have successfully installed pumps for this purpose to the Pontefract Urban District Council (two sets in different pumping stations), Castleford Urban District Council, Rotherham Corporation, &c. &c. Notwithstanding the fact that it has been on the market for many years, the Pulsometer steam pump has held its own against many claimants to the public notice, and retains its reputation as one of the handiest, hardest and certainly the most useful pump known. The number of instances where the Pulsometer steam pump has been utilised by municipal authorities during the past twelve months are far too numerous to permit of our mentioning them all, but the following two cases will probably prove of interest to our readers: Owing to the dry season, it was necessary to supplement quickly the water supply from a waterworks, and a No. 9 Pulsometer steam pump was installed. The duty of this pump was to deal with 20,000 gallons of water per hour, from 75 ft. below the surface, and deliver it through about $\frac{3}{4}$ mile of piping to one of the other pumping stations of the company. Another interesting instance where Pulsometer steam pumps have been utilised was at the recent army manoeuvres in Bucks, where five small Pulsometer steam pumps and boilers were used for supplying the whole of the water required by the troops and their horses. In this instance the water was drawn from five separate wells, down which each of the pumps was lowered by means of sling tackle.

Messrs. Ruston, Proctor & Co., have installed a large number of producer gas plants and engines for pumping purposes, having a power of from 100 to 152 b.h.p., to municipal and public waterworks. A very large and important list is furnished. Large crude oil engines for pumping purposes also form interesting items on the list.

Messrs. Drysdale & Co., Limited, of Glasgow, have supplied to the Portuguese Government centrifugal pumps driven by direct-current electric motors

arranged with vertical spindles. The pump in this instance is placed at the bottom of the well, just above the water-bearing strata, and the delivery pipe leads from this up to the storage reservoir. Messrs. Drysdale have also erected during the year a very large pumping station of this type in Canada for the supply of water to one of the Western towns. The method of distribution in this case was to pump the water into the pipe network throughout the city, no standpipe or reservoir being used. This was a case in which the centrifugal pump was specially adaptable, because when water is being drawn from the mains the pressure does not rise above a fixed limit depending upon speed and rotation. This pressure is constant, as the motors for driving the pumps are of the constant speed synchronous type. Each pump has a guaranteed output of 10,000,000 gallons per twenty-four hours and maintains with this delivery a pressure of 110 lb. per square inch. When the two units are arranged in series the pressure can be brought up to 160 lb. per square inch. For fire service a change over can be effected in a very short space of time owing to the arrangement of valves. Messrs. Drysdale have also supplied to the same Colony a turbine pump driven by water turbine. The water turbine is driven by water obtained from the same source as that from which the pump draws its supply. The pumped water is delivered to a standpipe, as is the usual practice in America. As in the previous case, the pressure can be raised by speeding up the turbine. Messrs. Drysdale have also supplied Booster pumps for fire service for increasing the pressure in existing water supply mains fed from gravitation reservoirs. These pumps were driven by A.C. motors.

Messrs. Tangyos, Limited, of Birmingham, have completed a large number of installations during 1913, driven by gas engines and suction-gas producers. These have been supplied for large waterworks at home and abroad. Large steam engines and pumps, lifting against a head of 1,663 ft., have been supplied for Hong Kong.

Messrs. the Campbell Gas Engine Company have carried out a large number of pumping installations during the past year, including gas engines, suction-gas plants and engines, oil engines, and turbine-driven pumps for various large municipal works.

The Dowson & Mason Gas Plant Company, Limited (combining the Dowson Economic Gas and Power Company, Limited, London, and Mason's Gas Power Company, Limited, Manchester), Alma Works, Levenshulme, Manchester, have carried out during the past year many works, the most important contract being that for the Metropolitan Water Board for their Chingford reservoir to drive four Humphrey patent gas pumps. This consists of four Dowson generators to develop a total of about 1,350-horse power. The year 1913 has been a very busy one, and on the furnace side the most important contract has just been completed for Sir W. G. Armstrong, Whitworth & Co., Limited, for their new Armstrong Shipyard, Walker-on-Tyne, Newcastle. This consists of a complete installation of gas-fired plate, bar and forge furnaces, and the necessary "Duff" gas producers, steel chimneys, flues, foundations, &c. They have also received many orders for the "Moore" patent water-jacketed gas producer with by-product recovery.

METERS.

Messrs. Kent report that the use of small and large meters for the measurement of water, air, &c., has been increased considerably during the year. Among the more interesting installations is one supplied to a large Chilean railway company. Several "Venturi" meters and reservoir level recorders were supplied to reservoirs at various points along the railway, and their records are conveyed electrically over a considerable distance to the office of the engineer-in-charge, where they all appear in one large cabinet, thus enabling the engineer to see at a glance the condition of these reservoirs. Another interesting installation is that supplied to a group of three mines in Asia. It was desired to obtain water from a common source situated at a considerable distance from the mines. The mineowners wished to avoid the expense of laying three pipe lines for the whole distance, but at the same time wished to ensure the equal division of the water. A common main has been brought to a point roughly equidistant from three meters governing the three separate supplies, and equity of division is assured by the use of "Venturi" meters and control gear, by means of which a record is given of the actual rate of flow passing to each main as well as

a registration of the total consumption by each. A Butterfly valve is contained in the downstream cone of each of the three "Venturi" tubes, and is controlled by means of the "Venturi" head and through the intermediary of a hydraulic cylinder. If any sudden demand upon the part of one main causes a rate of flow in excess of the proper quantity, the control gear within a few seconds closes the valve sufficiently to bring the flow within its proper limits; on the other hand, the control gear opens the valve wider when the diminished flow on the inlet side reduces the rate of flow.

STEEL PIPES.

Messrs. Stewarts & Lloyds report that last year's output of steel pipes was an easy record, and that this is principally due to the gradual adoption of steel where cast-iron was formerly used. The principal extensions in water supply in the past year have been in the newer countries, particularly Canada, Australia, South Africa, South America and India. Among the larger orders executed, or in progress, by Stewarts & Lloyds, Limited, may be mentioned 25 miles of 30-in. for Colombo waterworks, 10 miles of 24-in. for Port Arthur, Canada; some further 10 miles of 20-in. and 24-in., being extensions of previous large quantities supplied to Calgary (Canada), Vancouver, and Sarnia (Ontario); also some miles of 20-in. pipes for Santos; and sewage and water mains for Belfast, Burnley, and a number of other towns. Messrs. Stewarts & Lloyds have also supplied many hundreds of miles of smaller sizes (3-in. to 12-in.). All the above pipes were made by the lapwelded process; in addition they have a contract in hand of 5 miles of 45-in. diameter of the Mephan-Ferguson Lock Bar pipes. It will interest borough surveyors and engineers to note that in many of the above contracts steel pipes have now been adopted where cast-iron was formerly used. A visit to any one of Stewarts' & Lloyds' large pipe works, in England or Scotland, would well repay any municipal or water engineers who have water-pipe extensions in contemplation, and would certainly impress them with the immense developments in the steel pipe trade during the last ten years.

WELLS.

To report or to deal in detail with the long list of contracts for wells carried out during the past year by Messrs. A. C. Potter & Co., of Lant-street, Borough, would demand a long article dealing with the geology and water-bearing strata of many places. The work of this firm includes wells and pumping plant of various kinds of great magnitude.

Messrs. Le Grand & Sutcliffe, of Magdala Works, 125 Bunhill-row, have during the past year carried out a number of wells to which it is impossible to do justice in a short notice, so many and various are the instances and conditions, and so interesting are the results. The success of the year's work, and its importance and extent are very remarkable.

British Columbian Roads: A £33,000 a Mile Section.

—The remarkable fact is disclosed by the British Columbian estimates for 1913-14 that the province is spending for that period no less than £1,192,300 on roads, streets, bridges and wharves, and the appropriation for the greater part will be for roads and road bridges. Over 2,000 miles of road were built in 1913. The greatest single item in the provincial programme is an inter-provincial road from the western coast to the frontier of Alberta, and it is interesting to note that 6 miles of the old road—from Hope, up the Fraser, to Yale, and constructed by Sir James Douglas—was probably the most costly and dangerous ever built. The expense of replacing it would be over £200,000, and the new highway will therefore strike eastward from Hope to Princeton. The justification for so elaborate a scheme of road making is to be found in the prevalent use of the motor car. The distance from Vancouver to Seattle—some 200 miles—is daily covered by thirty or forty motor cars in the space of eight or nine hours. The road mileage of the province now exceeds 20,000—a figure which will be multiplied threefold when the Government's plans are completely carried out. The present total includes 2,050 miles in towns and rural municipalities, not under provincial management; 5,166 miles of trail passable at least by a pack-horse; and 12,847 miles of provincial roadway, of which over 5,000 have been brought up to standard—that is, they are surfaced with gravel or rock, and are not less than 16 ft. wide, while the highest grade is not over 8 per cent.—From the *Times* "Pacific Coast Number."

LONDON TRAFFIC PROBLEMS.

SIR HERBERT JEYKLL AT THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

"London Traffic Problems" was the subject of a paper read on Monday evening at a meeting of the Royal Institute of British Architects by Sir Herbert Jekyll. Discussing the need for new roads, Sir Herbert said that of the two methods of effecting improvement the construction of new streets was generally preferable to the widening of old ones, as it did not interfere with traffic, and in the end gave greater relief. Additional and wider bridges were also one of the pressing requirements at the present time. Necessary as it was to widen the principal thoroughfares or to add to their number, something might be done, at comparatively small expense, to increase their capacity. The greatest of all obstructions were the centre lamp-posts. They were even more pernicious than they appeared to be, for, although they were not wide, there was always a margin on each side within which no vehicle would pass, while the intervals between them were so short that little use could be made of the spaces between them. These were often occupied by cab ranks, so that practically a strip in the centre of the roadway was thrown out of use and the remainder was divided into two. Their retention was the less excusable because the advantages of central lighting could be had without them.

Reference was made by the author of the paper to the plan of new roads in London prepared by Colonel Hellard, and said the proposed roads were of three kinds—(1) radiating main roads; (2) encircling roads connecting with these, and making it possible to pass through London without traversing the crowded centre, and (3) by-pass roads, avoiding certain places where traffic was abnormally congested. Main roads should not be less than 100 ft. wide. In fixing this width it was not intended that the whole of it should be brought into use at once, but that no building should be allowed within 50 ft. of the centre line. If the width of new roads—especially such as radiated from the centre—were sufficient to admit of light railways on tracks of their own, apart from the roadway for ordinary traffic, such railways would assist materially in developing building areas, provided that the stopping places were far enough apart to admit of a high rate of speed.

Concluding his remarks, Sir Herbert strongly urged the establishment of a central authority with power, first, to lay down the lines of arterial roads, and, secondly, to require local authorities to make their schemes conform to prescribed lines.

DEATH OF CHESHIRE COUNTY SURVEYOR.

Mr. Harry F. Bull, ASSOC.M.INST.C.E., county surveyor of Cheshire, died, we regret to state, on Friday last at his residence Beechwood, Canal-street, Chester, after an illness of six months. He was fifty-one years of age. Mr. Bull became associated with the county surveyor's staff in 1889 as assistant to his uncle, the late Mr. Stanhope Bull, who was then county surveyor. On the death of his uncle, in 1896, Mr. Bull was appointed county surveyor. In addition to being an associate member of the Institution of Civil Engineers, he was a member of the Institution of Municipal and County Engineers, and a past-president of the County Surveyors' Society. For many years he was a well-known Freemason. He was a past-master of the Birkenhead Lodge, and for seventeen years had been a member of the Cestrian Lodge, being also a member of the Rose Croix Chapter and a Knight of the Temple. He leaves a widow and three young children. The funeral took place on Monday last.

"Asphaltmac."—This is now being used on an extensive scale, and from reports to hand it appears to be a material that will go far in the direction of solving the problem of an inexpensive pavement suitable for modern traffic conditions. Mr. Claude R. Berry, the managing director of the Premier Bitumen and Asphalt Company, Limited, has been intimately identified for many years with the manipulation of asphalts and bitumens for road surfaces, and it has been asserted that to him belongs the credit of the introduction of the first natural asphalt matrix.

THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS AND THE PROPOSED AFFILIATION OF CANADIAN ENGINEERS.

[On the principle that it is good occasionally to see ourselves as others see us, we quote the following comments from a letter forwarded to the *Contract Record* of Toronto by its London correspondent, who deals trenchantly with some considerations arising out of the formation of a Canadian Institution of Municipal Engineers and its suggested affiliation to the British Institution of Municipal and County Engineers, and with the admission of consulting engineers to such bodies.]

Very considerable interest attaches here, in England, to the formation of the Canadian Institution of Municipal Engineers. Opinions are divided as to the desirability of affiliation to one of the English societies, and even if affiliation were deemed the politic course a further difficulty would arise. The profession of municipal engineering is represented in England by two bodies—the Institution of Municipal and County Engineers, with a life of some forty years, and the Institution of Municipal Engineers, with a life of a little over five years. Six years ago the former body was lying moribund of sloth and inanition. Its rules, its methods of procedure, its administration were obsolete. It was controlled by quite a small section of its members, and no outsider could hope for admittance within the charmed circle unless he undertook to fight innovation and progress to the last ditch. The membership class was limited to those who held chief appointments, and there existed the anomaly that, while the deputy engineer of a city such as Manchester, Liverpool or Birmingham was ineligible for the class, the “chief” of the smallest district council—who might combine the offices of surveyor, sanitary inspector, petroleum inspector, rate collector and clerk, all for some £70 a year—was admitted without demerit.

The formation of the Institution of Municipal Engineers has changed all that, for the younger body is nothing if not progressive. It quickly realised the anomaly referred to, and it went further, for it recognised that gas, water and electrical engineers to municipal authorities were municipal engineers equally with the men who controlled simply the highways and bridges and sewerage and sewage works of the country. So, as fast as the younger body progressed, introduced new methods, abolished anachronisms and modified obsolete procedure, so fast did the older body follow in its footsteps, accepting all and giving nothing, but none the less setting its house in order, and taking on a new lease of life.

That is precisely how matters stand, the newer body constantly progressing, and the older body being as constantly forced by its members—by outside pressure, that is, for the circle still tenaciously cling to tradition—to adopt any and every measure. It has to be remembered, however—and the point is an important one—that the older body scores largely as regards prestige, while its roll contains the names of the greater proportion of the engineers to large cities and towns. Defections from its ranks have taken place among the smaller fry alone; but, again, it must be remembered that the small chief or the deputy of to-day will be the big man of to-morrow, and the next few years will see a considerable levelling upwards in this respect.

The Canadian institution will do well carefully to weigh matters up before affiliating with either one body or the other; indeed, it remains open to grave doubt whether affiliation would not be a most unwise proceeding. In any event, it would surely be wrong to take any such step until independent working had been tried. The English societies would necessarily be in friendly touch with the Canadian, and such little courtesies as exchange of “Proceedings” and the extension of facilities to visit works (when members contemplated crossing the pond) would not be wanting.

REGULATIONS OF THE PROPOSED INSTITUTION.

It is customary, in drawing up the rules and regulations which are to govern a new society, first to obtain copies of those of existing societies of a similar nature. These are then submitted to the process known as “boiling down,” the result of which has been exemplified by scores of instances. Experience has taught us that the happier the country the fewer its laws; hence the extreme anarchist (or no law) ideal. The really necessary by-laws for a professional society

could be written on one side of a sheet of foolscap paper, whereas there is scarcely a body in existence that is regulated by less than some twenty printed pages. Is it too much to hope that the Canadian institution will make its own regulations, and that it will, in their making, aim at brevity and clearness?

The question of whom to admit and whom to exclude is always a difficult one in the case of a professional society, and the solution is to be found only in the admittance of all. Thus, in a municipal engineering society, all who are municipal engineers (in any capacity) and all who are in training for such a calling—whether as premium pupils or not—should be admitted, regardless of age, colour or nationality. Such a society is only too often of the mutual admiration order, and a few top dogs rule the roost. Admit the rank and file, on equal terms if possible, and such a condition of things becomes impossible. The Institution of Municipal Engineers started with one class only—it has now three, and is proposing a fourth, and to that capitulation to the attacks of snobbery and dignity may be traced the slowness of its numerical progress during the past three years.

A third point of no little importance is the position of the consulting engineer as an applicant for membership. A consulting engineer is not a municipal engineer in any sense of the word, even though he may call himself a consulting municipal engineer or some such hybrid name. He is out for business as much as is a manufacturer or contractor, and if the members of the last-named classes are ineligible for election, there seems no reason why those of the other should be admitted. As a member of an institution composed of civil, mechanical or electrical engineers, the consultant has nothing much to gain. It is useless for him to canvass his fellows, for they are all out for work themselves. Turn him loose, however, among municipal engineers, and his course is clear. He will utilise his membership for business purposes, and such being the case it might be argued that he should be refused admittance. But then, he is a very useful man, of considerable experience, and free to speak his mind as he thinks fit, and so long as he keeps within decent bounds, there is no reason why, on the other hand, his application should not receive full consideration. Men styling themselves consulting municipal engineers should be sternly taboo, however, and the writer may be trusted to have good and valid reasons for such a strong pronouncement.

THE LATE MR. CHARLES JONES.

THE PROPOSED MEMORIAL: AN APPEAL.

A circular letter, bearing the signatures of the president, Mr. J. W. Cockrill, and the secretary, Mr. Thos. Cole, has been sent to members of the Institution of Municipal and County Engineers appealing for assistance in raising a fund to commemorate the association of the late Mr. Charles Jones with that body.

Mr. Jones, the circular recalls, was one of the original founders of the institution, and at all times gave the best of his characteristic energy and powers of organisation in furthering the interests of the institution. Beyond this, it adds, his genial disposition endeared him to all, few men being so universally esteemed, and he occupied a place in the friendship of many that it will be difficult to replace.

Road Surfaces in Northumberland.—At a Newcastle meeting called to discuss the dangerous condition of roads in Northumberland, one speaker said some roads in the district were like skating rinks, and horses ought to be shod with indiarubber.

Municipal Work at Lytham.—The chief work in Lytham during the ensuing year will be the completion of the West End sewer outfall works, the provision of an additional pump, and, probably, the installation of an improved screening and sludge removal apparatus at the East End sewage works. Improvements, Mr. A. J. Price, the engineer and surveyor, reports, are to be carried out on several of the principal roads, and a further extension of tar-macadam and tar-painting is contemplated. A number of new streets are scheduled to be put in statutory order, and several small sewerage schemes are to be carried out. The Local Government Board have been asked to sanction a loan of £24,000 for installing an electricity scheme, and this work, it is expected, will be, to a great extent, carried out this year.

Measuring and Quantity Surveying.*

By GEORGE CORDEROY, Member of Council of the Surveyors' Institution.

Measuring and quantity surveying is one of the branches of the surveyor's profession in which members of this institution practise.

What is the nature of the work comprised under this head? In our charter it is defined as the "Measuring and estimating artificers' work." I will venture, however, to amplify that definition by saying that it is concerned with—

- (a) The measuring, bringing to account, and valuation of all works of construction, whether of an architectural or engineering character, above or below the surface of the ground or water.
- (b) The ascertainment of the nature and quantities of the work required to be done in order to give physical embodiment to the designs and specifications prepared by an architect or an engineer, and the setting out of such character and quantities in a detailed, lucid, and orderly manner in a document entitled "A Bill of Quantities," thus enabling a precise estimate to be made of the cost of the execution of the work.

In the first half of the nineteenth century, when quantities were prepared for the purpose of obtaining tenders for proposed works the builder appointed a surveyor to represent him, and the architect, or engineer, Government department, or public body concerned appointed another to represent them, and the two sitting down together took off the quantities jointly, dividing the fees. This practice subsisted very largely until about thirty years ago, and in the early years of their practice many members of this institution have been thus nominated from time to time as their surveyor by the builders. Gradually the two surveyors gave up taking off together, and divided the work to be done between them, one taking off one portion, and one another, ceasing to collaborate.

The desuetude of the practice of collaboration—and, I suppose, the desire to reduce fees—and also the great extension of the system of letting contracts by competitive tendering, led to the

DIRECT EMPLOYMENT OF SURVEYORS

by architects, engineers, and public bodies to prepare bills of quantities for issue to competitors, making the payment of their fees part of the cost of carrying out the work. The surveyor so employed then adjusted any variations which had arisen on the contract, and in these days this has become practically universal in connection with private work. Some Government departments and public bodies, however, employ a surveyor to prepare bills of quantities, but not to make up the variation accounts. There is no doubt, in my opinion, that this is most undesirable and to the disadvantage of all parties to a contract. No one can be so well qualified to deal properly with the variations on a contract and to interpret truly the bill of quantities or schedule as the man who prepared it.

What is the present scope of a surveyor's employment in connection with measuring and quantity surveying?

The principal field is in connection with the letting of contracts for the purposes of works of construction—whether architectural or engineering—and the measuring and making up of accounts of work done. The determination of the method to be pursued in letting a contract depends upon varying considerations. This is a preliminary point upon which a surveyor's advice should be valuable and is usually asked.

One of the primary considerations is as to whether the lump-sum or schedule method is the better. If it be decided to let a contract as a lump-sum contract, it is a necessary postulate that the conditions of its execution are precisely known. The lump-sum method of contracting is especially applicable to all surface or above-ground work, such as buildings of an architectural character, or, in the case of engineering work, buildings required for the service of a dockyard, shipyard, railway, or important factory, where the conditions are known, and the design and methods of construction can be precisely determined beforehand.

Schedule contracts are measure and value contracts, and are of two classes:—

(1) For Specific Works.—It is possible to carry out any class of work under them, but they are particularly applicable to heavy engineering work and work below the surface, such as that involved in the construction of docks, harbours and breakwaters, foundations for factories, machinery, and important buildings where the nature of the site, the conditions under which the work will be carried out, and the method of construction to be employed cannot be precisely determined beforehand.

(2) For Contracts Let under Permanent Schedules of Prices.—These schedules are prepared mainly for the ordinary works of repairs and maintenance for large buildings or groups of buildings. This is a familiar method pursued by the Government in connection with barracks, hospitals, and other buildings. It has great advantages, and might be adopted with benefit to themselves by large property owners and corporations of all descriptions. The method of estimating is for contractors to state the percentage addition to or deduction from the rates in this permanent schedule at which they are prepared to undertake the work.

The work executed under this form of contract is measured and brought to account at stated periods by the surveyors of the employers or employing body.

It is usual to proceed by way of

COMPETITIVE TENDERING

in connection with all of these systems of contracting. Under all, however, it is likewise possible for an estimate to be agreed with an individual contractor without competition. If, however, this course is to be pursued, I am sure that, from the youngest to the oldest of my professional brethren, it will be agreed that the surveyor conducting the negotiations must be a man of large experience, sound judgment, and a person of recognised authority. It is possible to be able to prepare a very good bill of quantities or schedule for the purpose of competitive tendering and yet not to have had sufficient experience to agree a close and just estimate for the carrying out of an important work. After a very long experience of all the methods of obtaining estimates which I have outlined, I am of opinion that the fairest method to all parties is the competitive system, tenders being obtained upon the basis of particulars prepared by a surveyor of experience. Incidentally this system gives the best opportunity to young surveyors in their early practice, and also to young and enterprising contractors to establish themselves in business.

In my judgment the ideal arrangement with regard to any important work is the following:—

(1) That the architect or engineer should concern himself principally with the preparation of the design and the execution of the work, and the obtaining of the finished result within the period of time laid down in the contract.

(2) That the surveyor should either prepare quantities or a schedule, and all documents for the purpose of obtaining tenders, and, where the work is done on schedule, measure it as it proceeds, and when by lump-sum estimate deal with the valuation of all variations in design as they arise from time to time, and finally settle up the accounts under either system of contract.

(3) That the contractor should be left a free hand as to the method to be employed in carrying out the work, the architect or engineer only concerning himself with the quality and character of the finished work and seeing that it conforms to his design, and the surveyor with the valuation of the work ordered to be done by the architect or engineer.

Under an arrangement of this kind the employer has the great advantage of the combined energies of three separate orders of mind in producing the best-designed work, the best-constructed work, and the most economically executed work.

It must never be forgotten that

SURVEYORS' POWERS UNDER CONTRACTS

are strictly limited to making up an account of work done upon the basis of an agreed set of facts placed before them by the parties thereto. They have no control over the conduct of the work, and therefore

* From a paper read on Monday last at a meeting of the Surveyors' Institution.

the principal element affecting ultimate cost. Their position is very much that of an accountant's, with the important addition that under the terms of most contracts they usually value as well as bring to account the work executed.

The principal avenues of employment are—

- (1) Direct employment by an architect or engineer, as agent of the building owner.
- (2) Direct employment by a contractor or a solicitor.
- (3) Direct employment by public bodies.
- (4) Direct employment by the building owner.

When a surveyor is employed either by an architect, an engineer, a contractor, a lawyer, or a building owner, the nature of his work is generally understood. When, however, he is directly employed by public bodies, this is very often not the case. Members of committees and corporations appear unable to realise that the loss occasioned to the public by bad or inaccurate quantities and the

EMPLOYMENT OF INCOMPETENT SURVEYORS

to measure and make up accounts is most serious. Not understanding the professional position of the surveyor and the fiduciary character of his services, they have frequently resorted to the practice of inviting surveyors to tender for employment, with the result that irresponsible persons, with little training or knowledge or experience, quote fees which are an altogether inadequate remuneration for the work required to be done. Any system by which the financial return for professional work is reduced below the point at which it becomes remunerative to a properly trained and qualified man must inevitably in the long run lower the professional standard and prejudice the public, who, though they know it not, must necessarily depend to a great extent upon the ability and integrity of the surveyors they employ.

Even when the system of tendering is not resorted to, public bodies often assess the fees for work which they require done at altogether inadequate rates. I am glad to say, however, that it is becoming a practice (under the influence of the Royal Institute of British Architects) for public bodies to allow outside architects whom they employ, through means of competition or otherwise, for designing important public buildings, to nominate their own surveyor. I trust that this may do something to check the tendency to reduce the fees paid below reasonable limits.

To conclude, the surveyors practising in measuring and quantities have onerous duties to perform, and "demands are made upon their patience which would have taxed a Job to the utmost." It is pleasant to be able to add that with their brethren in general they are trusted all round for skilful, painstaking, intelligent, and honourable men of business. May it ever be so! The first and last requisite for the maintenance of these fine traditions is character. May we all, as members of this institution, guard it jealously!

Darwen Water Supply.—Mr. H. Howard Humphreys on Saturday closed the arbitration proceedings in London in which he is to determine the price to be paid to Bolton for 300,000 gallons per day. The Bolton Corporation claims 11-4d. as the result of adjustments agreed upon between the two corporations, and the evidence offered by Darwen is to the effect that the charge should be 6½d. per 1,000 gallons.

Horseshoe Competition.—Horseshoes from many nations are among the 800 received by the Roads Improvement Association in connection with their offer of a prize of £100 for a horseshoe which will best enable a horse to keep its footing securely on roadways without damage to the road itself. About 75 per cent have been made in the United Kingdom. The shoes selected by the judges next Tuesday will subsequently undergo practical tests.

Town Planning in the Doncaster District.—A conference of representatives of local authorities in the Doncaster district was held at Doncaster in Friday last to consider the question of town planning in connection with the extensive building operations in the district. The conference was called at the suggestion of the Local Government Board, who were represented by Mr. T. Adams. In the course of the discussion it was stated that the Rotherham Rural District Council had applied for a scheme of town planning for Thurgroft. The opinion was expressed that the Rotherham and Hensworth districts should be dealt with separately from the Doncaster district. The conference concluded on the understanding that another conference would be called in about three months to hear the reports of the delegates.

CORRESPONDENCE

*Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii. 2.

JOURNAL OR VOLUME?

To the Editor of THE SURVEYOR.

SIR, I see in your current issue (p. 127) a paragraph to the effect that the Journal Committee of the institute allege "that the principle of the journal was accepted at the last annual meeting, and that in issuing the proceedings in the form of a journal the council were acting under the instructions of the annual meeting."

The first half of this paragraph is quite correct—the principle was accepted, but it was only accepted because the meeting was informed that the council had already executed a contract with the printers for the monthly Journal, including the alteration of size. If the council had not executed this contract, it is almost certain that their action would not have been confirmed, and it is going somewhat too far to say that "the council are acting under the instructions of the annual meeting."

Many of us strongly deprecate the action of the council, and wish that the council had consulted the members before they entered into the contract. I enclose my card.—Yours, &c.,

ONE WHO WAS PRESENT.

January 26, 1914.

MR. BOULNOIS' "GLOSSARY OF ROAD TERMS."

To the Editor of THE SURVEYOR.

SIR,—I am greatly indebted to Dr. F. Judd Lewis for his courteous reply in your last issue to my appeal for some definitions of certain terms which I had attempted as a foundation for the glossary. They are precisely what I required, and I can assure Dr. Lewis that before publishing the glossary in book form I shall give his proposed definitions every consideration. I agree with him also that it is difficult to decide as to how far a glossary should include detailed information upon the words used in it. If a glossary is too much extended it becomes something in the nature of an encyclopædia, and such a work would necessarily be of great length, and involve an enormous amount of work.

My object in the preparation of the glossary was merely to give a fairly clear idea of what was intended to be conveyed by certain words that are used in highway nomenclature. Further than this I did not intend to go, as I believe it is the first effort that has ever been made even to group together the words commonly used in the construction, maintenance, and use of roads.—Yours, &c.,

H. PERCY BOULNOIS.

7 Victoria-street, S.W.

THE CORROSION OF IRON.

To the Editor of THE SURVEYOR.

SIR,—As I notice that the subject of corrosion of water mains, &c., has lately been occupying your columns, I am reminded that the difficulty of utilising chloride of lime for street watering purposes has recently been raised with us, owing to corrosion, &c., of the water tanks, and I am hoping that some of your readers will be kind enough to enlighten us as to the best means of minimising such evils.—Yours, &c.,

JAMES S. DUNN,

City Sanitary Inspector.

Town Hall,

Kimberley, South Africa.

December 19, 1913.

Garden Rollers and Seats.—Garden rollers of every description, and seats with cast-iron or wrought-iron supports, are illustrated in Catalogue No. 580 which Messrs. Summerscales, Limited, Keighley, have just issued.

Newent Town Hall.—Mr. H. W. Bruton and Mr. James Bruton, of Gloucester, have written to the Newent Parish Council stating that they have purchased the historic town hall of Newent, and they propose, with the approval of the council, to hand it over to the town to perpetuate the memory of their father, the late Mr. Henry Bruton, who was born at Newent in 1813.

SOME RECENT PUBLICATIONS.*

SEWAGE-DRAINAGE SYSTEMS. By Isaac Shone, Civil, Mining, and Sanitary Engineer, M.I.M.E., F.S.I. Price 25s. nett. London: E. & F. N. Spon, Limited.

This book, which is extremely well got up, is remarkable in two ways. In the first place it is the most elaborate description we have ever seen of the author's special systems of sewerage, sewage lifting by mechanical means, and sewer ventilation. Secondly, it is remarkable for the manner in which the author's views are set forth, consisting, as it does, of an open letter to the President of the Local Government Board, including an autobiography of the author, and numerous extracts from papers, discussions, and correspondence upon subjects of which Mr. Shone has made a speciality for a greater number of years than most people can remember. It is also noteworthy that the author should be capable of bringing out such a book at an age when most men would have retired from active life. At the same time we fear that, while there may be many who would gladly possess such a complete record of the views of the author, there will be few who will be prepared to pay the price demanded for it.

We have also received a handsomely bound smaller volume dealing with Mr. Shone's latest system of house drainage, including the apparatus which he has named the "Cuncta in unum," which was described in these pages on November 7th last.

BIBLIOGRAPHY OF ROADMAKING AND ROADS IN THE UNITED KINGDOM. By Dorothy Ballen. Price 15s. nett. London: P. S. King & Son.

This work forms the third volume of the series of bibliographies by students connected with the London School of Economics and Political Science. It was undertaken by the compiler at the suggestion of Prof. Sidney Webb, in view of the recent revival of interest in highway problems, and is merely a revised and considerably enlarged edition of the bibliography compiled by Mr. and Mrs. Webb in 1906. The first section consists of a list of bibliographies, and this is followed by a list of general works. The next part of the work is divided into sections topographically, each section being subdivided into history and description and administration. Complete lists of works dealing with the construction and repair of roads and streets are then given, and the final section is devoted to traffic on roads. The work is completed by comprehensive indexes of authors and subjects. As Sir George Gibb points out in his introduction, the proper attitude of mind towards a bibliography is one of simple gratitude, and in commending the result of Miss Ballen's arduous labours to our readers we can only say that if at any time they want to find the most complete information on any road topic, they cannot do better at the outset than consult this excellent work, and be thankful that its author has placed within their reach such a touchstone to all available authorities and references.

PRACTICAL SURVEYING. By Prof. Henry Adams. Price 4s. 6d. London: Macmillan & Co.

In adding to the already large number of textbooks on practical surveying, it might be thought that Prof. Adams was undertaking an unnecessary task. The scope of this new book, however, as revealed by the table of contents, shows that Prof. Adams' work has an individuality of its own, and that it ought quickly to achieve a wide popularity among students. While less ambitious than the large and expensive books, the author has treated in a clear and concise style not only the usual subjects which occur in the daily practice of the land surveyor, but also such matters as railway surveying, curve ranging, astronomical surveying, latitude and longitude. The book is divided into thirty-three chapters, the whole subject being logically arranged. It is well illustrated throughout, and, in addition to test questions at the close of each chapter, there are at the end of the volume 300 questions selected from papers set at the examinations of the Institution of Civil Engineers, the Institution of Municipal and County Engineers, the Surveyors' Institution, and many other bodies. We cordially recommend students of practical surveying to possess themselves of this book.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

A HANDBOOK OF HYGIENE. By A. M. Davies, M.R.C.S., &c. Fourth Edition by the Author and C. H. Melville, M.B., C.M. Price 10s. 6d. nett. London: Charles Griffin & Co., Limited.

This work may fairly be described as a compendium of preventive medicine, and although intended primarily for the medical man who may not have access to a large number of books—as, for example, when travelling abroad—it will be found very useful to medical officers of health, sanitary inspectors, and all who are interested in public health administration. The several chapters, each of which is divided into several sections, deal respectively with air and ventilation, water and water supply, food and dieting, the removal and disposal of sewage, clothing, habitations, personal hygiene, soils and sites, climate and meteorology, the causation and prevention of disease, and disinfection. Each of these subjects is dealt with systematically. For example, in the first chapter the properties and composition of air are first considered, then the impurities which may occur and their effects on health; the amount of fresh air required is next touched upon, followed by sections devoted to cubic space, and methods of supply of fresh air. Again, the chapter on water supply deals in order with the properties and composition of water, its impurities and their effects, and, in a separate section, with the subjects of collection, storage, distribution purification and examination. Of course, all these matters are treated only in their relation to hygiene; but enough has been said to show that as a handbook on this subject the work is comprehensive, lucid, and well arranged.

RECORDS OF THE SURVEY OF INDIA. Vol. III., 1911-1912.

Prepared under the direction of Colonel S. G. Burrard, C.S.I., R.E., Surveyor-General of India. Price Rs.4 (6s.).

In this volume the reports from the survey parties, briefly summarised in the General Report recently noticed in these columns, are given more fully, and a large amount of further information is given as regards survey operations generally. Under the head of "Triangulation" there is an interesting account of the Kashmir secondary operations, with extracts from the letters of the late Lieutenant H. G. Bell, R.E., who died during the course of the survey, the favourable progress of which was largely due to his energy. This party was in touch with the Russian survey party which was carrying on operations intended to effect a junction between the Russian survey in the Pamirs and the Indian triangulation. The report is embellished with some very good photogravures, some of which illustrate in a very effective manner the nature of the rugged mountain scenery in which the north-western operations were being carried on. The report contains many tables, giving the detailed results of observations, and notes on matters of practical detail as regards the manner in which the records are obtained and recorded. It is accompanied by about a dozen excellent maps.

THE "MECHANICAL WORLD" ELECTRICAL POCKET-BOOK FOR 1914. Price 6d. nett. Manchester: Emmott & Co., Limited.

In this pocket-book the electrician will find a mass of useful information in a well arranged and convenient form. The present issue is a considerable improvement on its predecessors in many particulars, some sections having been entirely rewritten, and several new features having been introduced. Among the latter may be mentioned new sections on Telephones, the Electrical Equipment of Ships, Lifting Magnets, Dry Batteries, Sparking Distances in Air, and Burglar Alarms. Reference is facilitated by a copious index, and a diary showing fourteen days at an opening is included. The book is excellent value at so modest a price.

WILLING'S PRESS GUIDE. Price 1s. London: James Willing, Limited.

The forty-first annual issue of Willing's Press Guide contains all the old features, but, as usual, it has been carefully revised. The complete alphabetical list of newspapers and periodicals, and the various other specially classified lists render the guide indispensable to all who have literary wares to dispose of, or who are in any way interested in the mighty engine of the Press. The present issue well maintains the reputation of its predecessors.

New Municipal Offices for Lewes.—The new municipal offices at Lewes, built from designs by Mr. R. H. Halls, were opened formally on Tuesday last.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

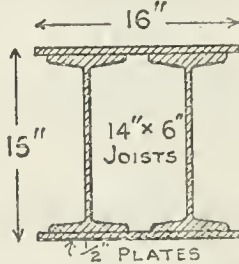
QUESTIONS.

This week answers are invited to the following questions:—

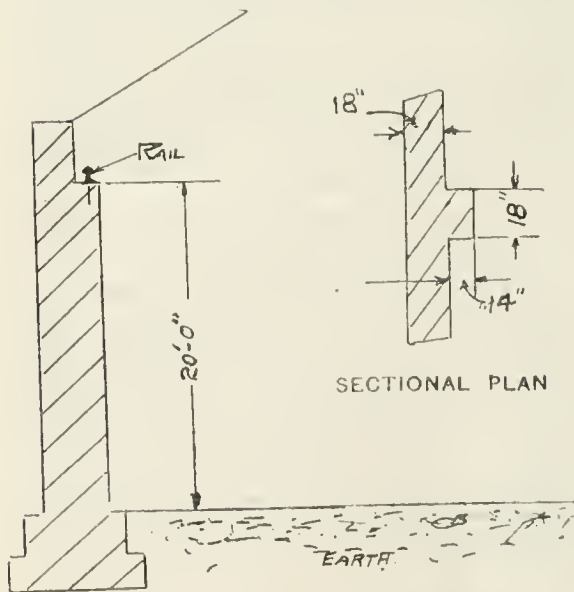
370. Temporary Building Design.—A temporary building is required, 50 ft. long, 30 ft. wide, and 10 ft. to eaves. Design a suitable structure, with steel trusses and stanchions, to be covered with corrugated iron on boards and felt, the bays to be filled in with 4-in. reinforced brickwork. (J. M. N., Hitchin.)

375. Working-class Dwellings.—Twenty working-class dwellings have been built at a cost of £3,500 for the buildings and £250 for the land. What must the rental be to ensure that the income will defray all loans, &c., charges? Give details as to how the allowances for empties, taxes, insurance, repairs, &c., are arrived at in the estimate. The money has been borrowed from the Public Works Loan Board at 3½ per cent for the usual periods. The poor and district rates are 6s. 8d. in the £ per annum. (Togun.)

376. Foundation for Stanchion.—A built-up steel stanchion, as shown in the diagram, transmits a load (including its own weight) of 250 tons. Design a suitable steel base and concrete and steel joist grillage foundation for the stanchion. The safe load on the earth may be taken as 2 tons per square foot. (I. W. S., Clapham Junction.)



377. Machine Shop.—An electric crane is to be fitted in a machine shop on existing piers, as shown in sketch. The piers are bonded into the wall, and about



VERTICAL SECTION THROUGH WALL AND PIER.

12 ft. centres. Assuming the foundations are good, and the work is in Staffordshire brick set in cement and sand, what is the safe load these piers will withstand? (H. W., Cradley Heath.)

378. Cost of Running Steam Engine.—Compare the cost of running a steam engine with that of an electric motor in the following circumstances: The horsepower required is 30; electricity costs 1d. per unit, coal (best steam) costs 18s. per ton delivered; the engine is required to drive a stone crusher working an average of eight hours per day for five days per week. (Crusher.)

REPLIES TO QUESTIONS.

372. Cemetery Lay-out.—A new cemetery is to be provided in an urban district having a population of 17,000, increasing at the rate of 800 per annum. Flat meadow land, in a suitable position, having frontage to a district road (sewered), can be obtained at £350 per acre; subsoil, 5 ft. ballast overlying stiff clay. State area of land which should be acquired; give an approximate estimate of the cost of laying out the same, including buildings; state also principles governing the lay-out, and describe in detail method of drainage, arrangement of plots, disposition of buildings, &c. (Togun.)

Since this town appears to be growing very rapidly, it will be advisable to obtain a large area of land which is to be laid out as a cemetery, but only a part of the ground need be laid out to begin with, and the remainder laid out as the occasion arises. A good proportion is to allow 1 acre of land to every 1,000 inhabitants, but in this case it will be better to be slightly in excess, and so, if the ground is available, a site of about 20 acres should be acquired. The cost per acre is stated to be £350; hence the cost of the land alone will be £7,000. This should be materially reduced by setting the site back some distance from the road, and having an entrance and a carriage drive up to the cemetery site. There will thus only be a small frontage to the road, and the land at the rear (not abutting on the road) should be obtained at a much cheaper rate. However, it has been assumed that the cost per acre is £350 in the following approximate estimate, and it is marked with an asterisk as indicating that it should be considerably reduced by adopting the above suggestion, for it will be noticed that it is this item which constitutes more than one half of the total cost of the cemetery.

APPROXIMATE ESTIMATE.

Cost of laying out cemetery	£1,500
Cost of fencing (an iron fencing of an unclimbable nature, and about 8 ft. high)	1,200
Cost of cemetery site	7,000
Cost of cemetery lodge	600
Cost of cemetery chapel	600
Cost of laying on water supply	100
Total	£11,000

The general principles to be borne in mind in laying out the cemetery are as follows: Certain portions of the land have to be consecrated and other portions not. The lodge should be built in such a style that it presents a pleasing elevation to the road, and it should be at the entrance to the cemetery by the entrance gates. It should be arranged that the chapel be placed at or near the centre of the cemetery. As indicated by the above estimate, it need only be of a small size, and it need not be of an elaborate character as regards internal fittings, but should be of an imposing character externally, in keeping with its general surroundings. A chapel to seat about 100 persons would be sufficient. In some cases two chapels are built—one for Nonconformists and the other for Church of England—but this practice is not general.

Care must be exercised in drawing up the regulations that no grave must be less than 5 ft. in depth for the following reason: Clay is impervious to water, while ballast is just the reverse; hence, if the graves were less than 5 ft. deep, it is quite conceivable that the surface water would become polluted with the foul matter that is generally associated with dead bodies, and the neighbouring watercourses would thus become polluted also, with very detrimental effects to cattle, &c. If, on the other hand, the graves are dug well below the clay line, it is impossible for the polluted water and decaying matter to soak away. A minimum depth of 7 ft. should be insisted upon. One point of primary importance is to arrange that all the graves face east and west, and not in any other direction.

As regards drainage, if the ground is very low it may become necessary to employ land drains, 3-in. diameter, laid open-jointed, and surrounded with 6 in. of washed beach. All the paths which are formed will have a minimum width of 6 ft., and should be drained by means of iron or stoneware gullies, 2 ft. deep, led into a sewer of 9-in. diameter, laid to a proper fall with proper cement joints, in the usual manner. If the separate system of drainage is in force, it may be convenient to drain all the surface water into the surface-water sewer; but if the combined system is in force, then it will, perhaps, be better to drain into any existing ditches or watercourses in the vicinity. The main carriage drive should be 30 ft. in width, the main paths and walks in the cemetery should be 18 ft. in width, and all subsidiary and other paths should have a minimum width of 6 ft. The paths should have a good fall to the channels, and their cross-section would conveniently consist of 3 in. of gravel on 6 in. of hardcore foundation.

All natural beauties—such as clumps of trees, isolated trees, hillocks and streams—should be fully taken advantage of, and attended to in order to give a bright and pleasing, but nevertheless a dignified, appearance to the cemetery. Paths and carriage drives need not necessarily be laid out in straight lines in all places; it will greatly add to the general appearance of the place if they are given graceful curves where possible. The edges and borders of the carriage drives and the boundary (about 8 ft. within the boundary fence) should be well planted with shrubs, flowers, &c., and a turf border of about 4 ft. in width, railed by a dwarf wire fence of about 18 in. in height, would further add to the general appearance of the cemetery. (T. W. P., *Bechill-on-Sea*.)

374. Magnetic North.—What is the difference in degrees between the magnetic and true north? (J. T. C., *Nottingham*.)

The angle between the direction of true north and the magnetic north at any place is called the declination or variation. To ascertain the value of this angle, the direction of geographical (or true) north is found by taking careful astronomical observations, and the direction of magnetic north is found by noting the position a magnet takes up when it is freely suspended, care being taken that no iron or steel is allowed near the magnet.

The declination is obviously not the same in all parts of the world, for it is well known that a freely suspended magnet will always have its N pole attracted towards the magnetic north pole, and its S pole attracted towards the magnetic south pole (N.B.—The north magnetic pole is really of south polarity, and *vice versa*), and consequently some places have westerly variation and some have easterly variation. There are two lines of no declination, termed agonic lines—that is, lines joining places which have the direction of true north and magnetic north coincident. The two lines pass from north to south, one being along the east coasts of North and South America, the other passing through Norway, the Black Sea, Southern India and Western Australia. There is also an agonic line in the form of an oval situated near to Siberia, and usually termed the Siberian Oval.

The continuous record of the values of the magnetic elements at any point show that these are undergoing a slight gradual change; such changes are termed secular. The earliest record of the declination at London was made in 1850, and was found to be 11° 20' E; from that date the easterly declination slowly diminished. The compass pointed true north in 1659, and then gradually moved to the west of true north. In 1823 the declination acquired a maximum value of 24° 30' W, and afterwards diminished. In 1908 the declination at Greenwich was 15° 53' 5" W, and is diminishing at an approximate rate of 5' per annum, and so the declination in London for 1914 may be taken at about 15° 23' 5" W.

In addition to the secular changes in the magnetic elements, there are also smaller changes extending over shorter periods. The annual change in declination at Greenwich amounts to 2' 25" with a maximum easterly and westerly value in August and February respectively. Periodic daily (or diurnal) changes in the elements are also observed; thus, the declination has a maximum value (easterly and westerly) at 8 a.m. and 1 p.m. respectively. In addition to these changes the declination varies in perfect unison with the eleven-year cycle of solar activity, the disturbance increasing and decreasing

with the increase and decrease of sun spots during this period. A similar sympathetic correspondence is found in the frequency of occurrence of polar lights or auroræ. (T. W. P., *Bechill-on-Sea*.)

The difference at the present time is approximately 14° 52'. It must be kept in mind, however, that the difference between the magnetic and true north is a variable item. At any particular place the direction of the compass needle undergoes a gradual change; the needle at one time pointing to the west of true north, and at another time to the east. This change of "declination" extends over centuries, during which period it passes from its maximum westward position to its maximum eastward position. We have no record of the variations previous to the year 1580. In that year the N. pole of the needle at London pointed nearly 11° east of the true north. The declination then gradually decreased, until in 1657 there was no declination. The N-seeking pole then began to move to the west, attaining its greatest westerly declination (24° 30') in 1816. At the present time (1901) the declination is slowly decreasing.

From the following table a more complete idea of the variations at London will be obtained:--

Year.	Declination.	Year.	Declination.
1580	11° 17' E.	1868	2° 33' W.
1634	1° 6' E.	1882	18° 22' W.
1657	0° 6'	1888	17° 40' W.
1705	9° 6' W.	1893	17° 11' W.
1760	19° 30' W.	1898	16° 39' W.
1816	24° 30' W.	1914	11° 52' W.
		(Approx.)	

The mean annual change of declination is nearly 7'. (From Poyser's "Magnetism"). (W. S., *Louth*.)

NOTES.

The following notes are submitted *apropos* of the answer to Question 371, which appeared in our issue of January 16, 1914:—

In your issue of this week I notice that the correspondent answering this question makes the following statement:—

"A little thought will quickly show that the diameter of the pipe has no effect whatever on the safe head."

Now, the total pressure of steam or water in any direction in a pipe is equal to the pressure on a plane perpendicular to that direction. Therefore if *d* is the inside diameter, *L* the length of the pipe, and *p* the unit pressure in lb. per square inch, the total pressure on the cylindrical walls is:—

$$P = pdL.$$

If *t* is the thickness of the pipe and *s* the working strength of the material, then the internal resistance of each half of the pipe is *tLs*, and as the total pressure must be equal to the total resistance, we have—

$$pdL = 2tLs, \text{ or } pd = 2ts,$$

From which the safe pressure of the pipe is—

$$p = \frac{2ts}{d} = fd$$

in which *F*=ultimate tensile strength of material, and *f*=factor of safety.

The head of water under which a pipe can be placed is found —

$$134 H = \frac{2tF}{fd}, \text{ H} = \frac{2tF}{434 fd} = 46 \frac{tF}{fd}$$

It will be readily seen by the above formulæ that it is impossible to get the same safe head for two pipes of equal thickness, but having different diameters. (H. V. A., *Clypton*.)

Proposed Three Towns Amalgamation.—At Plymouth a Local Government Board inquiry is now proceeding to consider the application by the Plymouth Corporation for an order to amalgamate the three towns of Plymouth, Devonport and Stonehouse, which together have a population of nearly 250,000. Devonport strongly opposes the scheme, while Stonehouse has consented to amalgamate if Devonport comes in.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

HIGHWAY DEDICATION: STRIP NOT MADE UP.—The House of Lords have affirmed the decision of the Court of Appeal in the case of *Tottenham Urban District Council v. Rowley* (noted in vol. xlii., p. 830). The facts were shortly as follows: The defendant was the owner of a building estate, and submitted to the council a plan for its development, showing (*inter alia*) a proposed new street (to be called Keston-road), 40 ft. wide, running east and west, and bounded on the north by the boundary fence of a public park belonging to the council. Houses were built on the south side of the road, and that half of the width of the road only was made up, the northern half being left in the rough. In 1908 the road was thrown open to the public, and had since been used both by foot passengers and vehicles without any objection by the defendant. In 1912 the council removed a portion of their fence in order to enable them to convey building materials into the park from Keston-road. The defendant then blocked up the opening, alleging that the road was a private road and had never been dedicated, or alternatively that the northern half had not been dedicated, or had been dedicated only as a footpath. The Court of Appeal held that the plan showed an intention to dedicate the whole road, which intention had been completed by user of the road by the public, and that the council were entitled to access thereto from their park. In the course of his judgment, moving the dismissal of the defendant's appeal from this decision, Lord Dunedin said that this road had all along been used by the public. Whether the defendant had dedicated it was to be judged by his acts, and not by what he said. The defendant's contention was that although the road had been thrown open it had only been made up in a way convenient for wheeled traffic as regards half its breadth, and that, therefore, where dedication was being inferred from user such dedication should not be held to extend to a greater breadth than the user had ordinarily extended to. His lordship thought that was really, in the circumstances, an impossible proposition. Persons would always, of course, use that part of the road which was in the best condition, and no doubt the actual traffic had gone along the made side of the road. But the rest of the road was open, and it was impossible to suppose that, if there was dedication, it was not a dedication of the whole. Lords Atkinson, Parker and Sumner concurred, and the appeal was dismissed with costs.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as nouns de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

HIGHWAY: ROAD SET OUT UNDER AWARD.—"W. S." writes: In an old township award a "road" or "lane" is set out for the purpose of giving access to the fell or moor, and any owner or occupier in the township may get stones on the moor for building or repairing drains within the township; also may cut and cart away bedding for the cattle. Some time ago part of the road was washed away by flood and is now impassable. The award further states that the lane is to be kept in repair in the same manner and by the same persons as repair the public highways in the said township. At that time each township repaired its own highways. The lane can be of no possible good to the general public, who would, indeed, be trespassers on the moor. Would the council be empowered to charge the cost of restoring such road (under sec. 7, Highways and Locomotives Act 1878) upon the township? Sec. 3, Highways and Bridges Act, 1891, would appear to assist the rural district council in doing this, but would the consent of the inhabitants of the parish be needed? The rural district council succeeded the Highway Board.

The rural district council, as successors to the Highway Board, could exercise the power given by sec. 7 of the Act

of 1878—i.e., they could divide their district (with the approval of the county council) into two or more "parts," and charge exclusively on each "part" the expense of repairing the highways in such part. Having done this I think the cost of repairing the awarded road would, under the terms of the award, be chargeable on the "part" in which it is situate. The Act of 1891 only applies where agreements are made between highway authorities as to the construction or improvement of a road.

HIGHWAY: REPAIR OF DITCH.—"Gem" writes: I should be obliged if you would give me your opinion on the following matter: In the area of the rural district council there is a road, and on one side of this is a drain or ditch, owned by the owner of the land on that side of the road. In several places the side of this drain adjacent to the road has slipped and let down the road. The owner of the drain says it is the heavy traffic on the road that causes these slips, and therefore it is the duty of the rural district council to repair them. Do you think this is so? In my opinion the cause of the slips is that the slope of the side of the drain is too steep for the nature of the soil, which is silt. I should be glad if you could quote me any decision bearing on this case.

The only duty of a landowner with respect to his ditches adjoining the highway appears to be to cleanse them to such an extent as to prevent nuisance or obstruction to passengers. I can find no authority to show that he is under any liability to repair his ditches (except so far as cleansing them may involve any repair). I think it is the duty of the highway authority to do what is necessary to reinstate the road.

HIGHWAY: ROAD MATERIAL.—"S. E. R." writes: A rural district council have completed an agreement with a landowner for getting road material from his enclosed land at a price per cube yard, and compensation paid to the occupier. The lord of the manor objects to the council taking the stone away into another township unless he is also paid a sum per yard. Can the lord of the manor enforce this? There does not appear to be any provision made for any payment to the lord of the manor under sec. 51 or 54, Highways Act, 1835, except compensation to the occupier or owner, and this has been agreed upon as above.

I presume this is a case in which the council have contracted with the landowner for the purchase of the materials under sec. 46 of the Highway Act, 1835, and assuming that the land is freehold, I do not see, from the information given in the query, on what ground the lord of the manor founds his claim. If, however, the land is copyhold of the manor, the question is whether the mines and minerals under the land belong to the lord or to the copyholder. In most manors mines and minerals belong to the lord, and if that is the case in this manor, of course the copyholder cannot dispose of them without the lord's consent.

BUILDING BY-LAWS: SWITCHBACK RAILWAY.—"Tapah" writes: Plans have been submitted to my council by a gravity switchback railway company for the proposed erection of a figure 8 railway, to be situated at a distance of 55 yds. from a dwelling-house and 8 yds. from the boundary of the property. My council have no special by-laws regarding the erection of such structures, and it is considered that this form of structure does not come under the building by-laws. Your opinion upon the following queries will be much esteemed: (1) Can the council impose conditions in considering or approving of plans for such structures more particularly (a) as to the distance of such structures from dwelling-houses, and whether there are any prescribed regulations relating thereto; (b) as to noise or nuisance arising therefrom; (c) as to whether the motor house should be fireproof? (2) Can the structure be treated as an exempted under the building by-laws?

(1) The first point is whether this is a new building within the meaning of the by-laws. It has been held that the word "building" in a by-law means some structure containing some feature contemplated by and dealt with in the by-laws, such as (for instance) walls and a roof (*Slaughter v. Sunderland Corporation*, 7 T.L.R., 296). The switchback railway itself presumably contains no feature contemplated by the by-laws, and if this is so I think it would probably be held not to be a "building." In that event the council cannot impose any conditions. The motor-house, on the other hand, probably is a "building," and if this is so it must comply with the by-laws. (2) No. I think not.

The Surveyor

And Municipal and County Engineer.

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LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Barrow T.C. (January 21st).—£75,000 for proposed new gasworks near Roose.—It was stated that the present gasworks were working at their maximum capacity, and could not be extended. The Barrow Board of Guardians opposed the application, on the ground that the site was less than 150 yds. from the workhouse and the infirmary. Dr. Orr, medical officer, stated that inmates would be injuriously affected from any fumes from the works. The gas manager said his opinion was that gas fumes were not injurious to public health.

Bournemouth T.C. (January 22nd. Mr. T. C. Ekin).—This was an inquiry into an application for powers to extend the borough boundary, and to rearrange the existing wards.—It is proposed to take in 1,465 acres with a rateable value of over £10,000, and a population of 782. Mr. F. W. Lacey, the borough engineer, said the proposed extension was very desirable. It was very necessary to begin town planning in the district, having regard to the developments that were likely to take place.

Brentwood U.D.C. and Billericay R.D.C. (January 9th. Major J. Stewart).—This was an application by the Brentwood Urban District Council for a loan of £532 for works of sewerage and sewage disposal; and by the Billericay Rural District Council to borrow £1,548 for works of sewerage and sewage disposal for the South Weald and Shenfield special drainage district, including the execution of works in the Brentwood Urban District.—The loans required are to meet excess expenditure on the sewerage scheme recently completed.

Bristol T.C. (January 27th. Mr. W. O. E. Meade-King).—£1,800 for the purchase of properties for the widening of Filton-road (Horfield), Kingsland-road (St. Philip's), Ashley-road, Old Market-street and East Tucker-street (Counterslip). The necessary details were submitted by the town clerk, Mr. W. H. Wise, with whom was in attendance the city engineer, Mr. L. S. McKenzie.

Dalkey (Co. Dublin) U.D.C. (January 19th. Mr. A. D. Price).—£2,041 for sewerage works and the construction of water mains.—Mr. S. R. Goings, engineer, stated it was the intention to have the work carried out by direct labour. There was no opposition.

Hollywood U.D.C. (January 14th. Mr. P. C. Cowan).—£4,000 for the purpose of providing an additional storage reservoir in connection with the district waterworks.—It was stated that the existing waterworks were constructed in 1883 at a cost of £6,600, the balance of the £10,000 loan being paid for compensation, and so forth. The present capacity of the reservoirs was 12,000,000 gallons, but since they were constructed 229 houses with modern sanitary conveniences had been built, and the consumption of water had increased by close on 100 per cent. Mr. James A. Hanna, surveyor, gave details of the proposed works.

Morpeth R.D.C. (January 16th. Mr. P. M. Crosthwaite).—£9,000 for a scheme of sewerage.—The scheme embraces a new system of drainage for the townships of Bullock's Hall, Chevington East, Chevington West, Hodstone, and Widdrington.

Rotherham R.D.C. (January 21st. Mr. Thomas Adams).—This was an inquiry into an application for a housing and town planning scheme covering an area which includes Brampton-en-le-Morthen and Loughton-en-le-Morthen.—The new Thurocroft Colliery Company proposes to lay out a building estate, plans for which have been adopted by the Rotherham Rural Council, and the latter, as the local authority, desire to prepare a town planning scheme co-extensive with the colliery estate.

Stafford T.C. (January 22nd).—This was an inquiry with respect to an application for the extension of the corporation's area for the supply of gas and water, for permission to supply gas in bulk, and for permission to raise loans during the next twenty years of £50,000 for the gas undertaking, and £10,000 for the water undertaking. The proposals of the corporation are to supply gas and water to the parish of Colwich, and water to the parish of Seighford, and to supply gas in bulk to the West Staffordshire Gas Company.

Sewage Disposal at Glasgow.—The Glasgow Corporation last week entrusted the order for travelling sewage distributors for the second instalment of their new filters at Dalmarnock to Messrs. Jones & Attwood, Limited, of Stourbridge. Each distributor will be capable of sprinkling up to 1,188,300 gallons per day.

Repair of Canal Bridges: Important Decision.—On Wednesday the Court of Appeal unanimously allowed the appeal of Worcester Corporation against the judgment of Mr. Justice Phillimore, who held that Sharpness new docks and the Gloucester and Birmingham Navigation Company were liable only to keep the bridges over their canal in the city of Worcester in order so as to be sufficient, having regard to their original construction in 1812, to bear such traffic as was then ordinary on the highway carried over the canal by the bridges. Lord Justice Vaughan Williams said, in his judgment, defendants were liable to support and repair bridges sufficiently to bear ordinary traffic of the district according to the standard of the present day. Lord Justice Kennedy said if the bridges had not been constructed as they were for the convenience of the canal company, the highways in places where bridges now were would have been repairable by the road authority according to the standard of requirements of traffic from time to time. He thought the Canal Act imposed on the canal company a duty equivalent to that which the public would have enjoyed if the Act had not been passed.

Wallasey T.C. (January 24th. Major J. Stewart).—£995 for the provision of public gardens between Breck-road and St. Hilary-drive, Wallasey; £5,860 for the erection of a central fire station in Manor-road, Liscard, and the purchase of No. 8 Anglesea-road, as a residence for the superintendent; £1,950 for the purchase of two new motor fire engines; and £8,725 for the widening and improvement of Claremount-road, Breck-road, and St. Hilary-brow, Wallasey, and Wallasey-road, Liscard. The necessary details were supplied by the corporation officers.

Winchcombe R.D.C. (January 22nd. Mr. A. W. Brightmore).—£17,100 for a water supply.—It was stated that the scheme would cost Great Washbourne £8 3s. per inhabitant; Southam £11 15s. per inhabitant. The rates all round, it was thought, would be raised to the extent of 1s. 3d. in the £.

APPLICATIONS FOR LOANS.

Abergavenny T.C.—£2,100 for the purchase of property for road widening.

Beckenham U.D.C.—£350 for road widening.

Brampton R.D.C.—£445 for sewerage works.

Gosforth U.D.C.—£375 for the Coxlodge-road improvement.

Hayes U.D.C.—£2,700 for the Yeading drainage scheme.

Kinsale R.D.C.—£730 for a water supply scheme.

Louth T.C.—£2,000 for the Ugate improvement scheme.

Mansfield T.C.—£1,200 for sewer extension.

Middlesbrough T.C.—£5,000 for the purchase of a recreation ground.

Nantyglo and Blaina U.D.C.—£24,600 for a housing scheme.

Paignton U.D.C.—£200 for a storm-water drainage scheme.

Portsmouth T.C.—£30,000 for the extension of the isolation hospital.

Southend T.C.—£1,000 for public conveniences, £420 for the purchase of land for road construction, and £1,350 for the electricity undertaking.

Wallsend T.C.—£3,250 for sewerage works.

Wantage R.D.C.—£1,600 for the purchase of land for a housing scheme.

LOANS SANCTIONED.

Carshalton U.D.C.—£500 for new stables.

Deptford B.C.—£600 in respect of the execution of granite paving works in White Post-lane, and £1,500 for laying concrete foundations for asphalt paving in High-street, the period of repayment being three years.

Eastleigh U.D.C.—£2,930 for private street works.

Grimsby T.C.—£315 for a public convenience.

Huddersfield T.C.—£30,000 for the electricity undertaking.

Knaresborough T.C.—£425 for a school recreation field.

Luton T.C.—£350 for the construction of a foul-water sewer.

Mansfield T.C.—£1,075 for the purchase of property for street improvement.

Newark T.C.—For the purchase of a school site at £650 an acre.

Norman Cross (Hunts) R.D.C.—£700 for the Longueville drainage scheme.

Poole T.C.—£256 for sewer extensions.

Shoreditch B.C.—£1,500 for paving works.

Woolwich B.C.—£1,098, repayable in thirty years, supplemental contribution towards the widening of Church-street and High-street.

FORTHCOMING INQUIRIES.

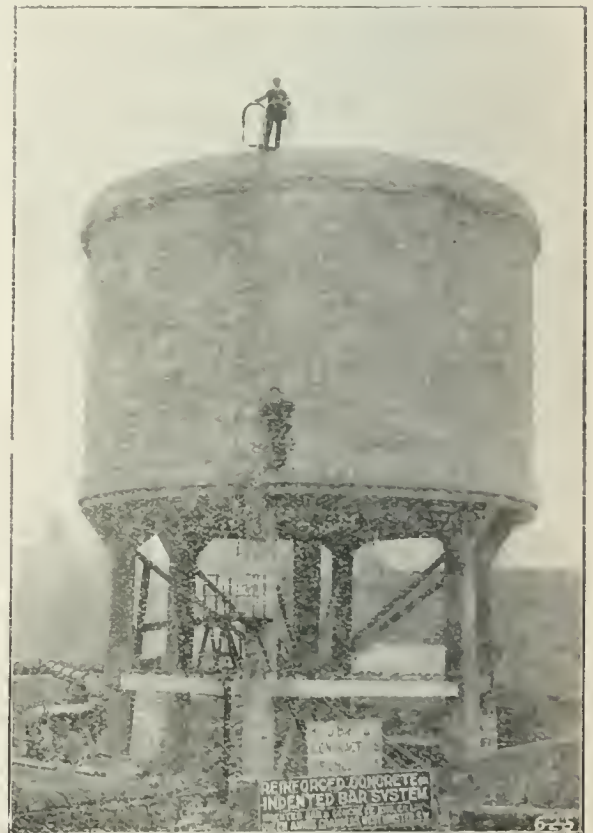
	£
2.— Exeter. For a housing scheme (Mr. Courtenay Clifton)	2,115
2.— Middlesbrough. For works of road improvement (Mr. R. H. Bicknell) ...	5,192
3.— Felling. For private street improvement (Mr. R. H. Bicknell)	1,000
3.— Frinton-on-Sea. For sea defence works (Mr. H. Shelford Bidwell)	—
3.— Great Ouseburn. For sewerage works (Mr. W. M. Cross)	4,500

3.— Newcastle-upon-Tyne. For the provision of a recreation ground and public convenience (Mr. R. H. Bicknell) ...	9,231
3.— Wallasey. For the purposes of gardens, fire station, and motor fire engines (Major J. Stewart)	17,530
4.— Walton-on-the-Naze. For the repair of a groyne (Mr. H. Shelford Bidwell) ...	500
5.— Brampton. For sewage disposal works (Mr. W. M. Cross)	1,240
5.— Dartford. For electricity works extension (Mr. H. R. Hooper)	11,000
5.— Penybont. For works of sewage disposal (Mr. A. G. Drury)	10,750
6.— Leyburn. For sewage disposal works (Mr. W. M. Cross)	300
6.— Northfleet. For the purchase of property (Mr. Edgar Dudley)	300

REINFORCED CONCRETE WATER TOWER, KEIGHLEY.

This water tower has just been completed at the electric power station of the Keighley Corporation, and has a capacity of 159,000 gallons.

The tower is 50 ft. 6 in. high, and the tank is 17 ft. 6 in. diameter and 23 ft. 6 in. deep. Owing to the poor quality of the ground, the foundation raft



KEIGHLEY WATER TOWER.

was designed to impose a load of only 16 cwt. per super. foot on it.

"It is interesting to note," says the *Indented Bar Bulletin* for January, "that this structure was the subject of a loan from the Local Government Board, who approved the plans and calculations, and granted the loan without question. This is rather a pleasing development, and seems to show that reinforced concrete will soon be treated in the same way as other materials of construction for which applications for loans are made to the Local Government Board."

The tank is open at the top, and a series of radiating beams have been provided to carry a water-cooling installation which will be erected to the designs of the engineer, Mr. Harry Webber, A.M.I.C.E.

The tower has been constructed by Messrs. Hird Brothers & Co., of Keighley, to the designs prepared by the Indented Bar and Concrete Engineering Company, Limited. Indented steel bars have been used as the reinforcement throughout the work.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Bethnal Green, Coventry, Dudley, Torquay £11,000; housing and town planning—Coventry £40,282; roads and materials—Croydon £38,000, Holland £9,686, Lewisham, Northamptonshire £41,625; sewerage and sewage disposal—Morpeh; water, gas and electricity—Cardiff, Mansfield.—Particulars of other projected works will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Bethnal Green B.C.—A report is being prepared upon the provision of public swimming baths.

Brownhills U.D.C.—It has been agreed to provide a disinfectant at an approximate cost of £200.

Burnley T.C.—The Education Committee have adopted a scheme for the provision of two new schools.

Coventry T.C.—It is proposed to effect extensions at the Little Heath school, at an estimated cost of £6,750.

Dudley T.C.—The Education Committee recommend the provision of a men's hostel, at an estimated cost of £8,560.

Finsbury B.C.—The question of constructing an underground convenience at the City end of St. John's-street has been referred to committee.

Greenwich B.C.—The Adoptive Acts Committee report that they have given instructions for certain necessary repairs to be carried out at the baths and washhouses, and they add that it is their intention to report fully at an early date on the whole question so as to give the council ample opportunity of considering the desirability of bringing the baths and washhouses more up to date.—The Public Health Committee are negotiating for a site for the erection of a permanent dispensary for the treatment of tuberculosis.

Huddersfield T.C.—A tuberculosis sanatorium is to be erected at Bradley Wood, and a hospital for children. It is also proposed to build a model lodging-house for women.

Radnorshire C.C.—A scheme has been agreed to for the widening and improvement of the bridge over the Wye at Builth, at a cost not exceeding £1,700, subject to a substantial grant being obtained from the Road Board.

Tamworth T.C.—The council have approved a recommendation of the Burial Board Committee to erect a chapel on a site at the cemetery, and that a design and estimate be prepared.

Torquay T.C.—The Education Committee on Tuesday agreed to a scheme for the provision of a new technical school to cost £11,000.

Windsor T.C.—A resolution has been passed adopting the Baths and Washhouses Acts.

HOUSING AND TOWN PLANNING.

Basingstoke T.C.—A scheme has been approved for the erection of fifty cottages, at an estimated cost of £1,743.

Brigg U.D.C.—A proposed housing scheme having been rejected on the ground that the site was unsuitable, and that the rent (4s. 9d. per house) would be insufficient to make the scheme self-supporting, the Local Government Board have written requesting the council not to allow the matter to remain in its present position. It was the duty of the council, the Board stated, to take effective action. Though a housing scheme should be self-supporting as far as possible, it was pointed out that a small deficiency would not necessarily deter sanction being given for a loan.

Coventry T.C.—Following the Local Government Board's refusal to consent to the clearance of a slum area until provision was made for the tenants, the council decided on Tuesday to erect 198 workmen's dwellings at a cost of £40,282, an average of £203 each. The council already own 184 houses.

Devizes R.D.C.—The council have adopted a scheme for building cottages at Poterne for the accommodation of the working classes. It is intended to erect

six cottages, each with three bedrooms, living room, scullery, and offices. The area allowed is $\frac{1}{2}$ acre for each two cottages.

Hayes U.D.C.—A scheme has been adopted for the erection of fifty workmen's houses at Botwell.

Hinckley U.D.C.—The surveyor, Mr. E. H. Crump, has received instructions to prepare plans of a further housing scheme.

Pwllheli T.C.—The council have resolved to invite the Welsh Housing Association to prepare and submit a scheme for twenty houses on land belonging to the corporation as a first instalment, such scheme to be for ten houses to be let at 5s. per week, and ten at 3s. 9d. per week, the National Welsh Housing Pioneers' Company to submit at the same time an estimate of cost at which they would be prepared to carry out the scheme.

Stirling T.C.—With a view to clearing the St. Mary's-wynd slum area the council have made offers to owners for the purchase of their properties.

PARKS AND OPEN SPACES.

Exeter T.C.—For laying out Northway House grounds the city surveyor, Mr. T. Moulding, has prepared the following estimates: Making paths and drainage, £550; walls, steps, and balustrading, £1,320; planting and turfing, £130; bandstand, £440; fountain, £220; seats and chairs, £176; entrances from Rougemont and the college grounds, £110; total, £2,946.—For laying out the Exeter Nursery estate an expenditure of £853 is recommended, including tennis court and bowling green, £156; conveniences, £200; pavilion, £90; shelter, £60; seats, £31.

Kingston (Surrey) T.C.—£120 is to be included in next year's estimates for the construction of two additional gravel lawn-tennis courts at the Canbury Gardens.

REFUSE COLLECTION AND DISPOSAL.

Scarborough T.C.—In order to prevent overlapping and waste in future in the cleansing department, it has been agreed to amalgamate the streets and buildings and the sanitary and lighting departments. It is hoped thereby that the team labour account will be considerably reduced by using the carts and horses belonging to the present sanitary department for the dual purpose of looking after the roads and sweeping them.

ROADS AND MATERIALS.

Aberdeen T.C.—A special committee has under consideration a series of schemes for the construction of a new access to the Links, and a scheme for a new access to the joint station. For the Links access three main schemes are proposed. The first one is estimated to cost £29,400, with alternative schemes costing £36,000, and £53,680. The second scheme is to cost £80,750, with two alternatives costing £70,000 and £63,660, while the third scheme, which has no alternative, would cost £26,100. A scheme for a new access to the joint railway station from Union-street at a nett cost of £72,000 is also being considered.

Croydon T.C.—Several schemes of road improvement are to be carried out at an estimated aggregate cost of £38,000.

Deptford B.C.—The council have agreed to make up St. Norbert-road, Avignon-road, and Arica-road, Brockley, as new streets.

Elgin C.C.—A report and estimate (£1,066) with respect to the widening of the main highway from Teit Hill Wood to Llanbry, and part of the road to the east of Shanbryd, are to be submitted to the Road Board with a request for a grant.

Exeter T.C.—The city surveyor, Mr. T. Moulding, has been instructed to submit a scheme for the widening of Topsham-road on the city side of Barnardo-road.

Greenwich B.C.—The council recently approved specifications for forming and paving Hervey-road (portion), Woodville-road (portion), and Eastbrook-road as "new streets," and it was then decided that the footways should be paved with approved patent

stone. The Highways Committee have since reported that they had inspected samples of flag paving, manufactured by the Bermondsey Borough Council, and the Guardians of Greenwich Union at Grove Park, and recommended that the accepted contractors for the paving works in the above district be required to obtain the necessary patent stone for the footways from the guardians of Greenwich Union. The council adopted this recommendation.

Holland (Lincs) C.C.—The Roads and Bridges Committee have submitted to the Road Board proposals for strengthening and widening main roads in the county at an estimated cost of £9,686.

Islington B.C.—With respect to a proposed loan of £5,744 for repaving works, the Finance Committee of the London County Council reported recently that the application was in respect of repaving with materials which were not of a more substantial character than the original wood paving for which loans were granted, and it did not appear to them that the proposals of the borough council (apart from the improvement of foundations) justified an exception being made to the council's rule not to sanction loans for repaving works. In the case, however, of the foundations, it appeared that the whole of the expenditure might be regarded largely as adding to the value of the foundations, and in the circumstances the committee recommended the council to sanction the borrowing of £1,696, repayable within three years, in respect of foundation works included in the two applications. The council agreed to the recommendation, and the sanction was therefore limited to an amount of £1,696.

Kingston (Surrey) T.C.—The guardians have purchased from the council 120 tons of granite at 10s. 6d. a ton.—Mr. R. H. Clucas, the surveyor, was on Tuesday authorised to obtain a tar-boiler at a cost of about £41, a slop van at £35, and, for trial purposes, a truck load of cement kerbing at about £10.—The offer of Messrs. G. J. Palmer & Sons, of 250 to 300 tons of charcoal at the rate of 35s. per ton dry weight, has been accepted.

Lewisham B.C.—Road improvement schemes amounting to £27,000 have been recommended by the Works Committee. It was explained that a loan could be obtained for the wood-paving works, and the annual charge for repayment of principal and interest would be about £4,080. As to the other works, costing £7,015, it was hoped the Road Board would make a grant, although so far they had expressed their inability.

Liverpool T.C.—Replying recently to a question by Mr. H. E. Davies as to the replacement of boulder-paved streets, Alderman Muirhead said that if the council would go in for a loan of £250,000, they would be able to do away with all the boulder paving very soon, but as that was out of the question, the committee were dealing with a proportion of these streets each year, taking the wards in rotation. Mr. Davies moved that the committee should be instructed to provide for a larger proportion of streets being converted from boulder paving to impervious paving. This work of conversion should be greatly accelerated. It was quite impossible to cleanse streets properly when they were boulder paved; and streets of this class were all in the poorer districts where there was the greatest need for cleanliness. There were some parts of Liverpool where 60 per cent of the streets had boulder paving, and at the present rate of progress it would be thirty years before they could all be put into anything like a sanitary condition. Everton, which was the heaviest-rated part of Liverpool, suffered particularly in this respect. Mr. Davies's proposition was carried.

Llandudno U.D.C.—A letter has been received from the Local Government Board giving authority to borrow the amount required for improving the promenade roadway at Craigydou, for taking out the dangerous double angle curve, and for laying out the promenade with grass as far as Maes-y-Mor.

Manchester T.C.—The Paving Committee have decided to pave St. Ann's-street from Cross-street to Deansgate with granited rock asphalt in place of the present wood blocks.

Northamptonshire C.C.—A scheme has been approved for completing the resurfacing of certain main roads with single pitch-grouted materials, and widening the carriageways to a minimum width of 20 ft. The work is estimated to cost £41,625, of which £23,625 is maintenance and £18,000 improve-

ment. Towards this the Road Board will make a grant of £13,500, and lend £15,000 free of interest, repayable by five annual instalments.

Paignton U.D.C.—The surveyor, Mr. C. O. Baines, estimates the cost of the road widenings at Collaton, including land, at £2,216.

Penzance T.C.—It is proposed to carry out improvements at Newlyn Green, at an estimated cost of £1,500.

Plymouth T.C.—The Special Works Committee recommend the adoption of road improvement schemes at an estimated cost of £2,800.

St. Ives T.C.—The widening of Stennack-road is to be carried out at an estimated cost of £1,265.

Sedgley U.D.C.—Estimates have been adopted for the construction of roads on the Sedgley estate.

Twickenham U.D.C.—The Finance Committee have reported the receipt of a letter from the Road Board, enclosing a draft statement of the proposed grant of £500 from the Road Improvement Fund to be made by the board to the council towards the cost of resurfacing Cross Deep and Waldegrave-road. The draft grant referred to was a proportion of the following improvement: Paving with a wearing surface of Trinidad Lake asphalt on a sub-crust of bituminous concrete, from King-street to parish boundary, 13,281 sq. yds. at 10481d. per square yard, £5,800; less estimated cost of resurfacing without improvement at 1973d. per square yard, £1,092; net estimated cost of improvement, £4,708; grant by the Road Board, £500.

Westminster B.C.—It has been decided to serve notices to treat upon the property owners for the widening of Wardour-street, and that the city engineer, Mr. J. W. Bradley, carry out the necessary paving work at a cost of £225. The inclusive cost of the scheme is £9,240, towards which the London County Council will make a contribution.

SEWERAGE AND SEWAGE DISPOSAL.

Blean R.D.C.—Sewerage extensions are to be carried out at a cost of £580.

Crediton U.D.C.—Mr. Jasper (engineer) has submitted estimates of the new sewage disposal works at £8,450, and the scheme has been forwarded to the Local Government Board.

Durham T.C.—The tender of Messrs. G. Bailey, Limited, Newcastle-on-Tyne, at £1,680, has been accepted for a new screening chamber and apparatus at the Barker's Haugh sewage works.

Guiseley U.D.C.—The scheme of Messrs. Paterson & Nicholson, Bradford, for the improvement of the effluent from the sewage works has been adopted, and Mr. I. N. Nicholson has received instructions to prepare the necessary plans and estimates for submission to the Local Government Board.

Holywell (Flintshire) U.D.C.—The council have agreed to ask the Local Government Board for a further loan of £240 in respect of the sewage disposal scheme, this sum having been inadvertently omitted from the original estimates. At the same time they passed a resolution thanking the clerk, Mr. I. K. Roberts, and the surveyor, Mr. R. A. Thomas, for the able manner in which they placed the case for the scheme before the Local Government Board inspector at the recent inquiry.

Morpeth R.D.C.—Amended plans for the sewage disposal scheme, estimated to cost £9,000, have been forwarded to the Local Government Board.

Portknockie T.C.—The council are considering the extension of the sewerage system at the west end of the town.

WATER, GAS, AND ELECTRICITY.

Cardiff T.C.—Some months ago a Local Government Board inquiry was held into an application of the corporation to borrow various sums of money required for the purchase of lands in connection with the extension of the waterworks undertaking. The necessary sanction has been granted for all the items with the exception of about £18,000 involved in the purchase of 50 acres of land in the Beacons.

Fulham B.C.—The council have accepted the tender of the British Thomson-Houston Company, at £7,646, for supplying and fixing a 3,000kw. turbo-alternator and Worthington condenser.

Greenock T.C.—An application has been made to the Water Committee, on behalf of the Lower Ward

of Renfrewshire County Council, for an augmented water supply for Wemyss Bay. It is suggested that a new pipe should be laid from the upper end of the pipe at Kelly Cut, to be connected with the outlet pipe at Kelly Dam, which would increase the pressure and prevent the present break in the tank. The Water Committee have agreed to give the suggestions favourable consideration.

Hertford R.D.C.—The council have adopted a scheme for a water supply for the districts of Datchworth and Tewin.

Huddersfield T.C.—The council have agreed upon a filtration scheme at Blackmoorfoot reservoir.

Leicester T.C.—The council are recommended by the Gas Committee to construct mains for high-pressure gas, at an estimated cost of £24,000.

Leyburn R.D.C.—The scheme for the Middleham water supply is to be carried out at an estimated cost of £250.

Linlithgowshire G.C.—The question of obtaining a greater reserve of water supplies for the eastern division of the county, including Queensferry, is engaging the attention of the council.

Mansfield T.C.—It was stated at a council meeting recently that the Gas Committee required £6,000 for new mains, and £2,000 for meters, and the Water Committee £1,180 for waterworks purposes at the Chesterfield-road pumping station.

Pickering R.D.C.—The engineer, Mr. C. E. Parker, has received instructions to report upon the cost of a water supply scheme for Thornton Dale.

Shrewsbury T.C.—The Local Government Board have refused to grant the council a Provisional Order in respect of the water undertaking of the borough. The objection of the board arose out of their disapproval of the dual water supply in the borough—two separate systems which they had previously notified as being, in their opinion, unsatisfactory. It was hoped, however, the board would sanction the council financing the conduit supply out of the profits of the Severn supply, and the building up of a reserve fund.

MISCELLANEOUS.

Margate T.C.—The corporation are considering proposals for the construction of two lifts connecting the eastern promenades with the sands.

Newton Abbot U.D.C.—The council have instructed the Lighting Committee to consider the question of providing a motor fire engine or motor lorry for the fire brigade.

PERSONAL.

Mr. W. Crozier has resigned his position as county architect of Durham after twenty-five years' service.

Mr. J. E. Smith, chief drainage inspector, Rochdale, has been elected a member of the Royal Sanitary Institute.

Mr. C. Kenneth Robertson, of Luton, has been appointed assistant surveyor to the East Barnet Urban District Council.

Mr. G. P. Pearson, surveyor and inspector to the Leake Rural District Council, has been appointed borough surveyor of Marlborough.

Mr. N. Spence, surveyor and inspector to the Harts-horne and Seals Rural District Council, has had his salary increased from £150 to £179 per annum.

Mr. William Jones, surveyor to the Rhondda Urban District Council, who died in October last, left estate of the gross value of £515, of which £131 is net personalty.

Mr. R. W. Smith Saville, borough surveyor of Darwen, has been taken ill at a London hotel. He is one of the principal witnesses in an arbitration case at the Surveyors' Institution between the corporations of Bolton and Darwen, to determine the price to be paid by Darwen to Bolton for a supply of 300,000 gallons of water daily.

Mr. A. T. Hobbs, ASSOC.M.INST.C.E., who has for eighteen months been an assistant in the department of Mr. R. H. Jeffes, surveyor to the Maldens and Coombe Urban District Council, is, it was announced at the last meeting of the council, resigning in order to take up an appointment under the Birmingham

City Council, and a committee was authorised to take what steps they thought advisable to fill the vacancy.

Mr. Reginald Brown, of Westminster and Southall, has been elected a member of the Institution of Mechanical Engineers. Mr. Brown is a member of the Institution of Civil Engineers and of the Institution of Municipal and County Engineers, a fellow of the Surveyors' Institution, a member of the Royal Sanitary Institute, and a hon. member of the Association of Managers of Sewage Disposal Works.

Mr. Henry Mattinson, ASSOC.M.INST.C.E., permanent way engineer to the Manchester tramways, has been appointed chief civil engineer to that department, under an agreement for four years, at a salary of £500, rising to £600 per annum. Mr. Mattinson recently made a tour of the principal cities of the Continent, United States and Canada, to study the methods of dealing with local passenger transportation in those countries, the congestion of traffic in Manchester calling for urgent attention.

Mr. H. Talbot-Crosbie, the town engineer of Yorkton, Saskatchewan, was born at Ardfert Abbey, Ireland, and educated at the Alban Academy, Glasgow. His father is Mr. L. B. Talbot-Crosbie, late of the Royal Navy and at present Deputy-Lieutenant of County Kerry, Ireland. Mr. Talbot-Crosbie served his apprenticeship from 1894 to 1899 with Messrs. Johnstone & Rankine, civil engineers, of Glasgow, and during that time he attended classes at the Glasgow University and Technical College. Upon the completion of his pupilage he became associated with the firm of Kyle, Dennison & Frew, Glasgow, proceeding to South Africa in 1900, but returning the following year to take charge of construction on the Invergarry and Fort Augustus Railway, Inverness-shire. In 1902 he went to Canada, and soon joined Messrs. Mackenzie & Mann, by whom he was sent to Nova Scotia on railway construction work. After marrying, and for a time taking up farming, he, in 1911, accepted the position of town engineer of Yorkton, where at present the works under his charge include a new water supply from York Lake, 4 miles distant. Mr. Talbot-Crosbie (concludes the *Contract Record*, to which we are indebted for these particulars) is an associate-member of the Canadian Society of Civil Engineers.

Mr. William Ramsay, the city engineer of Fernie, British Columbia, entered the engineering department of the Dundee Corporation in 1895, and was articled to Mr. G. Baxter, M.INST.C.E., the waterworks engineer. While serving his articles he took an engineering course at Dundee University College and obtained several diplomas. Eventually he was made assistant waterworks engineer in charge of all survey work. During the eleven years he was in Dundee he was responsible for all the details of many improvements, including better fire protection, covered concrete culverts in place of open aqueducts, sand filters, and clear-water reservoirs. The last work upon which Mr. Ramsay was engaged in Dundee involved an expenditure of £75,000. At the time he was identified with Messrs. D. Y. Stewart & Company, of Glasgow, by whom he was appointed resident engineer on rather an exceptional piece of work—namely, the lifting of $4\frac{1}{2}$ miles of 27-in. cast-iron trunk main and replacing it with the same size of main, but with different joints. This main portion, working under a pressure of 480 ft., or 208 lb. to the square inch, caused constant trouble from bursting at joints which were leaded and driven. To obviate this the joints on the new main were simply roped, leaded and caulked. The old main was broken by means of a pear-shaped weight of 1,700 lb., dropped from a height of 12 ft., and the old metal was shipped back to the pipe foundries and recast. Upon the completion of the work tests were made, and not a single leaking joint was discovered, although in places the ground was so treacherous that the pipes had to be laid on piles driven 8 ft. into the ground. Mr. Ramsay went to Canada some two years ago, and was appointed city engineer of Fernie in June, 1912, in succession to Mr. Robert Potter, now of Battleford, Saskatchewan. We are indebted for these details to the *Contract Record*, of Toronto.

With respect to the announcement of the resignation of Mr. F. Hopkinson, surveyor and inspector to the Blyth and Cuckney Rural District Council, it should be explained that, owing to the increase of his private practice, he has resigned the positions of sanitary surveyor and sanitary inspector, but continues to hold the office of highway surveyor.

ROAD WORK IN TONBRIDGE RURAL DISTRICT.

SURVEYOR'S REPORT.

Road tarring in the rural district of Tonbridge, Kent, cost during the year ended March 31st last, states the engineer and surveyor, Mr. Frank Harris, £1,038 for 195,561 super. yds., an average of 1½d. per super. yard. This is about £100 under the expenditure of the previous year, and 1d. less per super. yard. Although a very large outlay, Mr. Harris is convinced that the expenditure is justified from a maintenance point of view alone. Without it, he points out, the surface of the roads would be destroyed by the motor traffic. The immediate result is saving in manual labour.



NEW RESERVOIR, ELGIN.

scavenging and clearing, and the prevention of scouring of the roads after heavy storms, while the system must necessarily result in less material for repairs being required owing to the prolonged life of the road surface.

During the year about 2½ miles of highways were surfaced with tarred Kent ragstone. This proved very satisfactory on the very heaviest trafficked roads. Mr. Harris states that he used a carpet of tarred granite of 1-in. grade, supplied by the Tarred Granites Company, this being laid on a 3-in. sub-crust of tarred ragstone. The road is giving splendid results under motor-bus traffic, and he proposes to extend the system in the future. Mr. Harris has also laid the tar-carpeting 1-in. thick on old tarred rag surfaces. The results of this have been good, but he finds that, owing to the old surface being impervious, care must be taken to carry out the carpeting in dry weather, otherwise the water has difficulty in drying out. In all cases he recommends the final sealing by tar-painting.

Mr. Harris' experience leads him to believe that for country roads with traffic of any consideration an impervious and permanent sub-crust constructed of tarred macadam or pitch grout is essential. With a subsoil so constructed he finds attrition reduced to a minimum, if not altogether absent. The top or wearing surface requires renewing from time to time, and this can be done by the use of grouted chippings, tarred granite carpeting, or the use of large grade granite chippings after tar dressing. For ordinary trafficked district roads, the use of a good hard stone tar-painted is for the present all-sufficient.

"I find," adds the surveyor, "that with a somewhat liberal use of Tarvia—say 4½ to 5½ super. yds. to the gallon and spreading a coat of ¼-in. to ⅜-in. grade granite chippings, the chippings to be as cubical as possible, practically a tarred granite dressing is made in situ, a steam roller, if available, being run over the surface, or the traffic allowed to compress it. With a road of any degree of traffic, it is surprising how soon the chippings are consolidated with the tar. The system adds a wearing crust to the surface, and at the same time corrects all depressions and holes, an impervious and to all intents a tarred macadam surface being eventually built up."

Carshalton's Proposed New Park.—The General Purposes Committee of the Surrey County Council recommend the council to make a grant of £1,000 towards the purchase of 7 acres of Carshalton Park as an open space.

ELGIN'S FERRO-CONCRETE RESERVOIR.

The accompanying view shows a new reservoir which will supply the higher parts of the burgh of Elgin, N. B., with water.

The reservoir is constructed entirely of reinforced concrete, and has a capacity of 220,000 gallons. It is 90 ft. long, 45 ft. wide, and 10 ft. high to the surface of the water. The foundations are sunk 5 ft. into the ground, and a flat roof has been provided in 4-in. slabs, supported on two rows of columns and lateral beams.

The engineer was Mr. C. C. Dong, of Elgin, and the contractor was Mr. James Lawrence, of Craigellachie.

The designs were carried out on the system of the

Indented Bar and Concrete Engineering Company, Limited—from whose "Bulletin" for January we extract these details—and indented bars were used as reinforcement throughout.

Town Planning in Renfrewshire.—At a recent meeting of the First or Upper District Committee of the county of Renfrew, it was agreed that the local authority should make an application to the Local Government Board for authority to prepare a town planning scheme, with reference to the area which is in course of development, or appears likely to be used for building purposes, within the portion of the Renfrew parish and county on the north of the river Clyde.

Ilkeston Gas Supply.—As the result of the disaster at Ilkeston gasworks two years ago, it has been necessary to remove and re-erect the Loder damaged by the explosion. No fewer than 280 new plates have been used in the work, the storage capacity being 500,000 ft. A great change has been effected by the substitution of a brick and puddle tank below ground in place of the steel tank (which collapsed at the disaster) above ground. The cost of the work will be approximately £5,000.

Cornwall County Council and Motor Vehicles.—The Finance Committee of Cornwall County Council on Tuesday adopted the following resolution: "That representations be made to the Prime Minister and the President of the Local Government Board, asking for powers to levy and retain a tax on motor lorries and other mechanically propelled vehicles, the proceeds to be expended on the maintenance of local roads, and that a copy of this resolution be sent to the County Councils Association with a request for their co-operation."

The Surveyors' Institution.—The council have decided to fall in with representations which they have received from mining surveyors in different parts of Great Britain in favour of an additional sub-division of the institution examinations being established to meet the requirements of that branch of the profession. They have reason to believe that by thus enabling mining surveyors to possess the qualification attaching to membership of a professional society, obtained after a searching examination test, they will meet a want which has long been felt. The drawing up of the syllabus has been referred to the Education Committee of the institution, and in addressing themselves to their work they will endeavour to set up an examination which will be accepted by the Home Secretary as satisfying the requirements of secs. 20 and 21 of the Coal Mines Act, 1911.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COEKRILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

MANCHESTER MEETING.

A meeting of the institution will be held in the North-Western District at the Town Hall, Manchester, on Friday and Saturday, February 20th and 21st.

PROGRAMME.

Friday, February 20, 1914.

- 12.30 p.m.—Meeting of District Executive Committee.
- 1 p.m.—Members of District Executive and members of council attending the meeting will lunch with the Lord Mayor and the chairman of the Improvement Committee and of the Town Planning Committee.
- 2.15 p.m.—The members will assemble in the Manchester Town Hall, where they will be received by the Lord Mayor (Alderman McCabe) and Alderman Frowde (chairman of the Rivers Committee).
- 2.30 p.m.—North-Western District meeting in the Town Hall, Manchester.
Minutes of the previous meeting.
Any other district business.
- 3 p.m.—Description of some of the municipal works of the city of Manchester (illustrated by lantern slides) by Mr. T. de Courey Meade, M.INST.C.E., city surveyor of Manchester.
Drawings and photographs will be exhibited in the Lord Mayor's Parlour showing the works described and intended to be inspected.
A short paper on "The Future Government of Great Cities" (illustrated by lantern slides), by Councillor Joseph Swarbrick, M.INST.C.E.
- 6.30 p.m.—Dinner will be provided in the town hall at the invitation of the Lord Mayor and the Rivers Committee.

Saturday, February 21, 1914.

- 9 a.m.—Meet at Town Hall. Special tramcars (provided by the Tramways Committee) will leave Albert-square at 9.15 a.m. to convey members to any or all of the following works they may desire to inspect—viz.:—
Tramway ear repairing works and permanent way depot, Hyde-road.
Intercepting sewers at Withington and Didsbury.
Outfall sewers in Stretford and Davy-hulme.
Stuart-street subway and Coal Railway.
Lakes in Platt Fields and Heaton Park.
- 1 p.m.—Luncheon, at the invitation of the Tramways and Improvement Committees, at the Grand Hotel, where members will be received by the respective chairmen: Alderman Bowes, J.P. (chairman of the Tramways Committee), and Alderman Wilson, J.P. (chairman of the Improvement Committee).

A. W. BRADLEY, M.INST.C.E.,
Hon. District Secretary

St. Helens, Lanes.

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District will be held at Wakefield on Saturday, March 21, 1914.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

THE ANNUAL MEETING.

The date for the annual meeting of the Institution of Municipal and County Engineers at Cheltenham has been fixed definitely for June 24th, 25th, 26th and 27th next. It has been decided to make a special feature of town planning and of roads, and, if possible, to arrange for an exhibition of town plans.

THOMAS COLE,
Secretary.

92 Victoria-street, S.W.

Yarmouth Bridge Scheme Vetoed.—By 4,327 votes to 2,342, Yarmouth ratepayers on Tuesday decided against the promotion of a Parliamentary Bill to build a new Haven Bridge at a cost of £113,000. The scheme was approved by the town council. Half the electorate voted.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

EASTERN DISTRICT.

A meeting of the Eastern District of the institution will be held at Oundle on Saturday, February 21st.

PROGRAMME.

- 2.10 p.m.—Assemble at Oundle Railway Station and proceed to inspect the widening of the North Bridge (adjoining the station), under the direction of Mr. J. H. Dyson, clerk of works to the Northants County Council, who will give a brief description of the works.
- 3 p.m.—Visit of inspection to the schools of the Grocers' Company, by kind permission of the head master, Mr. F. W. Anderson, M.A.; also the new science and engineering block in course of erection by Messrs. Thompson & Sons, of Peterborough.
Time permitting, visits will also be paid to the Oundle Urban District Council's sewage disposal works, waterworks, cemetery, &c., under the direction of Mr. G. Belson Chilvers, surveyor and water engineer to the council.
- 4.45 p.m.—Meeting at the council offices.
Election of chairman and hon. district secretary.
Forthcoming meetings.
Paper, "The Municipal Undertakings of the Oundle Urban District Council," by Mr. G. Belson Chilvers.
- 5.30 p.m.—Tea at the Talbot Hotel.

P. S. BENNETT,
Hon. District Secretary.

Ramsey, Hunts.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District of the Institution of Municipal Engineers will be held at Manchester to-morrow (Saturday).

Portland's New Waterworks.—Erected at a cost of £15,000, making a total of £60,000 spent on water, the new works at Upwey, which supply Portland with water, were formally opened on Wednesday by the chairman of the Portland Urban District Council.

Paris Housing Scheme.—In the course of the next eighteen months cheap and hygienic dwellings are to be erected in Paris for 60,000 persons who are at present living in insanitary houses. The municipality has borrowed £800,000, and has already purchased 36 acres of building land for £433,222, an average cost of 5s. 6d. per square foot. At a cost of £2,600,000 it will be possible to build 11,000 lodgings, each capable of accommodating at least five persons. These dwellings will, it is hoped, be ready for occupation in June, 1915.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

CLERK.—January 31st.—Surveyor's department, Gellygaer Urban District Council. £80—£100.—Mr. F. T. James, clerk, Hengoed.

INSPECTOR OF NUISANCES.—February 1st.—Faversham Rural District Council. £145 per annum.—Mr. Guy Tassell, clerk.

WATERWORKS INSPECTOR. — February 2nd.—Corporation of Scarborough. 34s. per week.—Mr. W. Millhouse, water engineer, Town Hall.

SANITARY INSPECTOR.—February 2nd.—South-wark Borough Council. £150—£180 per annum.—Mr. P. H. Gray, town clerk.

INSPECTOR OF NUISANCES.—February 2nd.—Blyth and Cuckney Rural District Council. £130 per annum.—Mr. J. S. Whall, clerk.

INSPECTOR OF NUISANCES.—February 4th.—St. Columb Major Rural District Council.—Mr. C. E. Whitford, clerk.

ASSISTANT SANITARY INSPECTOR.—February 4th.—Southend Town Council. £100—£150.—Dr. C. G. Pugh, medical officer of health.

ROAD AND GENERAL FOREMAN.—February 5th. Corporation of Gravesend. 45s. per week.—Mr. H. H. Brown, town clerk.

CLERK OF WORKS.—February 7th.—Sussex County Council. £3 per week.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

INSPECTOR OF NUISANCES.—February 7th.—Hull and Goole Port Sanitary Authority. £150—£200 per annum.—Mr. J. Davie, clerk.

ASSISTANT SANITARY ENGINEERS.—February 7th.—Government of India. 800, 1,000, 500—700 and 460—620 rupees a month.—Secretary, Revenue Department, India Office, London, S.W.

BRIDGE AND MAIN ROAD SURVEYOR.—February 9th.—Devon County Council. £400 a year, with £200 a year for expenses.—Mr. F. Bailey, clerk, The Castle, Exeter.

GAS ENGINEER AND MANAGER.—February 9th. Swinton and Mexborough Gas Board. £200 per annum.—Mr. J. W. Hattersley, clerk, Mexborough, nr. Rotherham.

SURVEYOR'S ASSISTANT.—February 9th.—Corporation of Luton. £80 per annum.—Borough Surveyor, Town Hall, Luton.

SURVEYOR'S GENERAL ASSISTANT.—February 10th.—The Maldens and Coombe Urban District Council. £100—£150 per annum.—Mr. J. W. Johnson, clerk, New Malden, Surrey.

COUNTY SURVEYOR.—February 10th.—Queen's County Council. £350 per annum.—Mr. J. Carey, secretary, Maryboro'.

QUANTITY SURVEYORS.—February 11th.—Metropolitan Water Board.—Chief Engineer, Savoy-street, Strand, W.C.

HIGHWAY SURVEYOR.—February 12th.—Witney Rural District Council. £140 per annum, with £35 for a motor bicycle.—Mr. H. T. Ravenor, clerk.

SURVEYOR'S CLERK.—February 12th.—Corporation of St. Alban. £70 per annum.—Mr. E. P. Debenham, town clerk.

BOROUGH SURVEYOR'S CHIEF ASSISTANT.—February 12th.—Corporation of Stockport. £200—£260.—Mr. John Atkinson, borough surveyor.

ASSISTANT BOROUGH SURVEYOR.—February 13th.—Corporation of Guildford. £120—£150.—Mr. A. D. Jenkins, town clerk.

BOROUGH SURVEYOR AND INSPECTOR.—February 16th.—Dunstable Town Council. £225 per annum.—Mr. C. C. S. Benning, town clerk.

SUPERINTENDENT OF FIRE BRIGADE.—February 23th.—Municipality of Karachi. 200 rupees per month, with free quarters.—Mr. Measham Lea, chief officer and chief engineer.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

ASSISTANT ENGINEERS AND DRAUGHTSMEN.—Public Works Department of Sierra Leone. Engineers, £300—£400; draughtsmen, £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

OFFICE ASSISTANT AND PROVINCIAL ENGINEER.—Public Works Department of the Gold Coast Government. Office assistant, £500, with duty allowance of £100; provincial engineer, £400—£500, with duty allowance of £80.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

TEMPORARY ASSISTANT.—Erith Urban District Council.—Mr. H. Hind, surveyor.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

FARNBOROUGH.—February 11th.—Designs for three types of artisans' dwellings, for the urban district council. Premium, 20 guineas.—Mr. J. E. Hargreaves, surveyor.

IIENDON.—March 2nd.—Designs for public baths, for the urban district council. Premiums £100, £75, and £50.—The Clerk.

TWRCELYN.—March 9th.—Plans and specifications for a water supply and drainage scheme for Cemaes.—Mr. T. H. Hughes, clerk, Fir-grove, Menai Bridge.

BELFAST.—March 20th.—Designs for an art gallery and museum, for the corporation.—Mr. R. Meyer, town clerk.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

YORK.—February 2nd.—For piling and laying out the west bank of the river Ouse, between Lendal Bridge and Scarborough Bridge, for the corporation.—Mr. F. W. Spurr, city engineer.

NORTON (Malton).—February 2nd.—For the supply and laying of cast-iron mains and hydrants, for the rural district council.—Mr. G. S. Cattle, clerk.

WARRINGTON.—February 2nd.—For the erection of boiler-house, chimney, and alterations at the baths, for the corporation.—Borough Surveyor.

SOUTHEND.—February 2nd.—For the erection of a pavilion at the sanatorium, for the corporation.—Mr. E. J. Elford, borough engineer and surveyor.

WEST HAM.—February 2nd—16th.—For the erection of a school, for the Education Committee.—Mr. W. Jacques, architect, 2 Fen-court, Fenchurch-street, E.C.

WATH-UPON-DEARNE.—February 2nd.—For the construction of reservoirs, sand filters, and regulating chambers, for the urban district council.—Mr. J. H. Drew, engineer.

MERTHYR TYDFIL.—February 2nd.—For the erection of buildings for manual instruction and domestic subjects, for the corporation.—Borough Architect.

TODMORDEN.—February 3rd.—For the erection of a bandstand, three shelters, and bowling-green pavilion, for the corporation.—Borough Engineer.

LONDON.—February 3rd.—For the supply of building materials and tools, for the Prison Commissioners.—Prison Commission, Home Office, Whitehall, London, S.W.

SWANSEA.—February 3rd.—For the erection of an electric power sub-station, for the corporation.—Mr. E. Morgan, borough architect.

BRADFORD.—February 4th.—For the erection of superintendent's house, waterworks depot, for the corporation.—City Architect.

WILTS.—February 4th—25th.—For extensions to the asylum, for the county council.—Messrs. G. T. Hine and H. C. Pegg, architects, 35 Parliament-street, Westminster, S.W.

SCUNTHORPE.—February 4th.—For the sinking of a pump well, 12 ft. clear internal diameter by about 60 ft. deep, driving adits and sinking boreholes, for the urban district council.—Mr. C. Curtis Gray, engineer and surveyor.

HESTON AND ISLEWORTH.—February 4th.—For the erection of schools and caretaker's cottage, for the Education Committee.—Mr. J. G. Carey, architect and surveyor, Council House, Hounslow.

HOVE.—February 4th.—For additions to police station and the construction of underground lavatories, for the corporation.—Mr. H. H. Scott, borough surveyor.

BECKENHAM.—February 5th—18th.—For the erection of a school, for the urban district council.—Messrs. A. Boxall & Son, 8 Adam-street, Adelphi, W.C.

ST. THOMAS.—February 5th.—For the erection of six houses, for the rural district council.—Mr. E. E. Ellis, architect, Polsloe-road, Exeter.

RHONDDA.—February 6th.—For constructional works at the gasworks, for the urban district council.—Mr. O. Thomas, engineer and manager of gasworks.

SWAFFHAM.—February 6th.—For the erection of three pairs of cottages, for the rural district council.—Mr. S. Matthews, clerk.

EAST WESTMORLAND.—February 6th.—For excavating for, providing and laying cast-iron pipes for water supply, and constructing reservoir, for the rural district council.—Mr. Alfred Knewstubb, engineer, St. Andrew's Chambers, Penrith.

PONTYPRIDD.—February 9th.—For reservoir construction, for the Joint Water Board.—Mr. W. P. Nicholas, clerk, 49 Mill-street, Pontypridd.

HENDON.—February 9th.—For the erection of fifty dwellings, for the urban district council.—Mr. G. Hornblower, 2 Devonshire-terrace, Portland-place, London, W.

ATHERSTONE.—February 9th.—For the construction of a service reservoir in reinforced concrete, for the rural district council.—Mr. R. Fielders, clerk.

SWINDON.—February 9th.—For constructional work at electricity works, for the corporation.—Mr. A. Dimmack, borough electrical engineer.

NEWTON ABBOT.—February 10th.—For extensions to hospital, for the Hospital Committee.—Mr. J. C. Beare, architect, Newton Abbot.

SPALDING.—February 10th.—For the erection of cottages, for the rural district council.—Mr. W. H. A. Davis, architect and surveyor, 6 Double-street, Spalding.

STOKE NEWINGTON.—February 11th.—For the erection of public wash-houses, for the borough council.—Town Clerk.

CAMBRIDGE.—February 11th.—For the erection of wards and pavilion at hospital, for the corporation.—Borough Surveyor.

YSTRADGYNLAIS.—February 11th.—For the erection of eighteen houses, for the rural district council.—Mr. J. C. Rees, architect, Parade Chambers, Neath.

DEVON.—February 11th.—For rebuilding two bridges in reinforced concrete, for the county council.—Mr. F. Bailey, clerk, The Castle, Exeter.

NORMANTON.—February 12th.—For the erection of seventy-six houses, for the urban district council.—Mr. A. Hartley, architect and surveyor.

BEACONSFIELD.—February 14th.—For the erection of thirty-four cottages, for the urban district council.—Mr. H. Sargeant, surveyor.

MILFORD (Ireland).—February 14th.—For the erection of forty-two labourers' cottages, for the rural district council.—Mr. S. Watters, clerk.

MONMOUTH.—February 14th.—For the erection of new schools, for the county council.—Mr. J. Bain, County Council Offices, Newport.

LOWESTOFT.—February 16th.—For extensions to sanatorium, for the corporation.—Mr. G. H. Hauby, borough surveyor.

WARMINSTER.—February 20th.—For the erection of an isolation hospital, for the Joint Isolation Hospital Committee.—Mr. C. H. Lawson, architect, 32 High-street, Warminster.

WEST RIDING.—February 20th.—For the erection of a school, for the county council.—Education Architect, County Hall, Wakefield.

LANCASHIRE.—February 21st.—For the erection of a tuberculosis sanatorium at High Carley, for the county council.—Mr. Dean J. Brundritt, architect, County-square, Ulverston.

FEATHERSTONE.—February 28th.—For the erection of 149 working-class dwellings, for the urban district council.—Mr. S. Chesney, architect.

Iron and Steel.

EGREMONT.—February 2nd.—For the supply of unclimbable iron fencing, for the urban district council.—The Surveyor.

SHEFFIELD.—February 3rd.—For structural steel-work at power-house, for the Electric Supply Committee.—Mr. S. E. Fedden, general manager and engineer, Commercial-street.

URMSTON AND FLIXTON.—February 4th.—For supplying and fixing an oil engine, or alternatively a gas engine and pump, for the pumping alternatively of sludge and supernatant water at the outfall works, for the Drainage Joint Committee.—Mr. J. P. Wilkinson, engineer, 301 Cathedral-street, Manchester.

SOUTHEND.—February 6th.—For the supply of steel tramway rails, for the corporation.—Mr. E. J. Elford, borough engineer.

WARSAW.—February 16th.—For the supply of two vertical compound engines, with plunger, piston, or differential pumps, or of two turbines, with centrifugal or turbo pumps, for the Municipality.—Sir William H. Lindley, 29 Blittersdorpherplatz, Frankfurt-on-Maine.

WALLASEY.—February 19th.—For the supply of 20 tons of rails, creosoted sleepers, and the construction of short railway siding, for the corporation.—Mr. J. H. Crowther, engineer.

Roads.

BROMLEY (Kent).—February 2nd.—For the execution of sewerage, levelling, paving, metalling, channelling and making good portion of a road, for the rural district council.—The Surveyor, Maulden House, Sidecup-hill, Sidecup.

BLYTH AND CUCKNEY.—February 2nd.—For road widening, for the rural district council.—Mr. F. Hopkinson, surveyor, Worksop.

EAST GRINSTEAD.—February 2nd.—For the supply of 400 cub. yds. of fine compo sand, flint grit, or other material for the surface-tarring of roads, for the rural district council.—Mr. Francis S. White, clerk.

YORK.—February 2nd.—For the supply of Portland cement, pitch and creosote oil, stoneware pipes, building and sewage lime, Yorkshire stone flags, kerbing and edging, broken and rough whinstone, broken and rough slag and limestone chippings, for the corporation.—Mr. F. W. Spurr, city engineer.

DROXFORD.—February 2nd.—For the hire of steam rollers and scarifiers, for the rural district council.—Mr. A. V. Carter, surveyor, Droxford, Hants.

HENDON.—February 2nd.—For making up certain roads, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

POOLE.—February 2nd.—For the supply of granite, for the corporation.—Mr. S. J. Newman, borough surveyor.

PORT GLASGOW.—February 2nd.—For paving, tar-macadam and other work, for the corporation.—Mr. A. Paton, town clerk.

WORKSOP.—February 2nd.—For the supply of slag, for the urban district council.—Mr. G. Featherstone, clerk.

SUTTON-IN-ASHFIELD.—February 2nd.—For the supply of tar-macadam and broken slag, for the urban district council.—Mr. W. Burn, surveyor.

LEWISHAM.—February 3rd.—For making up Grove Park-road, for the borough council.—Borough Surveyor.

CHINGFORD.—February 3rd.—For the supply of granite, stone ballast, hoggins, and boiler clinker, and steam roller and scarifier, for the urban district council.—Mr. L. C. Bowen, clerk.

MIDDLESBROUGH.—February 3rd.—For the supply of whinstone and tarred slag, for the rural district council.—Mr. W. H. Dixon, district surveyor, Kirkby-in-Cleveland, near Stokesley, Yorks.

WEALDSTONE.—February 3rd.—For making up certain roads, for the urban district council.—Mr. H. Walker, surveyor.

NORTHAMPTON.—February 3rd.—For the supply of granite, slag and gravel, for the rural district council.—The Surveyor.

BARNESLEY.—February 4th.—For making up a street, for the corporation.—Mr. J. H. Taylor, borough surveyor.

ROTHERHAM.—February 4th.—For the supply of granite, slag, and team labour, for the rural district council.—Mr. R. Bradbury, district surveyor.

MIDDLESEX.—February 4th.—For the supply of about 12,000 tons of 2-in. and 1½-in. hand-broken basalt for road construction, and 2,000 tons of ½-in. chippings, for the county council.—Mr. H. T. Wakelam, Middlesex Guildhall, Westminster, S.W.

HERTFORDSHIRE.—February 5th.—For the supply of broken granite, slag and tar-macadam required for the main roads during the year ending March 31, 1915, for the county council.—Mr. Urban A. Smith, county surveyor, Hatfield.

OLDHAM.—February 5th.—For making up certain streets, for the corporation.—Borough Surveyor.

ELY.—February 5th.—For the supply of broken materials, for the county council.—Mr. H. F. Simpson, county surveyor, Wisbech, and Mr. R. S. W. Perkins, county surveyor, Ely.

LINTHWAITE.—February 5th.—For work of street construction, for the urban district council.—Mr. D. J. Bailey, clerk.

CUDWORTH.—February 5th.—For the supply of a 10-ton road roller fitted with an approved scarifier, for the urban district council.—Mr. W. E. Raley, clerk, Regent-street, Barnsley.

WORCESTER.—February 5th.—For the construction of roads, drains and entrance gates at the Fort Royal recreation ground, for the corporation.—Mr. Thomas Caink, city engineer.

SUTTON (Surrey).—February 5th.—For tar-spraying various roads, for the urban district council.—Mr. H. Hedley Grieves, surveyor.

STOKESLEY.—February 5th.—For the supply of whinstone, limestone, and tarred slag and whinstone, for the rural district council.—Mr. W. H. Dixon, Kirkby-in-Cleveland, near Stokesley, Yorks.

NEWTON ABBOT.—February 6th.—For the supply of macadam, carting and horse hire, for the urban district council.—Mr. C. D. White, surveyor.

SPALDING.—February 6th.—For the supply of granite, slag and gravel, for the rural district council.—Mr. H. S. Maples, clerk.

STOCKPORT.—February 6th.—For the supply of materials and manual and team labour, for the corporation.—Mr. J. Atkinson, borough surveyor.

OXENDEN.—February 6th.—For the supply of road materials, for the rural district council.—Mr. W. J. Smith, surveyor, Rothwell House, Market Harborough.

PAIGNTON.—February 6th.—For work of road widening, for the urban district council.—The Surveyor.

CRICK.—February 7th.—For the supply of granite, for the rural district council.—Mr. J. W. Pendred, clerk.

HORNCASTLE.—February 7th.—For the supply of granite and slag, for the rural district council.—Mr. J. E. Chatterton, clerk.

PENGE.—February 7th.—For the supply of granite macadam, cement and lime, Kentish flints, gravel, shingle, tarred paving and tarred macadam, for the urban district council.—The surveyor, Town Hall, Anerley, S.E.

GLAMORGAN.—February 7th.—For the supply of material and haulage for the county council.—Mr. G. A. Phillips, county surveyor, County Hall, Cardiff.

WELLINGBOROUGH.—February 7th.—For the supply of granite, for the rural district council.—The Clerk.

HAVANT.—February 7th.—For the supply of road materials, for the rural district council.—Mr. W. L. Hibberd, surveyor.

NORTHAMPTONSHIRE.—February 9th.—For the haulage of granite by motor wagons, for the county council.—Mr. C. S. Morris, county surveyor, Northampton.

NORTHAMPTONSHIRE.—February 9th.—For the supply of broken granite, for the county council.—Mr. C. S. Morris, county surveyor, Northampton.

HENDON.—February 9th.—For the supply of artificial stone, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

SOUTHAM.—February 9th.—For the supply of granite, for the rural district council.—Mr. H. Pickering, surveyor.

NEWARK.—February 9th.—For the supply of 850 tons of granite, 1,900 tons of slag, and 250 tons of tar-macadam, for the rural district council.—Mr. R. Oakden junr., 27 Winchelsea-avenue, Newark.

BEVERLEY.—February 9th.—For the supply of about 3,000 to 4,000 tons of stone for macadamising, for the rural district council.—Mr. E. Pickett, surveyor.

BIRKENHEAD.—February 9th.—For the supply of granite, Rawtenstall kerbs and channels, Penmaen-mawr breaking stone, natural flags, paving setts, and creosoted red deal paving blocks, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor.

SOUTHAMPTON.—February 9th.—For the supply of a 10-ton steam road roller fitted with Morrison's scarifier, for the corporation.—Mr. R. R. Linthorne, town clerk.

CHEADLE.—February 10th.—For private street improvement works, for the urban district council.—Mr. H. Sykes, council offices.

MALDEN AND COOMBE.—February 10th.—For work of making up and paving, for the urban district council.—Mr. R. H. Jeffes, engineer and surveyor, New Malden.

LONG SUTTON.—February 10th.—For the supply of road materials, for the urban district council.—Mr. S. S. Mossop, clerk.

LITTLEBOROUGH.—February 10th.—For the supply of 3,700 tons of 4-in. and 5-in. granite setts, for the urban district council.—The Surveyor.

HAYDOCK.—February 11th.—For making up certain streets, for the urban district council.—Mr. J. Dickinson, clerk.

HEMSWORTH.—February 11th.—For making up a certain street, for the rural district council.—Mr. T. H. Richardson, surveyor.

WARWICKSHIRE.—February 11th.—For the haulage of main road material and general team labour, for the county council.—Mr. John Wilnot, county surveyor, 6 Waterloo-street, Birmingham.

BRADFORD.—February 11th.—For the supply of materials and cartage, for the corporation.—Mr. W. H. S. Dawson, city engineer and surveyor.

BARNET.—February 11th.—For repaving, rekerbing and channelling in Wood-street, for the urban district council.—Mr. W. F. Wilkins, surveyor.

CHELMSFORD.—February 12th.—For the supply of tar-macadam, for the corporation.—Mr. G. Melvin, town clerk.

HAM.—February 13th.—For the supply of 150 yds. of broken brown Kent flints, for the urban district council.—Mr. R. W. Hindhaugh, surveyor.

KEYNSHAM.—February 13th.—For the supply of granite or basalt, for the rural district council.—Mr. T. Johnson, surveyor.

MALDSTONE.—February 14th.—For the supply of road material and team labour, for the rural district council.—Mr. T. A. Busbridge, surveyor.

SURBITON.—February 16th.—For the supply of road materials, for the urban district council.—The Surveyor.

EASINGTON.—February 16th.—For making up certain streets, for the rural district council.—Mr. G. Waterhouse, surveyor.

WATFORD.—February 17th.—For making up certain roads, for the urban district council.—Mr. D. Waterhouse, engineer and surveyor.

LEWISHAM.—February 17th.—For making up a certain road, for the borough council.—Borough Surveyor.

EAST SUFFOLK.—February 17th.—For steam rolling main roads, for the county council.—Mr. W. Jervis, county road surveyor, Ipswich.

EGREMONT.—February 17th.—For the supply of material and laying kerbs, channels and flagging, for the urban district council.—Mr. James Cowan, surveyor.

THORNE.—February 17th.—For the supply of dress, screenings, granite and tar, for the rural district council.—Mr. G. Kenyon, clerk, Thorne, via Doncaster.

CHEESHIRE.—February 21st.—For the supply of macadam, tar-macadam and chippings, for the county council.—Mr. W. Holland, deputy county surveyor, Chester.

HEREFORDSHIRE.—February 21st.—For the supply of tar-macadam, 2½-in. granite, 2½-in. slag, and 3-in. and 9-in. rough material for foundations, consisting of basalt, limestone, slag, or other suitable materials, for the county council.—Mr. G. H. Jack, county surveyor, Shire Hall, Hereford.

FINCHEY.—February 23rd.—For the supply of grit for tar-painting, for the urban district council.—Mr. C. J. Jenkin, engineer.

FINCHEY.—February 23rd.—For the supply of 55,900 gallons of tar for road surface treatment, for the urban district council.—Mr. E. H. Lister, clerk.

EPSOM.—February 23rd.—For making up Rosebery-road, Cheam, for the rural district council.—Mr. T. E. Ware, surveyor of highways.

MERIONETH.—February 23rd.—For road rolling and macadamising, for the county council.—Mr. E. Vaughan, county surveyor, Arthog, Dolgelly.

SEATON DELAVAL.—February 24th.—For the supply of tar-macadam, tarred slag, whinstone, and hire of steam roller, for the urban district council.—Mr. A. Dorin, surveyor.

OTLEY.—February 27th.—For the supply of granite macadam, furnace slag dust, kerbs and flags, limestone macadam, tar-macadam, brushes, pitch, and carting road metal, for the urban district council.—Mr. C. F. Hodgson, surveyor.

Sanitary.

UPPER STOUR VALLEY.—January 31st.—For the construction of cast-iron pipe sewer, with manholes, for the Upper Stour Valley Main Drainage Board.—Mr. W. Fiddian, engineer, Stourbridge.

MELTON MOWBRAY.—February 1st.—For the construction of 90 yds. of stoneware pipe sewer, for the rural district council.—Mr. G. E. Fryer, surveyor and inspector.

MALDENS AND COOMBE.—February 2nd.—For additions to the sewage disposal works, comprising raising walls of existing sedimentation tanks, constructing detritus tanks, No. 5 percolating filters, high and low level humus tanks, ejector chamber, ejectors, carriers, sludge pipes, forming sludge beds, and preparing storm-water filtration area, for the urban district council.—Mr. R. H. Jeffes, engineer and surveyor.

LONDON.—February 2nd.—For the execution of works for three years in the reparation, maintenance, and reconstruction of sewers and drains, for the corporation of the city.—Bell, Guildhall, E.C.

ROWLEY REGIS.—February 2nd.—For the removal of house refuse, for the urban district council.—Mr. D. Wright, clerk, Council House, Old Hill, Staffs.

LONDON.—February 2nd.—For the supply of drain pipes to the Royal parks.—Office of Works, Storey's gate, London, S.W.

CRAMLINGTON.—February 3rd.—For carting work and scavenging, for the urban district council.—Mr. W. J. Coulson, surveyor.

WREXHAM.—February 4th.—For the construction of sewer and manholes, for the rural district council.—Mr. J. P. Evans, engineer, Argyle Chambers, Wrexham.

EDGEFIELD.—February 4th.—For scavenging the various districts, for the rural district council.—Mr. J. W. Tweddle, inspector, Blackgate, Coxhoe.

OLDHAM.—February 4th.—For the supply of 200 wash-down water-closets, cisterns, and fittings, for the corporation.—Borough Surveyor.

SOUTHPORT.—February 5th.—For the construction of storm-overflow sewer, concrete storm tank to hold 500,000 gallons, and other works appertaining thereto.—Mr. J. Ernest Jarratt, town clerk.

WHISTON.—February 5th.—For the construction of 450 yds. of pipe drain, for the rural district council.—Highway Surveyor.

PENRITH.—February 5th.—For the supply of 1,000 yards of second quality 9-in. diameter earthenware or stoneware glazed socketed pipes, for the urban district council.—Mr. George Wainwright, clerk.

PORTHCAWL.—February 5th.—For the construction of stoneware and iron sewers, concrete tube sewers, flushing tanks, and other appurtenances, for the urban district council.—Messrs. John Taylor & Sons, Caxton House, Westminster, S.W.

ST. MELLONS.—February 9th.—For laying stoneware pipe sewer, manholes, and ventilators, for the rural district council.—Mr. C. S. Morgan, engineer, Pontypridd.

SHERINGHAM.—February 9th.—For the construction of stoneware pipe sewer and manholes, for the urban district council.—Mr. F. H. Smith, engineer.

GRIMSBY.—February 9th.—For the construction of 1,300 yds. of glazed pipes, 200 yds. of concrete tubes, and 600 yds. of brick culverts, for the corporation.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

BLAYDON.—February 10th.—For scavenging work, for the urban district council.—Mr. R. Biggins, Clayton-on-Tyne.

BEDLINGTONSHIRE.—February 10th.—For the construction of sewers, manholes and gullies, for the urban district council.—Mr. J. E. Johnston, surveyor, Front-street, Bedlington.

ORSETT.—February 11th.—For the construction of stoneware sewers, manholes and junctions, for the urban district council.—Mr. C. F. W. Marsh, engineer and surveyor.

BEACONSFIELD.—February 14th.—For the construction of sewage disposal works and sewerage, for the urban district council.—Mr. H. Sergeant, surveyor.

TENTERDEN.—February 14th.—For the construction of 5 miles of stoneware and iron pipe intercepting sewers and appurtenances, for the corporation.—Messrs. John Taylor & Sons, Caxton House, Westminster.

TYLDESLEY-WITH-SHAKERLEY.—February 14th.—For the construction of No. 7 revolving distributors and appurtenances, cast-iron pipes, screening apparatus, 100-gallon capacity ejector, and concrete and stoneware sewer tubes, for the urban district council.—Mr. E. E. Jones, engineer and surveyor, Tyldesley.

BATH.—February 14th.—For the construction of 12 miles of stoneware pipe sewers, and about 1 mile of cast-iron sewer, railway, canal, and river crossings, manholes, lampholes, and flushing chambers, for the rural district council.—Messrs. Willeox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

HALIFAX.—February 14th.—For the construction of cast-iron pipe sewers, for the corporation.—Mr. J. Lord, borough engineer.

SOUTHPORT.—February 16th.—For the construction of stoneware pipe sewers, surface-water drains, and other works, for the corporation.—Borough Engineer and Surveyor.

READING.—February 25th.—For sewerage and surface-water drainage, for the corporation.—Mr. G. Midgley Taylor, engineer, Caxton House, Westminster, S.W.

COALVILLE.—March 2nd.—For laying 1 mile of 9-in. sewers and 490 yds. of 18-in. sewer, and 300 yds. of 4-in. cast-iron and steel main, for the urban district council.—Mr. L. L. Baldwin, surveyor.

Stores.

CARDIFF.—February 2nd.—For the supply of road and sanitary materials and general stores, for the corporation.—City Engineer.

KENSINGTON.—February 4th.—For the supply of road, sanitary and general stores, for the borough council.—Mr. W. C. Leete, town clerk.

WEST HAM.—February 6th.—For the supply of paving materials, broken granite and chippings, road flints, sand, tar and pitch, ironmongery, iron castings, lime, plaster, Portland cement, rope and tarpaulins, hardwood, lead, zinc, solder, oils, colours, stoneware pipes, brooms, brushes, boots, sanitary articles, disinfectants, domestic articles, clothing, soaps, and electrical fittings, for the corporation.—Mr. H. W. Greaves, town clerk.

BISHOP AUCKLAND.—February 7th.—For the supply of sanitary pipes, cement, brooms, road material, and disinfectants, for the urban district council.—The Surveyor.

ILFORD.—February 9th.—For the supply of granite macadam, broken flints, tar-paving, Portland cement, lime, stock and other bricks, Thames ballast, stoneware pipes, iron castings, coal and coke, provender, horse hire and cartage, oils, paints, wheelwrights' timber, tools, general timber, brooms, brushes, baskets, engineers' sundries, pitch, creosote oil, and disinfectants, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

PONTYPRIDD.—February 9th.—For the supply of stores and materials in the surveyor's department, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor.

STEPNEY.—February 10th.—For the supply of bricks, lime, fireclay, brooms, cast-iron work, colours, varnishes, painters' brushes, drainage materials, oilman's goods, Portland cement, pitch, tar, green oil, bitumen, timber, tools, implements, ironmongery, wheelwrights' materials, ballast, shingle, sand, hoggins, flints, uniform clothing, boots, disinfectants, paving materials, horse hire, and squaring and redressing old paving materials, for the borough council.—Mr. M. W. Jamieson, borough engineer.

DEPTFORD.—February 10th.—For the supply of sewer connections and jobbing works, road materials, brooms, disinfectants, cement, and ironmongery, for the borough council.—Mr. Arthur Purkis, town clerk.

WOOLWICH.—February 11th.—For the supply of ballast, sand, brooms, brushes, cement, chandlery, drain pipes, forage, granite kerb, harness, ironmongery, road material, sewer ironwork, and timber, for the borough council.—Mr. J. Rush Dixon, borough engineer.

BATTERSEA.—February 11th.—For the supply of veterinary attendance, horse hire, materials for cart and van covers, harness, paints, tools, ironmongery, macadam, chippings, slag macadam, tared paving material for footpaths, chippings, York paving, Thames ballast, sand, stoneware pipes, timber, bricks, cement, iron castings, iron bars, disinfectants, coal, coke, soap and oils, for the borough council.—Mr. W. Marcus Wilkins, town clerk.

MARPLE.—February 16th.—For the supply of granite macadam, Macclesfield macadam, limestone macadam, 6-in. setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor.

SHOREDITCH.—February 17th.—For laying patent or manufactured stone, asphalt, and supplying broken granite, plumbers' and smiths' work, drain pipes, junctions, bends, drain rods, pails, ropes, timber, sewer ironwork, street posts, lime, cement, general cartage, street name plates, notice boards, ballast, hoggin, shingle, sand, scavenging, and miscellaneous requisites, for the borough council.—Mr. J. A. D. Milne, town clerk.

ECCLES.—February 17th.—For the supply of setts, flags, kerbs, broken rubble, broken slag, granite macadam and chippings, prepared tarred slag, prepared tarred limestone, limestone cube chippings, gravel, cinders, castings, pitch, creosote and tar, Simpson's patent street gullies, stoneware passage gullies, stoneware pipes, bends and junctions, mortar, and channel stones, for the corporation.—Mr. Thomas S. Picton, borough surveyor.

GOOLE.—February 19th.—For the supply of road metal (Guernsey granite and chippings), granite setts, slag (broken and unbroken), hardcore (broken and unbroken for foundations), concrete flags, York flags, kerb, channel, stoneware pipes, bends, Portland cement, tar-macadam, gravel, coal, and bricks, for the urban district council.—Mr. C. G. Bradley, engineer and surveyor.

SOUTHEND-ON-SEA.—February 25th.—For the supply of stoneware pipes, bends, flints, bricks, gravel, sand, timber, ironmongery, paints, oils, colours, cement, lime, chalk, team labour, forage, tar-paving, tar-macadam, iron castings, granite kerb, channel, broken Guernsey granite, broken granite, pitch, creosote oil, harness supplies, brooms, brushes, iron, steel, and disinfectants, for the corporation.—Mr. E. J. Elford, borough surveyor.

Miscellaneous.

BECKENHAM.—February 9th.—For the supply of a petrol-driven motor fire engine, escape and ladders, for the urban district council.—Mr. John A. Angell, surveyor.

WOODFORD.—February 10th.—For a "Hallford" motor fire hose van, fitted with 40-ft. fire escape, for the urban district council.—Mr. W. Farrington, surveyor.

BARNES.—March 9th.—Offers are invited for a Merryweather double-cylinder "Greenwich" steam fire engine complete with all fittings.—Mr. G. Bruce Tomes, surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

ALTRINCHAM.—For resurfacing a road with tarred Wigan slag, for the urban district council.—Mr. H. E. Brown, surveyor:—
M. Naylor, Manchester 4516
W. H. Worthington, Limited, Manchester 179
McGill, Price & Co., Sale 473
W. & A. Higginbottom, Manchester 468
Bethell & Sons, Sale 405

BLAYDON.—For draining, excavating, removing debris, levelling, metalling, channelling, and making good of a diversion (about 450 yds. long) of the Derwent and Shotley main road at The Slide, near Lockhaugh Lodge, Blaydon-on-Tyne, for the urban district council.—Mr. G. Symon, surveyor:—
J. B. Robson, Gosforth 42,115
W. G. Armstrong, Blaydon-on-Tyne 2,611
E. R. Davison, Limited, Blaydon-on-Tyne 1,774
G. W. Armstrong, Whitley Bay 1,748
J. Friend, Blaydon 1,546
R. O. Brebner & Co., Edinburgh 1,467
G. Dyson, Pelton Lane Ends 1,393
Davis Brothers, Burnopfield 1,468
Surveyor's estimate, £1,620.

BRENTWOOD AND BILLERICAY.—For the making up of the portion of Kavanagh-road situate in the Brentwood Urban District, the making up of the portion of Kavanagh-road in the Billericay Rural District, and for works of surface-water drainage, for the Brentwood Urban and Billericay Rural District Councils.—Mr. A. T. G. Woods, Brentwood, surveyor:—
R. A. Bonnett & Co., Chelmsford 42,855
Davey & Armitage, Southend-on-Sea 2,355
Dowsing & Davis, Romford 2,269
Parlby & Besobey, Romford 2,227
W. Lingwood, Romford 1,924
Cronin & Sons, Great Warley 1,891
W. & C. French, Buckhurst Hill 1,855

CHINGFORD.—For making up, paving, and channelling Ashley-road, Leonard-road, and parts of Westward-road, Chingford, for the urban district council.—Mr. J. T. Griffin, surveyor:—

Markham & Markham, Victoria-street, S.W. 42,746
G. Bell & Sons, Limited, Tottenham, N. 2,191
Free & Sons, Maidenhead 2,055
T. Adams, Wood Green, N. 2,007
W. & C. French, Buckhurst Hill 1,700
G. Porter, Clapton, N.E.* 1,558

HACKNEY.—For the erection of the proposed electricity sub-stations, for the borough council:—

NORTHWOLD-ROAD.
H. C. Horswill, Forest Gate 43,461
S. E. Moss & Son, Southend-on-Sea 3,245
S. Roberts, Ltd., Plymouth 2,760
F. J. Coxhead, Leytonstone 2,569
Rice & Son, Stockwell-road, S.W.† 2,527

DALSTON-LANE.
H. C. Horswill, Forest Gate 44,322
S. E. Moss & Son, Southend-on-Sea 3,790
S. Roberts, Limited, Plymouth 3,630
Rice & Son, Stockwell-road, S.W.† 3,342
F. J. Coxhead, Leytonstone 3,313

BALCORNE-STREET.
H. C. Horswill, Forest Gate 44,496
S. E. Moss & Son, Southend-on-Sea 3,690
S. Roberts, Limited, Plymouth 3,719
F. J. Coxhead, Leytonstone 3,440
Rice & Son, Stockwell-road, S.W.† 3,341

HEMEL Hempstead.—For works of sewerage, for the rural district council.—Mr. W. H. Hatford, engineer, Nottingham:—

F. Hodson & Co., Earls Colne, Essex 42,221
W. Waring & Sons, Huddersfield 2,079
A. Timberlake, King's Langley 1,992
H. H. Barry, Radcliffe-on-Trent 1,887
W. Wright, Chesham* 1,769

LANCHESTER.—For works required for additions to the administrative block at Leadgate Hospital, for the Lanchester Joint Hospital Board.—Mr. G. T. Wilson, architect, Blackhill:—

— Ledger 4318
— Jackson 308
— Gallacher 299
— Eltringham 288
Aylon & Sons 282
— Moyle 274
Aylon & Moralee 265
R. Southren, Depton, co. Durham* 256

LONDON.—For the provision of steam, exhaust, condenser, feed, &c., piping, and water tanks, at the Greenwich generating station, for the county council:—

Butterley Company, Limited, Derby 46,634
E. L. Bas & Co., London 6,290
Staveley Coal and Iron Company, Limited, Chesterfield 5,973
Brightside Foundry and Engineering Company, Limited, London 5,438
Chief tramway officer's estimate, £7,000.

MALDON.—For the provision and laying of 2,500 lin. yds. of 3-in. water mains and fittings, for the rural district council.—Mr. W. Almond, surveyor:—

Farrow & Sons, Chelmsford 4623
J. J. Furlong, Maldon 612
W. Lingwood, junr., Romford 523
A. T. Arnold, Hatfield Peverel 499
J. Sheldrake & Son, Hornsea, Yorks 462

MANSFIELD.—For making up two streets, for the corporation.—Mr. T. P. Collinge, borough engineer and surveyor:—

King-street.—H. Ashley, Mansfield, £220.
Moor-lane.—C. Fulcher, Mansfield, £422.

NORWICH.—For the supply of materials, for the corporation.—Mr. A. E. Collins, borough engineer:—

FOR TWELVE MONTHS, ENDING MARCH 31, 1915.
Gravel.—Cunnell & Co., Limited, Norwich, for items Nos. 1 to 17, inclusive of specification (local gravel, shingle, &c.), at tendered prices.
Shingle.—Norfolk Gravel Pits Company, Limited.
Creosoted Red Deal Paving Blocks.—Acme Flooring and Paving Company (1901), Limited, Victoria Park, N.E. at tendered prices.
Local Bricks and Peterborough or Fletton Bricks.—R. R. Ruymp & Son, St. George's Wharf, Norwich, at tendered prices.
Foreign Wood.—A. & W. Cushion, Norwich, at 8 per cent of scheduled prices.
Stoneware Pipes and Fittings.—Doulton & Co., Limited, Lambeth, S.E., for standard stoneware pipes and fittings at tendered prices; J. Knowles & Co. (London), Limited, St. Pancras, N.W., for "Knowles' "free-flow" patent stoneware pipes at tendered prices.
Cast-iron Gullies, Manhole Covers, &c.—Barnards, Limited, Norwich, at tendered prices.
Brushes.—S. D. Page & Sons, Limited, Norwich, at tendered prices.
Concrete Paving Flags.—Atlas Stone Company, Limited, Cambridge, at tendered prices.
Rope, Cord, Tarpaulins, &c.—D. Hurn & Sons, Limited, Norwich, at tendered prices.
Engine-fitter and Boilermakers' Work.—Sabberton Brothers, Norwich, at tendered prices.
Water-closet Pans.—Twyfords, Limited, Stoke-on-Trent, at tendered price.
Water-closet Lead-lined Flushing Cisterns.—Lamberts, Limited, London, S.E., at tendered price.

FOR FIVE YEARS, ENDING MARCH 31, 1919.
Materials for Macadam Roads and Footpaths.—London Granite Company, Limited, London, E.C., at tendered prices, less 7d. per ton all round; Enderby and Stoney Stanton Granite Company, Limited, Leicester, for such Welsh stone as may be required at tendered prices.
Kerbs, Channels, and Paving Setts.—Enderby and Stoney Stanton Granite Company, Limited, Leicester, at tendered prices.

RUISLIP-NORTHWOOD.—For the construction of about 663 yds. of 9-in. stoneware pipe sewer, with manholes and incidental works, for the urban district council.—Mr. W. L. Carr, surveyor:—

Clements, Knowling & Co., Limited, Brentford ..	£877
W. Lingwood, junr., Romford ..	812
Lavington, Limited, Berners-street, W.	691
Willis & Powis, Wembley ..	678
E. Free & Sons, Maidenhead ..	678
W. Halsey & Sons, Edgware ..	641
G. R. Mann, Edgware ..	626
W. Wright, Chesham ..	623
H. Farrow, Brixton ..	600

SLOUGH.—The following tenders have been accepted by the urban district council for twelve months:—

Young & Son, London.—Cement, 34s. 9d. per ton.
 Catchpole & Son, London.—Distilled tar, 43d. per gallon.
 Forbes, Abbott & Co., London.—Distilled tar, 43d. per gallon.
 Clare & Co., Liverpool.—Distilled tar, 43d. per gallon.
 Maidenhead Gas Company.—Tar oil, 3d. per gallon.
 Staines and Egham Gas Company.—Tar oil, 13d. per gallon.
 Boyer & Sons, London.—Screened shingle, 4s. 4d. per cubic yard.
 G. W. Charlton.—Team hire, 8s. per day.
 H. & C. Cullingham.—Team hire, 8s. per day; carting materials, 1s. 6d. per ton.

TOTTENHAM.—For the construction of roads and sewers on the White Hart-lane estate, Tottenham, for the London County Council:—

Markham & Markham, Westminster ..	£3,981
J. Ford, Willesden ..	2,965
G. E. Cloke, Hampstead ..	2,945
W. H. Wheeler & Co., Limited, Blackfriars ..	2,899
W. Griffiths & Co., Limited, Bishopsgate ..	2,821
G. Bell & Sons, Limited, Tottenham ..	2,765
J. M. Vine, Tumbridge Wells ..	2,575
H. Farrow, Brixton ..	2,525
F. J. Coxhead, Leytonstone ..	2,468
E. T. Bloomfield, Tottenham ..	2,410
Nash & Cracknell, Hendon † ..	2,149

Architect's estimate, £2,405.

TWICKENHAM.—For forming, levelling, paving, metalling, kerbing, channelling, and making good portions of Martington-road, for the urban district council.—Mr. Fred W. Pearce, surveyor:—

Fry Brothers, Limited, Greenwich, S.E.	£242
J. Mowlem & Co., Limited, Westminster, S.W.	223
G. Wimpey & Co., Hammersmith, W.	186

WANTAGE.—For the construction of four workmen's dwellings, sewers, and drains, for the rural district council.—Mr. J. W. Harris, engineer and surveyor:—

G. P. Trentham, Limited, Birmingham ..	£1,262
E. Organ & Sons, Oxford ..	1,000
R. Stibbs & Son, Wantage ..	809
Cox & Son, Abingdon ..	809
Simms & Son, Oxford ..	802
J. P. Barrett, Wantage ..	797

Surveyor's estimate, £813.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JANUARY.

- 30.—Institution of Civil Engineers (Students' Meeting): Mr. E. W. Monkhouse, M.A., M.INST.C.E., on "The Testing of Materials for Use in Engineering Construction." 8 p.m.
- 31.—Institution of Municipal Engineers: North-Western District Meeting, Mitre Hotel, Manchester. 1.30 p.m.

FEBRUARY.

- 2.—Society of Engineers: Mr. H. C. H. Shenton delivers his Presidential Address. Institution of Electrical Engineers. 7.30 p.m.
- 4.—Institute of Sanitary Engineers: Annual Dinner, Holborn Restaurant.
- 9.—Royal Institute of British Architects: President's Address to Students; Presentation of Prizes and Studentships
- 12.—Society of Architects: Mr. A. Ainsworth Hunt on "Buildings for Small Holdings." 8 p.m.
- 16.—Institute of Sanitary Engineers: Mr. F. R. O'Shaughnessy, F.I.C., on "The Significance of Colloidal Matter in the Problem of Sewage Disposal." Caxton Hall, Westminster. 8 p.m.
- 20-21.—Institution of Municipal and County Engineers: Meeting at Manchester.
- 21.—Institution of Municipal Engineers: Eastern District Meeting at Oundle.
- 23.—Surveyors' Institution: Annual Dinner, Whitehall Rooms. 7 p.m.

MARCH.

- 21.—Institution of Municipal and County Engineers: North-Eastern District Meeting at Wakefield.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

**METROPOLITAN WATER BOARD.
NEW RESERVOIRS AND OTHER WORKS AT
LITTLETON, NEAR STAINES.**

The Board propose to appoint Quantity Surveyors to take out the Quantities in respect of the above-named Reservoirs (7,000 million gallons), Conduits, River Diversion, Intake, and other Works.

Applications for the appointment must be made on

the Official Form, to be obtained from the Clerk, Metropolitan Water Board, Savoy Court, Strand, W.C., and must be delivered at the Offices of the Board not later than 11 a.m. on Wednesday, 11th February, 1914, enclosed in sealed envelopes, endorsed "Quantity Surveyors."

Full particulars may be obtained, and Drawings inspected, at the Offices of the Chief Engineer, Savoy-court, Strand.

The Board do not guarantee to accept any application.

A. B. PILLING,

Clerk of the Board.

Savoy-court,
Strand, W.C.

January 28, 1914.

(1,221)

**BOROUGH OF LUTON.
SURVEYOR'S ASSISTANT.**

The Council of the Borough of Luton require the Services of an Assistant in the Surveyor's Department, at a commencing salary of £80 per annum.

Candidates must possess a thorough knowledge of Surveying and Levelling, and be neat and accurate Draughtsmen.

Applications, stating age, qualifications and experience, together with copies of not more than three testimonials, to be forwarded to the Borough Surveyor, Town Hall, Luton, not later than Monday, 9th February, 1914.

W. SMITH,

Town Clerk.

Town Hall, Luton.

January 26, 1914.

(1,224)

**WITNEY RURAL DISTRICT COUNCIL.
APPOINTMENT OF HIGHWAY SURVEYOR.**

Applications are invited for the appointment of Highway Surveyor for the Eastern Division of the above District.

Applicants must not exceed the age of 40 years, have had previous experience in the repair and maintenance of roads, and a thorough knowledge of modern methods of construction.

Salary £140 per annum, and £35 per annum for the provision and upkeep of a motor bicycle.

Applications are to be made on printed Forms only, which will be sent on receipt of a stamped addressed foolscap envelope.

These must be returned to the undersigned not later than 12 noon on February 12th, 1914.

Canvassing in any form will be deemed a disqualification.

H. T. RAVENOR,

Solicitor.

Clerk to the Rural District Council.

Witney.

January 29, 1914.

(1,225)

**KARACHI MUNICIPALITY.
APPOINTMENT OF SUPERINTENDENT OF
FIRE BRIGADE.**

Applications are invited for the post of Superintendent of the Municipal Fire Brigade. Salary Rs.200/- per mensem, with Free Quarters, unfurnished.

The Superintendent will be a full-time Officer, and, in addition to taking charge of a Motor Fire Engine at fires, will be required to organise the Brigade, to conduct fire drills regularly, and to see that all fire appliances are always in good working order, and generally to act under the orders of the Chief Engineer of the Municipality.

Preference will be given to a young, active man, with experience in a properly organised Brigade, used to obeying and enforcing discipline.

The selected candidate will be subject to all the Municipal Rules, including Leave and Provident Fund Rules, and the appointment may be terminated at any time by three months' notice on either side.

Single second-class fare will be paid to enable the candidate to join his appointment.

Applications, stating age, nationality, qualification and experience, will be received up to 28th February, 1914.

MEASHAM LEA, ASSOC.M.INST.C.E.

Chief Officer and Chief Engineer,
Karachi Municipality.

(1,138)

THE MALDEN AND COOMBE URBAN DISTRICT COUNCIL.

SURVEYOR'S GENERAL ASSISTANT.

A General Assistant is required in the Engineer and Surveyor's Department, who must have had previous experience in the routine duties of such an office, be a good Surveyor and Draughtsman, used to taking levels, and have a thorough knowledge of building construction. It is desirable that he should also have a knowledge of the principles of town planning.

Candidates should be not less than 24 years of age, and preference will be given to those who have obtained the testimonial of the Institution of Municipal and County Engineers.

Salary, £100 per annum (payable monthly), rising by annual increments of £10 to £150.

Applications, on the form to be supplied by me upon receipt of a stamped and addressed foolscap envelope, accompanied by copies of three recent testimonials, are to be delivered at the Municipal Offices, New Malden, on or before 10th February, in envelope endorsed "Surveyor's Assistant," and addressed to the undersigned.

Canvassing, directly or indirectly, will be a disqualification.

JAMES WM. JOHNSON,
Clerk of the Council.

Municipal Offices,
New Malden, Surrey.
January 27, 1914. (1,218)

EAST SUSSEX COUNTY COUNCIL. RECONSTRUCTION OF MONK BRETTON BRIDGE, RYE.

Wanted, a thoroughly capable man as Clerk of Works. Preference will be given to one experienced in Ferro-concrete construction.

Salary, £3 per week.

Applications, accompanied by three references, to reach the undersigned on or before Saturday, February 7th, 1914.

F. J. WOOD, ASSOC. M. INST. C. E.,
County Surveyor.

County Surveyor's Department,
County Hall,
Lewes. (1,203)

CITY OF ST. ALBAN. APPOINTMENT OF SURVEYOR'S CLERK.

The Council invite applications for the above appointment. Applicants must have had experience in a Municipal Surveyor's Office, including the keeping of all the various books, and be an efficient Short-hand Typist.

The salary will be at the rate of £70 per annum.

Applications, in candidate's own handwriting, stating age and qualifications, to be addressed and delivered to the undersigned, accompanied by copies of three testimonials, not later than Thursday, the 12th February, endorsed "Surveyor's Clerk." Canvassing will be deemed a disqualification.

E. P. DEBENHAM,
Town Clerk.

Town Clerk's Office,
St. Albans.
January 21, 1914. (1,192)

BOROUGH OF GRAVESEND. The Corporation invite applications for the Appointment of Road and General Foreman.

Applicants must possess a thoroughly practical experience in the control of Men, the making of Macadamised and Flint Roads, General Mason's and Paving Work, Drain and Sewer Work, Tar Paving and Tar-macadam work, and Scavenging of a district, and must be able to keep Time Books, &c.

Wages 45s. per week.

None but thoroughly competent men need apply, and canvassing is strictly prohibited and will disqualify.

Applications, in candidate's own handwriting, giving full particulars of age, qualifications, previous experience and present employment, and accompanied by copies of not more than three recent testimonials, to be sent to my Office not later than Thursday, February 5th, endorsed "Road Foreman." Applications must be made on a Form which will be supplied on application to the undersigned.

H. H. BROWN,
Town Clerk. (1,178)

COUNTY BOROUGH OF STOCKPORT. CHIEF ASSISTANT—BOROUGH SURVEYOR'S OFFICE.

The Highways and Sewers Committee of the County Borough of Stockport invite applications from qualified persons from 30 years to 35 years of age, for the position of Chief Assistant in the Borough Surveyor's Office. Salary £200 per annum, rising to £260 by annual instalments of £10.

It is essential that each candidate should be a fully qualified Civil Engineer, and have had the necessary Education and Municipal Training of a Borough Surveyor's Office, to fill the position—including actual experience in the design and supervision of Tramways and Bridge Construction, Sewage Works, Private Street Improvement Works, &c.—and sufficient Architectural knowledge to design Buildings in connection with Engineering Works.

Full particulars of the duties and conditions relating to the appointment, together with Form of Application, can be obtained on application to the undersigned.

Applications to be on the pre-scribed Form (no other will be considered), and addressed to the Borough Surveyor, endorsed "Chief Assistant," and must be delivered not later than Thursday, 12th February next.

JOHN ATKINSON, ASSOC. M. INST. C. E.,
Borough Surveyor.

Town Hall,
Stockport.
January 21, 1914. (1,191)

BOROUGH OF GUILDFORD. ASSISTANT BOROUGH SURVEYOR.

The Corporation of Guildford invite applications for the appointment of Assistant Borough Surveyor. Salary £120 per annum, rising, subject to satisfactory service, by annual increments of £10 to a maximum of £150 per annum. The person to be appointed must be a good Draughtsman and Surveyor, and possess a thoroughly practical knowledge of the work of a Municipal Engineer's Department. He will be required to devote the whole of his time to the duties of the office. Applicants must state age, present and previous employment, and the date on which the applicant can take up the duties. Applications, accompanied by copies of not more than three recent testimonials, must be sent to me, the undersigned, not later than Friday, the 13th February, 1914, endorsed "Assistant Surveyor."

Personal canvassing will disqualify.

A. D. JENKINS,
Town Clerk.

Town Clerk's Office,
Bridge-street,
Guildford.
January 28, 1914. (1,223)

THE GOVERNMENT OF INDIA have four vacancies for Assistant Sanitary Engineers, two on salaries of Rs.800 a month, rising by annual increments of Rs.50 to Rs.1,000 a month; one on a salary of Rs.500 a month, rising by annual increments of Rs.50 to Rs.700 a month; and one on Rs.400 a month, rising by annual increments of Rs.40 to Rs.620 a month.

Candidates for the two last-mentioned posts must not be above 33 years of age, and should either have passed the qualifying examination for A.M.I.C.E., or should hold such other engineering degrees, diplomas or certificates as are sufficient to show that they have attained the requisite standard implied by the above examination. They must also have had considerable practical experience both in the design and execution of works of water and sanitary engineering.

For the two other posts there is no fixed upper limit of age, but preference would be given to candidates not above 33 years of age, if highly qualified in all respects. Candidates must have a sound knowledge of modern methods of construction of water-works installations, and long—in one case not less than ten years'—practical experience of the working of such installations. Some drainage experience will be regarded as a strong additional qualification.

Further particulars and Forms of Application can be obtained from the Secretary, Revenue Department, India Office, London, S.W., to whom applications should be submitted not later than 7th February.

(1,175)

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

FEBRUARY 6, 1914.

No. 1,151.

Minutes of Proceedings.

Society of Engineers: Presidential Address.

Among the many unwritten laws which govern civilised mankind is one which exempts from discussion a presidential address. It is one of those things which has to be listened to and endured, and no matter what storm of protest, indignation or amazement it may call up in the breasts of an audience, none would so transgress "good form" as to give speech to his feelings. Even favourable comment and earnest inquiry are denied, and it is fortunate therefore that the Press are free to deal with an address on its merits, untrammelled by any bogey of bad form or impertinence. Presidential addresses almost invariably take the shape of either a quasi-historical review and forecast, or a dissertation upon some particular branch of knowledge. In the case of the latter the subject matter is more suitable for a "paper" than for an inaugural address, while the former type is not usually of interest to others than the members of the particular society before which it is delivered. In the address delivered by Mr. H. C. H. Shenton before the Society of Engineers on Monday, we have a happy combination of the two. It may well be divided into distinct portions—the one professional, the other technical—and we intend to deal with it in this manner. As will be known to the bulk of our readers, Mr. Shenton specialises in water supply and sewage disposal, and as he is one of those few men who very rightly believe in "sticking to their last," he treats technically only of these subjects. To use his own words in speaking of the profession of engineering, "if the profession is to be properly organised the consulting engineer ought not to undertake personal work for which he does not specialise." We have no intention in the present article of dealing with the technical portion of the address, as the many points there raised call, we consider, for isolated treatment.

Among the many matters of vital importance in the address, that of the necessity for the organisation of the profession stands in strong relief. It is patent that "the well-being of the engineer" can be secured only by combined effort on the part of the members of all branches—civil, mechanical, illuminating, municipal, and sanitary—of the profession. Mr. Shenton rightly terms "individual and spasmodic" the efforts which have so far been made in this direction, but progress of every kind is inevitably, in its earlier stages, open to the charge. Before there can be effective combination of existing engineering societies, there must be some uniformity in their separate working. There are societies which admit by examination, and societies which admit without. There are others in which an examination is compulsory only in the case of those

seeking admittance to the lower ranks, the favoured ones going direct to the highest class without examination. There are still others in which examinations are quite optional, and have no bearing either one way or the other upon the question of admittance. Every engineering society necessarily admits engineers, but the best of engineers may be excluded if the requisite "influence" cannot be obtained, while a relatively inferior man, if well backed, may aspire to council honours in a twelvemonth! Any "controlling body" which might be elected now would, we fear, so far as the examination question alone goes, have a very sorry task before it. And the very word "engineer" yet awaits precise definition. The unnecessary waste of public money, due to the engagement of unqualified persons, is another matter of considerable importance, and Mr. Shenton suggests that "engineers should combine in the endeavour to make it impossible that their work should be given to persons outside the profession." We are rather inclined to think that for a great deal of the waste persons *in* the profession are responsible; indeed, Mr. Shenton is of our opinion himself to some considerable extent, since he deplors the number of engineers who have not specialised knowledge on the work in which they are engaged. "It," he says, "the list of failures in sewage disposal works and in water supply works were recorded, together with the names of those responsible for the work done, the result would be very instructive." And the result would, we are confident, reveal the fact that the greater number of failures lay at the door of those in the profession. Mr. Shenton is perhaps obsessed by the idea that the municipal engineer does much engineering work that belongs of right to the consultant; but even if he does, that fact in itself is a proof of his competence rather than of his incompetence. Local authorities are not prone to betray the trust reposed in them merely for the sake of obliging the surveyor.

Press censorship is one of those subjects that is scarcely to be looked for in a presidential address delivered before a body of engineers, and we had serious misgivings when we read, "It seems as if some sort of Press censorship is desirable." Here was Mr. Shenton in quite a new line, and we read on expecting every moment to find him advocating the censoring of *THE SURVEYOR* by the Society of Engineers. Happily, Mr. Shenton puts forward nothing so drastic as that; indeed, his suggested Press censorship is not Press censorship (as generally understood) at all. What he hits at is the ease with which a man may pose as an authority on a subject, if only he compiles a book upon it. As he points out, there are numbers of technical books which are full of errors, and serve but to bewilder and

lead astray the student. "It seems," says Mr. Shenton, "as if all that is required at the present day is for a person to make an assertion. The assertion goes forward, frequently without comment, as a fact, and becomes a source of error." He would have a department "for the careful reading of new books written by unknown authors, with a view to their inclusion in a list of text-books suitable for students preparing for examinations." We are with him all the way, but we would include known authors and old books, for it would be manifestly ridiculous to allow either old errors to continue or new ones to arise simply because they came from a "known authority." There are men who are famous owing mainly to a large output of purely mediocre works. The manufacturer's "ghost" in authorship certainly requires "laying." There is not the least objection to manufacturers writing books and advocating their own methods, appliances, and materials, but such works should carry the name of the manufacturers on the title page, and not that of some engineer employed for the purpose of puffing the contents. Equally to be deplored are the free designs (even up to a specification and full drawings) supplied to engineers by manufacturing and contracting firms. If an engineer is not capable of preparing his own designs, he should certainly not be allowed to obtain them elsewhere. It places him in an awkward position, since the contractor will almost inevitably have to be allowed what amounts to a free hand. "If," says Mr. Shenton, "this system of obtaining designs free of charge from manufacturers is to be admitted as being in conformity with the rules of the engineering profession, it follows that any person of organising capacity, however limited his knowledge of engineering may be, may carry out very large works which are really designed by other people, and about which he is quite incompetent to express an opinion, and to charge the full fees of a consulting engineer for doing so." This is precisely what does happen only too frequently, and the matter is one which calls for the earnest consideration of the profession. The manufacturer would, we think, be the first to welcome the extinction of a system which hits him most unfairly.

Space does not allow us to comment further upon the professional portion of Mr. Shenton's striking address. Many columns would be necessary to do full justice to it, and other matters claim their share of attention. In our next issue we shall deal with the technical portion, and say what we have to regarding his views upon water supply and sewage disposal. Mr. Shenton will, during the next twelve months, have full scope for his activities, and if an angury may be gathered from the reception he received on Monday when he took the chair, he will have substantial and whole-hearted support in that arduous labour which is the reward of high offices such as the one he now holds.

Skidding Vehicles in London Streets. While much of the criticism of road surveyors and their works which appears in the lay Press is of little or no importance, it is necessary from time to time to pay attention to the more conspicuous or more plausible of the attacks directed against the profession. The public is beginning to understand some of the difficulties which confront the country road surveyor, but in the case of criticisms of the work of the highly qualified engineers employed by the road authorities of the greatest city in the world, an attack upon the work done is obviously directed against the responsible official. The statements that "the shape of our streets is too often unsuited to modern traction," and that "the camber or slope is excessive, and is apt to cause slips," appeared in a recent issue of the *Daily*

Mail, and, having regard to the general tenour of this leading article, we are surprised to find it in so conspicuous a position. The heading was "Unsafe London Streets," and the article was written by way of comment on an accident—the overturning of a motor omnibus. In view of the circumstances of other accidents, it is, perhaps, of some significance that the vehicle was taking a private party to a football match, and the majority of the passengers were travelling outside. The ultimate cause of the skidding, our contemporary states, was "the bad condition of the road surface," but in view of the unsatisfactory nature of some of the features of the present type of motor omnibus, this opinion cannot be accepted as necessarily correct. Both sideslip proper and the skidding of braked wheels are influenced by the diameter of the wheels, and those of motor omnibuses are much too small, while the design of the brakes themselves is defective. It may be noted in passing that the braking arrangements of some other motor vehicles are also defective, and dangerously so. Our contemporary further contends that "London needs not only better surfaces, but also far wider streets, and a far more stringent regulation of vehicles," but there is nothing to show whether the regulation of vehicle design is referred to, or traffic regulations only. How far wider streets can be obtained is left to the imagination of the reader, but this is another matter. It may be pointed out, however, that some important London streets are less congested than they used to be.

It is well known that the great influence of the *Daily Mail* is often exerted in favour of the motor omnibus, and our own appreciation of this useful vehicle has been expressed often enough to make any further reference to it unnecessary in the present connection. We trust that our powerful contemporary will reconsider its attitude towards certain enthusiasts on the one hand and highway engineers on the other hand, and will consider the expediency of including in criticisms of the work of surveyors such reservations and courtesies as are employed by the entire Press in references to professional and technical matters in which architects or members of the medical profession are concerned. We feel sure that the editors of influential newspapers will not like to realise too late that under new conditions of highway administration the status of official engineers is lower and their remuneration less than should be the case as a result of their unfair treatment in the Press for a number of years preceding the changes.

* * *

America's First City Manager.

The system of municipal administration by a select commission, which finds favour in America, is something quite foreign to our notions of local self-government in this country, which is established upon the basis of wide popular election. That the American plan works satisfactorily on the whole is to be inferred from the fact that it has been subjected recently to an interesting development in Dayton, Ohio. Here there is offered the first example of a large city trying the experiment with the City-Manager plan of municipal government. The gentleman appointed to this position is Mr. Henry M. Waite, who has for some time past held the office of chief engineer of the Cincinnati department of public works. The City Commission, from which Mr. Waite has received his appointment, consists of five members elected for four years. The mayor is the commissioner who receives the largest number of votes, and along with the other commissioners he is paid a salary—the mayor £360 a year, and the others £220. The commission thus constituted is a legislative body which has no executive authority, and as regards the administrative work of the city, the city manager runs what in familiar language would be termed a one-man show. He is the

administrative head of the municipal government, responsible for the efficient working of all the departments. He has the power of appointing or removing all subordinate officers, and, in fact, exercises universal control, including the duty of advising as to the financial condition and needs of the city. Nothing is stated as to the amount of salary Mr. Waite is receiving, but we should imagine that to be commensurate with the extent of the responsibilities of his office it ought to be ambassadorial or vice-regal in its proportions. The experiment, we gather, is being watched with considerable interest in municipal circles in America. It is something of a novelty, even in the States, to find one individual charged with the direction and control of a whole city. We have every expectation and hope that Mr. Waite will be quite equal to the occasion.

* * *

"Controlling" the Municipal Engineer.

The letter from "Togun" which appeared in our issue of December 26th under the heading "Controlling the Municipal Engineer," refers to a subject which, although in part treated with good-humoured banter by the writer, is of very real importance. The tendency to supersede the municipal engineer in regard to the administration of matters which come within his legitimate sphere, and with which he is specially qualified to deal, is one which has never commended itself to our judgment. The undue multiplication of central authorities—which, too often, are apt to lose touch with public opinion—is in itself undesirable as leading to unnecessary complication and expense in the practical work of administration. Further, where such bodies are set up, their function should be to guide and direct rather than to control. In the matter of town planning, to which "Togun" specifically refers, we have always taken a strong view that no body of men are more fitted, alike by training, experience and knowledge of existing conditions, to advise upon and carry out schemes under the Act of 1909. The co-operation of the architect, the social expert and others is no doubt necessary, but when all is said and done, the improvement and development of towns is in its essence purely a matter of municipal engineering. Water supply is on rather a different plane, because of the keen competition for sources of supply which has been taking place recently. To this extent the problem appears to us to be a national one; but once the source has been allotted its utilisation for the needs of a particular town or district is a matter for purely local control. We followed with much amusement the "exclusive information" outlined in "Togun's" letter in regard to the proposed Ministry of Refuse Removal, and the newly formed Sewers Improvement Association. The whole question of outside control, however, is a very important one, and is worthy of the close attention of the professional institutions and of all municipal engineers.

* * *

A Council's Liability.

The case of *Papworth v. The Battersea Borough Council*, in which judgment was recently given by Mr. Justice Horridge, is of great interest as illustrating the principles on which the liability of a local authority for street accidents rests. The plaintiff alleged that while she was cycling in Lombard-road in January last year she rode over a sewer gully which was in a dangerous state of repair, and because of this she was thrown from her bicycle and a car passed over her, inflicting such injuries as to prevent her permanently from following her employment. The jury found, in the first place, that the gully, which had originally been constructed by the old Wandsworth District Board of Works, had been negligently constructed, and that the accident was primarily due to this fact. On this finding the learned judge held that the Act which constituted the Battersea Vestry successors of the Wandsworth District Board of Works did

not operate to transfer pre-existing liabilities, and that consequently the defendants, being the successors of the vestry, were not liable on this head. The jury, however, further found that the defendants were guilty of negligence in not having repaired a broken frame, and that this broken frame was a contributory cause of the accident. Upon this finding it was argued for the defendants that they were not liable for mere misfeasance in suffering the frame to get out of repair, but that their liability only extended to acts of nonfeasance, and the cases which establish a similar principle in regard to the repair of highways were cited. It was held, however, that the defendants were liable upon the principle that if a duty is undertaken and improperly performed, and actual damage is occasioned thereby, the person injured has a good cause of action. Judgment was consequently given for the plaintiff for the amount assessed by the jury—viz., £1,961 with costs.

* * *

Rectifying a Contract.

The order of Mr. Justice Sargant made in the Chancery Division last Friday for the rectification of a building contract between H.M. Commissioners of Works and Messrs. William King & Son is of considerable interest to surveyors and engineers. The contract in question, which was for the erection of a post office, was for a fixed sum of rather more than £20,000, and there was appended to it a schedule of prices according to which variations were to be valued. Among the items in this schedule was "reinforced concrete," which, by a typist's error, appeared at £3 12s. 6d. per foot cube, instead of per yard cube. According to the evidence, both parties intended the price to be per cube yard, and after the contract had been signed neither of them had any idea that the word "foot" had been substituted. The contractor did not become aware of the mistake until after the completion of the work, when he admitted in correspondence that it was an obvious error. Nevertheless, he set up a claim based on the price quoted per cubic foot, because he conceived himself to have been treated unreasonably in respect of some other matters. The learned judge expressed the opinion that this claim was extravagant and exorbitant, and rectified the contract by substituting the word "yard" for "foot." In the circumstances the decision appears to have been quite equitable, but it must be remembered that it was given in regard to a schedule attached to a lump sum contract, and not with reference to a priced bill of quantities.

* * *

The Manchester Meeting.

As will be gathered from the published programme, the meeting of the Institution of Municipal and County Engineers which is to be held at Manchester on Friday and Saturday, the 20th and 21st inst., will be of an exceptionally attractive character. The Lord Mayor and those committees of the corporation who are most closely concerned with the municipal engineering work of the city appear to be doing all that is possible, both in regard to hospitality and arrangements for the instruction of the members, and a large and highly successful gathering should be assured. Ample time has been allotted to business, and it is likely that not the least interesting part of this will be the description which Mr. T. de Courcy Meade, the city surveyor, will furnish of the numerous and important undertakings for which he is responsible. A record, we have reason to believe, mainly of original investigations, his address should be one of a most valuable nature, and may be expected to afford considerable pleasure—apart from the information it will provide—to all who are privileged to hear it.

The Design of Plain and Retaining Walls.

By F. NOEL TAYLOR, M.I.MUN.E.

The design of walls forms an important item of the civil engineer's practice. By walls is meant those structures which have to sustain a pressure, usually on one side, of either earth, water, or wind, and in a lesser degree pressure from above in the form of superincumbent loads. To start with, we have the ordinary garden wall, which sustains a wind pressure only; secondly, the house wall, which sustains a superincumbent load. These two forms of wall do not usually demand any special calculations, yet at the same time they are worthy of the few remarks which will be made upon them. Far more important to the engineer is the proper understanding of the stresses in and the design of walls which have to withstand thrust, known usually as retaining walls, and when the thrust of water, dams. Not only must these walls be designed so as to be entirely free from any liability to fail under ordinary conditions, but the engineer must so thoroughly understand the principles of design that the material put into the wall will be so disposed of as to render the cost as low as possible, compatible with safety. As the literature having direct bearing on the subject is not too abundant, and also very widely scattered over numerous textbooks, the writer has aimed in the following article at bringing together the essential principles as concisely as possible.

Now, the essence of the problem of the stability of walls is based on the following facts: The material of which they are built exerts a downward pressure, varying according to its mass, due to the effects of gravity. The earth or water which they retain, or the simple wind pressure to which they are subjected, exerts pressure against the sides of the wall. In the case of water and wind this pressure is horizontal, but with earth it will usually be inclined at an angle to the horizontal, which will vary according to the nature of the earth and its consequent angle of repose. It is reduced to horizontal and vertical components by calculations. Hence we see that there will be two pressures to contend with, one vertically downwards, known as the passive force or resistance, and the other horizontal, called the direct pressure. But the forces alone are not considered. It is the moment of the forces which we proceed to investigate—that is to say, the passive force is considered to act vertically through the centre of gravity of the wall, and its moment is the distance from the point where a perpendicular dropped from the centre of gravity of the wall cuts the base to the outer edge of that base; while the pressure, if it be water or earth, is considered to act at a point one-third the way up from the base of the wall (or that part exposed to the water) to top-water level, which point is known as the centre of pressure; while if only wind is under consideration the centre of pressure is taken halfway up the exposed face of the wall. Bearing in mind, then, the foregoing rules, the reader should be able to understand the sequel.

CASE I.

The simplest case that could be presented to the reader is that of the ordinary brick garden wall. In practice such walls are not usually subject to much

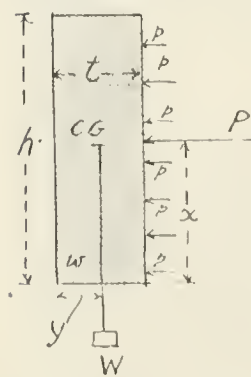


FIG. 1.

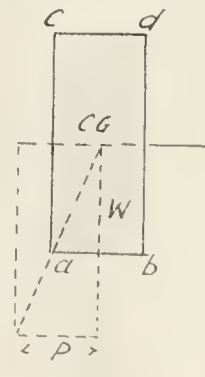


FIG. 2.

calculation, because the practical thickness of the brickwork is usually ample to supply a resisting moment greater than any overturning moment.

Knowing the force of the wind, say, 40 lb. per square foot, which in Britain is more than enough, and the height of our wall, the thickness would be t

$$t = \sqrt{\frac{ph}{w}} \dots \dots \dots 1$$

where p —the wind pressure on a strip of wall 1 ft. wide, and w the weight of the wall per foot-run, while if t is limited the greatest safe value of h will be

$$h = \frac{wt^2}{p} \dots \dots \dots 2$$

Now, to illustrate the above reasoning, the reader is referred to Figs. 1 and 2.

P is the pressure and t its moment
 W = weight of wall, and y its moment
 CG = centre of gravity of the wall.

In Fig. 2 we have the parallelogram of forces applied to the wall, a diagram which has universal application in problems of this sort. For instance, let

p = wind pressure in lb. per square foot
 w = weight of brickwork in lb. per cubic foot
 h = height of wall in feet
 x = leverage of wind to toe of wall
 y = leverage of weight to toe of wall
 P = total wind pressure on a strip of wall 1 foot wide = ph
 W = total weight of 1 foot run of wall of thickness t and height h
 $P = ph$, $W = w h t$, and for equilibrium
 Px = must be equal to or less than* Wy , or, say, $w = 110$,
 $h = 10$, $t = 1$, and $y = 5$, $P = 40$, $x = 5$.

We have ratio of stability = $\frac{wt h y}{Px} \dots \dots \dots 3$
 $= \frac{110 \times 1 \times 10 \times 5}{40 \times 10 \times 5} = \frac{5.5}{20}$, which is not satisfactory.

Trying equation 1 we have

$$t = \sqrt{\frac{ph}{w}} = \sqrt{\frac{40 \times 10}{110}}$$

$= \sqrt{3.636} = 1.905$, say the wall was made 2ft. thick, in which case equation 3 will give $\frac{110 \times 2 \times 10 \times 1}{40 \times 10 \times 5} = \frac{11}{10}$ which is quite satisfactory.

It must be remembered in designing a wall as above that there will always be a tendency for it to slide upon its bed joints, and this tendency is directly proportional to the coefficient of friction of the mortar, and in calculations is written μ .

CASE II.—SIMPLE RETAINING WALL.

Referring now to the diagram in Fig. 2, from the centre of gravity of the wall a perpendicular is dropped. To a certain scale of tons, pounds, &c., the value of W is set off along it from the point where the line of pressure cuts it, while a horizontal line passes through CG , which in the case of a wind pressure is also the centre of pressure, and along it is set the value P to the same scale as W . The parallelo-

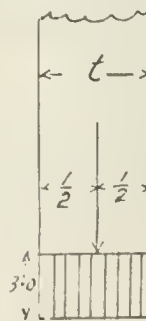


FIG. 3.

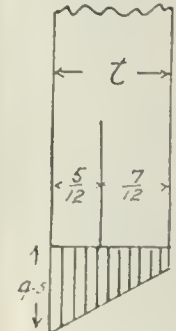


FIG. 4.

gram is completed and the diagonal drawn, and if this diagonal falls outside the middle third of the base, as shown, something is wrong. The diagram refers to the unsafe wall which was worked out, and the wall would tend to topple over.† If the diagonal cuts the base within the middle third, the wall will be safe against failure from this cause; but, although there

* In practice considerably less than according to the factor of safety employed.
 † The value of P is exaggerated for clearness.

may be no resulting tension on the inner joints, there may be too much compression on the outer ones.

Let us see how this is investigated. In Fig. 3 we have a diagram showing the reaction with the resultant acting through the centre of the wall; Fig. 4 shows it acting through the middle third of the wall. But such diagrams have only a limited application, and when any wall has been calculated upon, it is very useful to check the calculations by a very well-known formula which has a very universal application. It is written:—

$$\frac{W}{A} + \frac{M}{Z} \dots\dots\dots 4$$

and is explained as follows. The wall is subject to a longitudinal thrust *W*, producing a bending moment *M* at any section.

Let *I* = moment of inertia of the section.

For a rectangular section = $\frac{BD^3}{12} \dots\dots\dots 5$

For a rectangle of breadth *B* and depth *D*

y = distance of extreme fibre of cross section from the neutral axis (which passes through the centre of gravity of the section)

p = unit stress at the extreme fibre produced by the bending moment.

Then $p = \frac{M}{I} y \dots\dots\dots 6$

And as *A* = area of cross section

*p*₁ = unit stress produced by $W = \frac{W}{A} \dots\dots\dots 7$

∴ Total stress at the given point in section

$$= \frac{W}{A} + \frac{M}{I} y \dots\dots\dots 8$$

and $\frac{I}{y}$ is usually written *Z*; hence our formula No. 4.

Adding up the two quantities, we have the compression on the outer joints, and subtraction the tension on the inner ones. For instance, take the following case of a wall so loaded, bearing in mind at the same time that it is not designed as a retaining wall, which we shall consider later on.

CASE III.

A common case would be the thrust of a roof. We will assume the loads on the roof worked out in the ordinary manner, and a value for *W* = 150. The trusses are 10 ft. centre to centre, and the wall 9 in. thick.

$$\therefore \frac{W}{A} + \frac{M}{Z} = \frac{150}{10 \times .75} + \frac{150 \times 5}{\frac{1}{8} (10 \times .75^2)} \dots\dots\dots (9)$$

= 20 + 80 = 100 ÷ 20 = 5 tons per square foot compression and 60 ÷ 20 = 3 tons per square foot tension.

The tension is too much for a mortar joint, and the compression rather high; but if the above calculation is repeated for a 14-in. wall, it will prove safe. The moment of *W* for use in the top line of the equation is scaled off from the ordinary stress diagram, and is

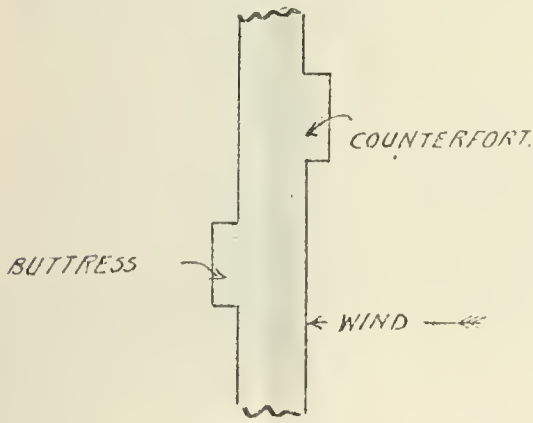


Fig. 5.

the distance from the point where the resultant cuts the base of the wall to the centre of that base.

The use of buttresses and counterforts on walls exposed solely to wind pressure is very usual. They add a certain amount of strength to the wall, and enhance their appearance when used with retaining walls. They both add to the stability and reduce cost, and will be discussed in that connection later; but with ordinary boundary walls it is usual to make them twice the thickness of the wall in width, and half the thickness of the wall in depth. They should

be spaced 12 ft. to 15 ft. apart. The difference between a buttress and counterfort is this: A buttress is a projection on that side of the wall away from the pressure or, in the case of a boundary wall, the leeward side, while a counterfort is placed on the pressure or windward side, as shown in Fig. 5.

Walls may also be built as panelled walls, shown in Fig. 6, and a certain saving of material effected, while another construction effecting the same end is shown

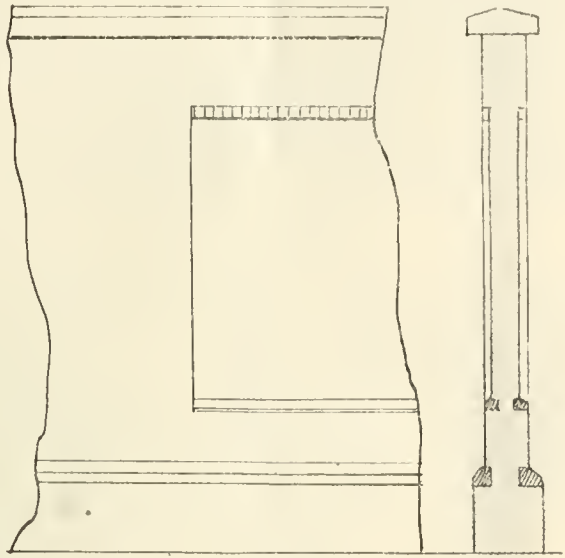


FIG. 6.

in Fig. 7; but in most cases the saving of actual cost will be only small owing to the expense of the moulded cornices. Their use is mostly for artistic effect. Finally, we may say a word on ordinary house walls. Their thickness is usually left to the discretion of the architect, and is generally the multiple of a single brick. A general formula for arriving at an economical thickness has, however, been deduced, which stands as follows:—

if *t* = thickness in feet
L = length in feet
H = height in feet

$$c = \text{a constant} = \frac{H}{20} \text{ for ordinary houses and } \frac{H}{12} \text{ for big warehouses,}$$

$$\text{Then } t = \frac{Lc}{\sqrt{H^2 + L^2}} \dots\dots\dots (10)$$

We now pass on to a much more important question—that of retaining walls for earth and small depths of water.

The stability of a retaining wall depends on—

- (a) The heaviness of the material composing it.
- (b) The breadth and height.
- (c) The square of the thickness.
- (d) The inclination of the bed joints to the horizontal.

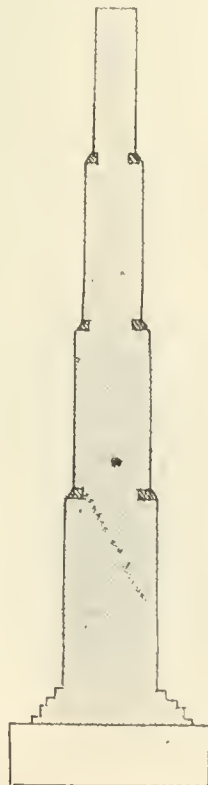


FIG. 7.

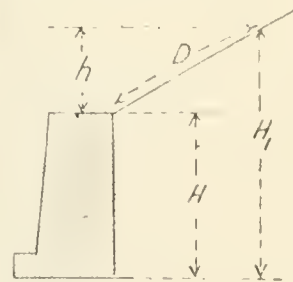


FIG. 8.



FIG. 9.

(c) The distance of the centre of resistance from the centre of gravity of the wall (measured horizontally).

- (f) The angle of slope of the earth backing.
 While failure may be produced by—
 (1) Shearing.
 (2) Toppling over (turning on the outer joints).
 (3) Crushing of the outer joints and consequent separation of the inner ones.
 (4) Sliding on the surface.
 (5) Sliding on the bed joints.

Stress diagrams are very useful in the design of retaining walls, but it is also a good plan when plotting a proposed section for calculation by diagram to have some idea of the approximate thickness. For this purpose we must first ascertain the weight per cubic foot of the wall (according to the material of which it is to be built), also the weight per cubic foot of the earth backing, and its actual angle of repose. The following is a table of the usual materials employed in building:—

TABLE I.

Portland cement concrete	125	5
Stock brick in cement ...	115	6
Stock brick in lias mortar	112	5
Stock brick in lime mortar	112	3
Blue brick in cement ..	120	9
Sandstone... ..	130	12
Portland stone... ..	135	13
Hard limestone	140	14
Granite	160	15
	Weight in lb. per ft. cube.	Safe load tons per sq. ft.

The following is a table of the earth backing usually found:—

TABLE II.

Dry sand	21
Clay (dry)	36
Clay (damp)	40
Clay (wet)	15
Mixed earth	23
Gravel	40
	Angle of repose θ

CASE IV.—EARTH RETAINING WALL.

Then let H be the height of the proposed wall in feet.

W the weight of material from Table I.

w " " earth

T = mean thickness of wall in feet

a = angle of slope of earth, Table II.

The quantity $\tan \frac{a}{2}$ will of course vary, and in practical calculations it is usual to take it as a mean of .5, and when water pressure is under consideration 1.0.

Then

$$T = .7 H \tan \frac{a}{2} \sqrt{\frac{w}{W}} \dots \dots \dots (11)$$

a formula which, of course, applies to those walls of which the backing is trimmed off on a level with the top in a horizontal plane. When, however, as is very often the case, the backing slopes upwards and away from the top of the wall, a modification has to be introduced, as shown in Fig. 8, in which D is set off equal to H and H₁, as scaled off substituted for H. Such walls are termed revetment walls, while if the earth comes right over to the front face (as shown by Fig. 9), D must be measured from the point x, as shown. This wall is known as a surcharged revetment. Having then calculated the mean thickness of our wall, as shown, we proceed to test its stability by means of diagrams, bearing in mind, however, that the value of T given applies to walls with a plumb face. If the face has a batter the following values of T are used:—

TABLE III.

Batter 1-12	T = .86 of value found
" 1-8	T = .80 "
" 1-6	T = .74 "
" 1-5	T = .72 "
Internal face stepped	T = .85 "

Referring to Fig. 10, AW to scale represents the

weight of 1-ft. run of the wall (Table I.), plus the weight of the earth (Table II.) contained in the irregular space MOL.

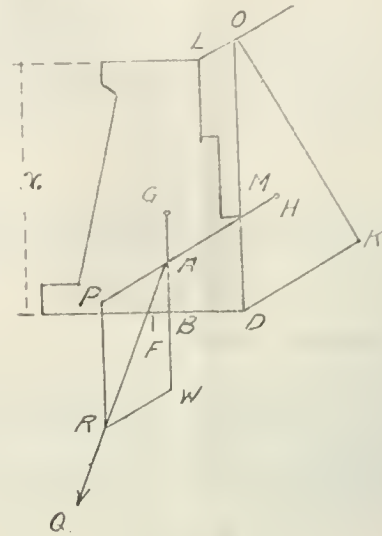


FIG. 10.

But in Fig. 11, which represents a sloping wall, the space BOL is considered equal to the weight of that quantity of material forming the wall, less such a quantity of earth.

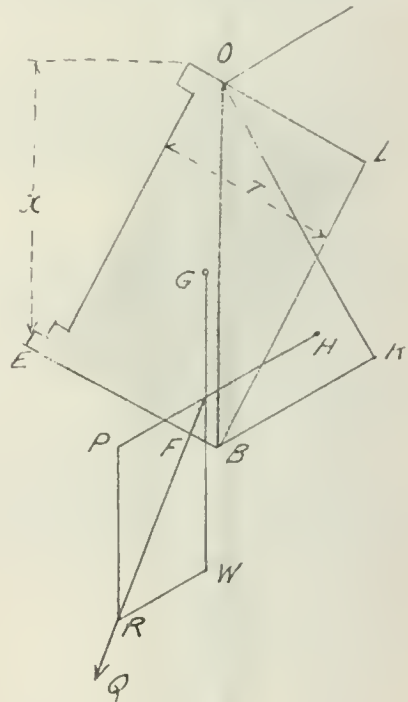


FIG. 11.

The pressure AP is always parallel to the slope of the earth. Its value $\frac{w}{2}$ (12)

and when multiplied by the perpendicular distance from F to PH will give us the overthrowing moment of the wall M. The advantage of the wall, as shown in Fig. 11, is that the slanting face reduces the obliquity of pressure, and allows of the condition of frictional stability being fulfilled.

The centre of gravity of the triangle of earth is then found, also the centre of gravity of the wall. Through the latter is dropped a perpendicular, and through the former is drawn a line parallel to the natural slope (HAP in the diagram). Where it cuts A on the perpendicular is the point from which the parallelogram of forces is set out as before explained in order to ascertain if the resultant falls in the middle third of the base.

CASE V.

Let us consider what happens in a wall under water pressure. Referring to Fig. 12, we suppose the wall AB subject to water pressure all the way up. The water is assumed to weigh 62.5 lb. per foot-cube = w.

Set off $BD = AB$, then the pressure over 1-ft. run of the wall is equal to

$$P = \frac{BD \times AB \times w}{2} \dots \dots \dots 13$$

which, however, acts at the centre of pressure, which is one-third the way up from B. We then have an overturning moment equal to

$$\frac{wh^3}{6} \dots \dots \dots 14$$

which must be equal to or less than the resisting moment of the wall. Say, for instance, the wall was 10 ft. high, overturning moment would be equal to $\frac{62.5 \times 10^3}{6} = 1,040$ lb.-ft. If the mean thickness of the wall was equal to

$$7 \times 10 \times 1 \times \sqrt{\frac{62.5}{125}} = 7 \times 10 \times 1 \times .7 = 4.9, \text{ say } 5 \text{ feet,}$$

the wall would be safe.

CASE VI.

In case, however, the wall was subject to pressure on both sides, the thrust will, of course, be materially reduced according to the difference of levels of water

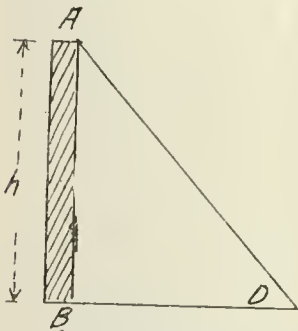


FIG. 12.

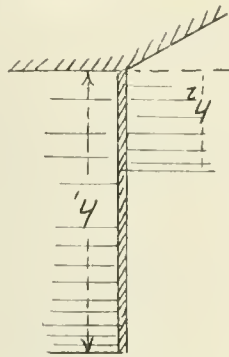


FIG. 13.

on each side. For instance, the total pressure on a wall of breadth b is equal to

$$P = h_1^2 - h_2^2 \left(\frac{bw}{2} \right) \dots \dots \dots (15)$$

where h_1 and h_2 are as shown in Fig. 13. But this pressure will no longer act at a point one-third the way up the wall, but at a distance from the base equal to

$$\frac{\frac{1}{3}(h_1^3 - h_2^3)}{h_1^2 - h_2^2} \dots \dots \dots (16)$$

which, of course, will alter the circumstances considerably.

CASE VII.

But when a retaining wall has been designed, and the pressure worked out as shown, and a diagram

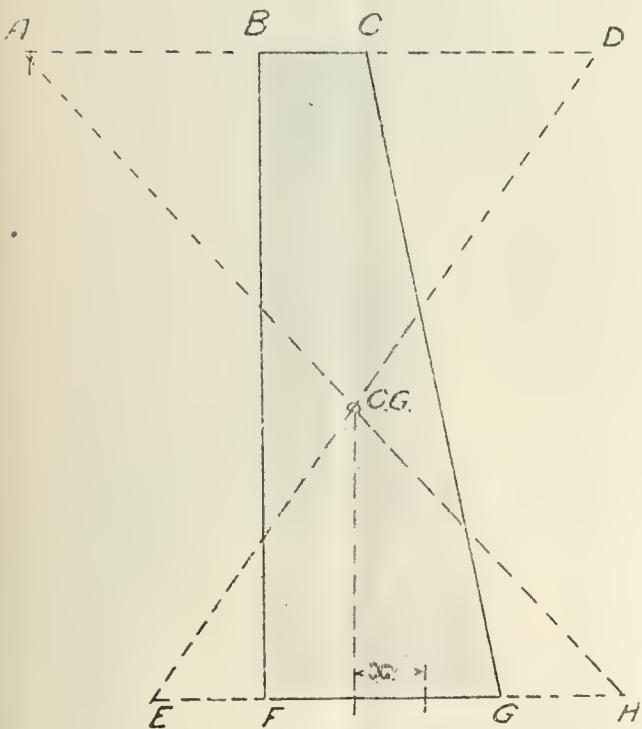


FIG. 14.

plotted showing the position of the resultant, it is necessary, as we pointed out with the ordinary garden

wall, to find if we have a safe tension and compression by equation 9. For instance, in the wall shown in Fig. 14, which is drawn to scale, we find the pressure is equal to $\frac{1 \times 12^2}{2} \times 62.5 = 4,500$ lb., the wall being 12 ft.

to top-water level, and the amount equal to $4,500 \times \frac{12}{3} = 18,000$ lb. Attention is also drawn to the dotted lines as a means of finding the centre of gravity of the wall. This is done by setting out AB, CD, each equal to FG and EF, GH each equal to BC, and joining the diagonals. The centre of gravity is at their intersection. Proceeding, we find the resisting moment of the wall, if built of 6-1 concrete at 130 lb. per foot cube = $5 \times 130 \times 15 \times 1 = 9,750$, from which we find

$$\text{a value for } x = \frac{18,000}{9,750} = 1.84, \text{ say.}$$

$$\text{Then } Z = \frac{6d^2}{6} = \frac{1 \times 5 \times 5}{6} = 4.166. \text{ Now } 9,750 \div 2,210 = 4.35 = W. \quad M = 4.35 \times 1.84 = 8.0.$$

$$\text{Hence } \frac{W}{A} + \frac{M}{Z} = \frac{4.35}{5} + \frac{8.0}{4.166} = .87 + 1.92 = 2.79 \text{ tons}$$

per square foot compression and 1.05 tons tension, both within safe limits.

CASE VIII.

Now, previous mention has been made of battering walls; we proceed to investigate how this batter is most economically laid out. First set out a preliminary rectangular wall by means of equation 11, and find its centre of resistance F (Fig. 15). Set out the point f vertically below g , the centre of gravity of the irregular space OE/N. Now make QN equal to three times Ef, and join EQ, and the irregular prism so enclosed is the safest and most economical deduction we can make from the rectangular section. The same reasoning applies to the curved wall shown in Fig. 16; but while the foregoing method

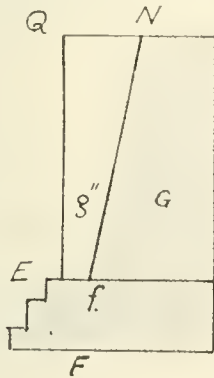


FIG. 15.

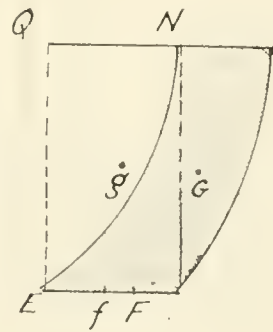


FIG. 16.

of finding the centre of gravity is applicable to Fig. 15, in Fig. 16 we must find the centre of gravity of the complementary rectangular wall g , and then make the distance gG equal to

$$\frac{1}{3} QN \dots \dots \dots (17)$$

The curve EN may be either circular or parabolic.

CASE IX.

Counterforts are often used in retaining walls; they, of course, strengthen them, and somewhat reduce the

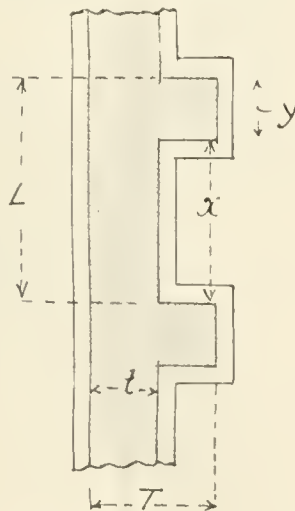


FIG. 17.

total quantity of material; but their special efficiency is in their bending effect which they exert on the

earth backing. Referring to Fig. 17, let x , T , t and y be as shown.

Then the moment of stability of that wall between the counterforts will be

$$S_1 = gwh \cdot t^2 \dots \dots \dots (18)$$

$$\text{and at the counterforts } S_2 = gwh \cdot y \cdot T^2 \dots \dots (19)$$

Then the mean stability of the wall per unit length is equal to

$$gwh \frac{x t^2 + y T^2}{x + y} \dots \dots \dots 20$$

whence, by transposing, we have

$$t_1 = \sqrt{\left(\frac{x t^2 + y T^2}{x + y} \right)} \dots \dots \dots (21)$$

Hence, if we design a wall with a safe value of t , the value of t_1 found as above should show a saving of material which, however, will sometimes only be very small, because the ratio of masonry in the plain and counterforted wall is as

$$x t + y T \text{ is to } (x + y) t_1 \dots \dots \dots (22)$$

It is usual to step out the base of retaining walls in front, as shown in Fig. 15. It tends to bring the resisting moment towards the middle of the base.

CASE X.

Another form of construction found in high-class work is that shown in Fig. 18, in which arched re-

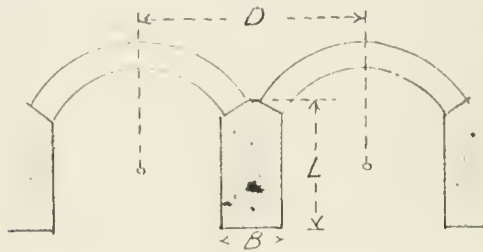


FIG. 18.

cesses are formed in the wall, using the notation in the figure

$$L = T \times \frac{\sqrt{D}}{B} \dots \dots \dots (23)$$

$$\text{and } B = D \times \frac{T^2}{L^2} \dots \dots \dots (24)$$

T being found by equation 11

Under the heading of retaining walls will come bridge abutments.

CASE XI.

Let us consider an ordinary girder bridge first. Referring to Fig. 19, the abutment would first of all be

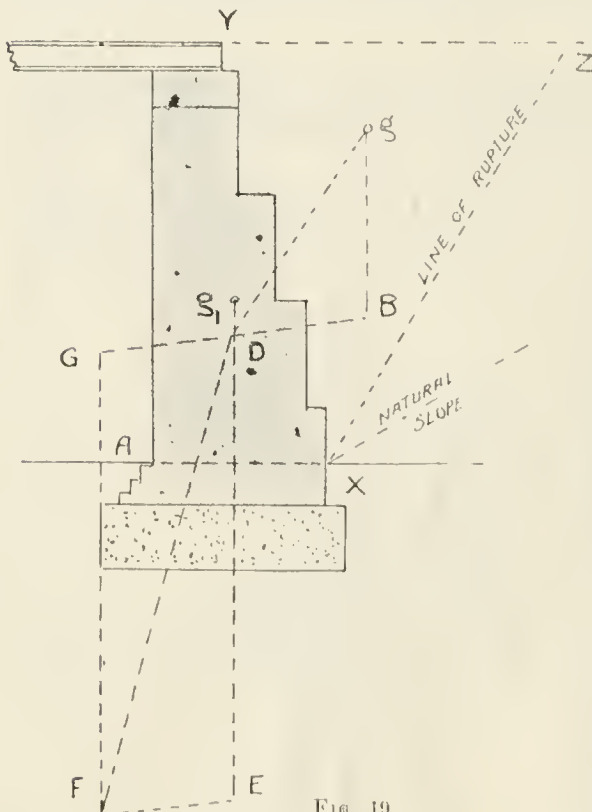


FIG. 19.

set out approximately by first ascertaining, by any usual methods, the live and dead load likely to come

on it. This would then be distributed according to the safe load on the material of which it is going to be constructed. The foundations would be stepped out to distribute this load over a sufficient area according to the bearing power of the soil, and the wall would either be sloped or stepped out behind, as shown. At ground level the angle of slope is set up and bisected so as to get the level of rupture; we then have the wedge of earth XYZ. Find the centre of gravity g in the usual way, and drop gB , a perpendicular, through it to any suitable scale equal to the weight of that wedge plus the greatest live load on the bridge. Divide this quantity by the distance between the wing walls. Now draw gD parallel to the line of rupture, cutting g_1E in D . BD will be the total thrust on 1 ft. of the abutment. Let AX be the ground line, and of that part of the abutment above AX find g_1 , the centre of gravity, and drop a perpendicular to meet GB in D . Let DE = weight of wall between wing walls plus half the dead and live loads on the bridge, and divide this by the distance between the wing walls. Make $FG = DE$, and complete the parallelogram, and then DF is the resultant, which, of course, should fall within the middle third of the masonry.

CASE XII.

The abutments of arches are treated somewhat differently. We consider half the arch, and find the

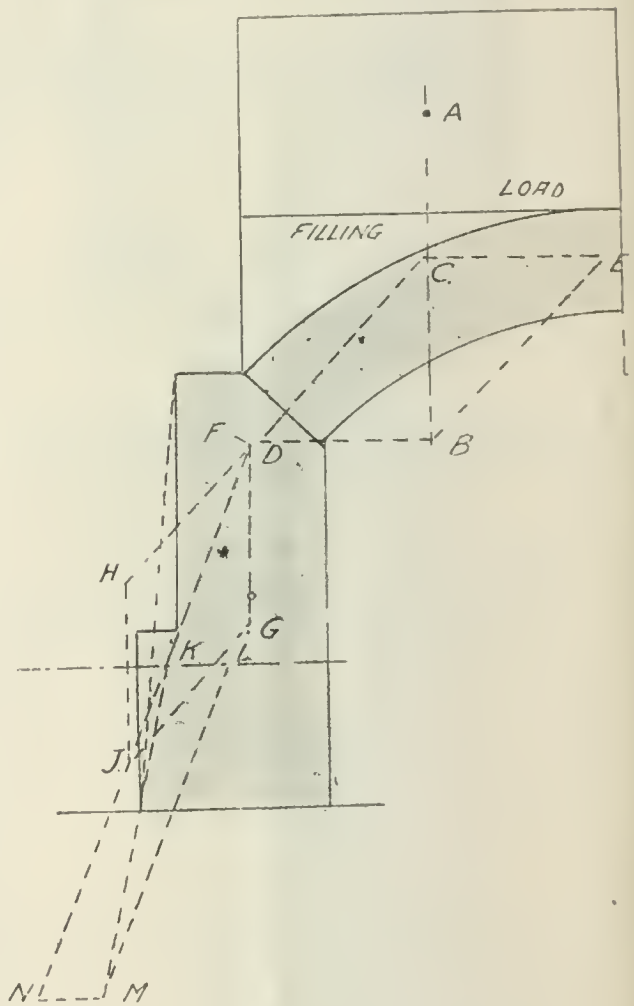


FIG. 20.

greatest load likely to come upon it in cwt. We then consider this equivalent live and dead load as so much masonry, and plot according to 1 cwt. per foot cube in the form of a rectangle (Fig. 20). Find the centre of gravity of this rectangle, and also of half the arch; drop the perpendicular AB , and from the top of the middle third at crown draw a horizontal line to cut AB in C . Join C to bottom of middle third at the abutment. From C set off CB weight of arch and load above. Complete the parallelogram $DCEB$. From the centre of gravity of wall set up a perpendicular cutting CD in F , and from F set off the weight of the wall FG , and thrust at the skewback FH , and complete the parallelogram $FGJH$. We then combine the resultant FJ with the thrust of the earth, and get the parallelogram $KLMN$. Find the value of the resultant,

and the distance at which it cuts the ground line from the centre of the wall, and finally test by the

equation $\frac{W}{A} + \frac{M}{Z}$ in the usual way.

TOWN PLANNING INSTITUTE.

INAUGURAL DINNER.

Formed to advance the study of town planning and civic design and generally to promote the artistic and scientific development of cities, the above-named body held its inaugural dinner—with Mr. John Burns, President of the Local Government Board, the guest of the evening—on Friday last at the Connaught Rooms. Among those present were Sir Aston Webb, F.R.I.B.A., in the chair, Sir George Gibb, chairman of the Road Board, Sir Laurence Gomme, clerk to the London County Council, Sir Alexander Stenning, Prof. S. D. Adshhead, F.R.I.B.A., Prof. P. Geddes, Captain G. Swinton (Road Board), Messrs. T. Adams (Local Government Board), H. R. Aldridge, J. W. Cockrill (president of the Institution of Municipal and County Engineers), R. Collins (surveyor to the Enfield Urban District Council), E. G. Culpin, W. R. Davidge, F.S.I., ASSOC.M.INST.C.E. (district surveyor, Lewisham), C. J. Jenkin, M.INST.C.E. (surveyor to the Finchley Urban District Council), F. O. Kirby, M.S.C. (borough surveyor, Doncaster), G. L. Pepler, F.S.I., J. S. Pickering, M.INST.C.E. (president-elect of the Institution of Municipal and County Engineers), H. E. Stilgoe, M.INST.C.E. (city engineer, Birmingham), Raymond Unwin, F.R.I.B.A., and L. Vigers, past-president of the Surveyors' Institution.

In proposing the health of Mr. John Burns, Sir ASTON WEBB spoke of the President of the Local Government Board as "the father of town planning." It was to him they owed the foundation of the institute, composed as it was of engineers, surveyors, architects, lawyers, and administrators.

Mr. JOHN BURNS said that town planning meant the adoption of the environment and amenities of the people to the needs of that community. "I agree with the futurists to this extent," said Mr. Burns, "that a nation cannot live on the beauty of the past. It is our business to see that, while incorporating everything which we have derived from the great civilisations of the past, we put into the organisations of city life the same forethought, order and design, the same skill, and the same labour conscientiously applied, not to repeat in modern times mere slavish replicas of classical examples, but to produce cities adapted to modern needs." In the four years since the Town Planning Act was passed 200 local authorities, mainly large towns and cities, had moved definitely in the matter of town planning. Fifty with a population of over 5,000,000, not including London, had so far applied to the Local Government Board for authority to prepare schemes. In two cases schemes had been finally approved and three were before the board for final approval. Other cities had been authorised to prepare schemes, and about 150 cities were at work on the preliminary stages. Mr. Burns, defending his department in the matter of the charge of undue slowness in approving schemes, said that it was much more important to have the ground carefully prepared and surveyed—what he called "pegging out the whole of the country for posterity"—than to accelerate with undue haste the final stages of the scheme. They were told that town planning ought to be made compulsory, but he thought that the result of that would be the creation of stereotyped plans and chess-board schemes, and he was convinced that for the moment it was neither practicable nor desirable. He did not think that an amendment of the Act was possible for some years, but short of that it would be possible to improve and simplify the regulations and procedure and to give relief wherever necessary, and he hoped that shortly these improvements in procedure would be submitted, and that as the result the movement would progress more rapidly.

"The Town Planning Institute" was proposed by Sir LAURENCE GOMME, and responded to by Mr. RAYMOND UNWIN and Mr. J. W. COCKRILL.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

THE WATER SUPPLY OF BERLIN.

FIGURES FOR THE YEAR 1912.

An official report, recently issued, contains interesting figures relating to the supply of water to Berlin in the year 1912 (or April 1, 1912, to March 31, 1913), with, in some cases, the corresponding figures for preceding years. The information here given is taken from an extract from the report, appearing in a recent issue of the *Zeitschrift für Transportwesen und Strassenbau*, the British equivalents for metric quantities being added in most cases.

Since the rainfall over the area served, and the distribution of that rainfall throughout the year, considerably affect the consumption of water for some of the purposes of a town supply, the conditions at Berlin in this respect are of some importance in the present connection, and the monthly rainfalls for the year 1912 are therefore given in the following table, together with the monthly averages for a period of sixty years.

	Measured rainfall in inches.	
	1912	Averages 1848-1897.
April	1.32	1.43
May	1.37	1.83
June	1.94	2.49
July	0.39	2.87
August	3.51	2.24
September	1.31	1.63
October	1.22	1.83
November	2.04	1.68
December	2.33	1.78
January	1.01	1.46
February	1.02	1.49
March	1.37	1.67
Year	18.83	22.40

The rainfall for the year was less than the sixty years' average by 3.57 in., the chief defect being in July. The figures for the sixty years show that the average annual rainfall is not much less than that of a considerable portion of England. The distribution is favourable, being notably regular, with the largest totals in the three summer months, and the next largest in May, when the sun exerts nearly its greatest direct effects.

Another table in the report shows that the population of the area served has increased but little during the past five years. Beginning with 1908, we find that there was a decrease of 0.25 per cent in 1909, followed by increases of 0.59 in 1910, 0.59 in 1911, and 0.50 in 1912, when the population was 2,085,473. The consumption of water increased by 3.76 per cent in 1910, and by 7.30 per cent in 1911, but decreased by 1.58 per cent in 1912 (compared with 1911). Of the total supply just over 92 per cent was through meters, of which, on March 31, 1913, there were nearly 32,000 in service. More than 11,000, or over 35 per cent of the meters were changed during the year from all causes.

Of the total supply, less than 1 per cent was used in the watering of open parks and pleasure grounds in Berlin, about 1.88 per cent in street sprinkling, about 2.3 per cent in flushing the sewers, and a little more than 0.04 per cent in watering the trees in the streets of the city.

The total quantity of water supplied was 73,879,605 cubic metres, or about 16,254 million gallons; but certain losses and allowances reduce the figure for statistical purposes to about 72,700,000 cubic metres, or nearly 16,000 million gallons.

The average consumption per head per day was 91.20 litres, or about 20½ gallons. The maximum consumption per head per day (on July 13th) was 135.46 litres, or nearly 29.8 gallons, and the minimum (on April 8th) was 60.89 litres, or 13.4 gallons. The proportions of maximum, mean and minimum were, therefore, 1.49:1.00:0.67, or, on the slightly larger full total of the supply, 1.478:1.000:0.663. These figures can conveniently be kept in mind, since the maximum day's draught was nearly 1½ times the average, and the minimum nearly ⅔ of the average.

While the maximum days' draught is a matter of importance with respect to the capacities of the mains, the maximum draught for a whole week is a more important matter as regards the storage capacities of

the service reservoirs, or the capacity of a principal main or aqueduct "upstream" of these. In Berlin, in the week of maximum draught, 1,880,398 cubic metres were supplied to the distribution system, and, assuming that this corresponds to the supply, the total of which was 72 millions odd cubic metres, we have nearly the proportion of 188 to 140 maximum week to average week, or 1.34 to 1.00. A proportion of 1½ to 1 for the day of maximum draught is reduced, therefore, to little more than 1½ to 1 for the week of maximum draught, which, it may be noted, began two days later.

In the week of least draught the consumption was 1,152,633 cubic metres, or about 0.82 of the average.

For nearly the whole area—that is, for Berlin itself the consumption per head per day was less than in 1911, being 92.21 litres against 93.90 litres, the figure for 1910 being 88.27 litres.

The cost of the water is given for every year since 1905, the term used being "selbstkostpreis." It increased from 9.12 pfennig in 1905 to 10.59 pfennig in 1909, was somewhat less in 1910 and 1911, and was 10.826 pfennig in 1912. Taking a mark as 1s., this is equivalent to a cost of nearly 5.9d. per 1,000 gallons.

The position as regards various new works now in progress is stated in the report, and it is expected that some addition to the present supply will be available by next summer.

MUNICIPAL WORK AT CLACTON.

SEA FRONT IMPROVEMENTS.

Clacton-on-Sea Urban District Council are carrying out this winter a handstand colonnade scheme, in the cliffs on the Marine Parade East, at a cost of £12,000. This will give seating accommodation for 3,900 persons, of whom 1,500 will be sheltered from rain, and 2,500 from rough winds. The surveyor, Mr. D. J. Bowe, is carrying out this work entirely by administration. A bathing chalet is also being provided on the east cliff for the accommodation of eighty persons at one time, the cost of this being £850.

The whole of the shops forming Pier Gap have been demolished, and in their place planted terraces leading to the pier are being formed. A ferro-concrete bridge of ornamental design, with a span of 60 ft., and a width between the parapets of 20 ft., is also in course of erection in connection with this scheme. These improvements, including the purchase of property, is costing the town some £7,000.

The protection of the foreshore and accretion of beach is being continued in view of the great improvement shown during the past two years, and two additional concrete groynes, each 400 ft. in length, will be proceeded with during the summer, at a cost of £3,500.

The scavenging and watering of the main roads is being transferred by the county council to the urban district council, and the roadway at the junction of Pier-avenue and Marine-parade will be widened. Additional shelters on the sea front are in contemplation, while a public highway widening scheme is being prepared, and several private streets will be made up. The electric light station is being enlarged, and new workshops and stores built in the town-yard, and a convenience for both sexes erected at Magdalen-green.

Royal Institute of British Architects.—The annual exhibition of designs and drawings submitted for the Institute Prizes and Studentships 1913-1914 is now open at the R.I.B.A. Galleries, 9 Conduit-street, W. The exhibition will be open each day from 10 a.m. till 8 p.m. (Saturdays till 6 p.m.), and will close on Monday, February 9th.

Refuse Disposal in London.—Reporting upon the disposal of refuse, the Westminster Highways Committee state that some 115,000 tons of refuse have to be disposed of each year by the council, and the cost of disposal is a very heavy item of expense. The question, the committee say, is one which affects all the districts of London, and they think it would be mutually advantageous to the metropolitan local authorities to confer on the matter. The following recommendation is appended to the report: "That a conference of representatives of the Corporation of London and the metropolitan borough councils be convened at the City Hall to consider the whole question of the disposal of refuse; that each authority be invited to send three delegates, one to be the engineer or cleansing superintendent, and that it be referred to us to make the necessary arrangements."

SURVEYORS' INSTITUTION.

PRELIMINARY EXAMINATION, 1914.

The following candidates have satisfied the examiner in the above examination:—

Messrs. T. E. Arnistead, Bradford; R. D. Badoock, Lynton; F. Barnes, Herne Hill, S.E.; R. H. Barnes, Leyland, near Preston; W. J. G. Beach, Street, Somerset; G. T. Beale, Streatham Common, S.W.; W. H. Bennett, Stamford Hill, N.; A. E. Boucher, Lutterworth; R. W. Bright, Bushey; G. B. Brown, Watford; H. H. Buckle, Lichfield; H. V. Budgen, East Grinstead; K. W. Calvert, Bath; J. L. Charles, Leeds; S. J. Chittenden, Hove; C. H. Collins, Handsworth, Birmingham; J. H. Collins, Little Horton, Bradford; E. L. Colston, Gerrard's Cross, Bucks.; E. T. Covington, Clapham Common, S.W.; F. M. Craston, Withington; L. Dallow, Rowley Regis; N. H. N. Darley, Newton Abbot; A. J. Davis, Highbury, N.; A. H. Dawes, Wellingborough; H. Digby, Woodford Green; V. C. Donaldson, Upper Clapton, N.; A. Donn, Maida Vale, W.; L. F. Dunbar, Hemel Hempstead; G. E. Edwards, Arley, near Bewdley, Worcestershire; C. E. Elliott, Southbourne, Bournemouth; H. M. Enderby, Skegness; E. M. Evans, Aberystwyth; J. E. V. Evans, Llanelly; R. C. Evans, Wrexham; G. F. Fisher, Moseley, Birmingham; A. H. Fisk, Bushey; A. E. P. Grant, Llanidloes; R. J. Gratton, Ashbourne; A. F. Greenwood, Bradford; T. C. N. Hall, Shrewsbury; S. J. Hannaford, Chulmleigh, N. Devon; E. A. Hardman, Enfield; A. Hinxman, Winchester; W. S. Hobson, Disley, Cheshire; K. S. Holland, Bishop's Stortford; C. J. Homer, Birmingham; G. H. A. Hughes, Luton; F. Jenkins, Keynsham, near Bristol; A. S. Jennings, Worcester; D. S. Jones, Llangennech, Carmarthenshire; H. A. R. Jones, Carreg Llwyd, Oswestry; R. O. Jones, Carnarvon; G. A. Joy, Witchampton, near Wimborne; E. R. Lake, Brockley, S.E.; F. Lamberth, Cricklewood, N.W.*; P. L. L. Lea, Moseley, Birmingham; K. Liell, Purley, Surrey; K. H. Limmer, Cromer; H. K. Liversedge, Great Crosby, Lancashire; H. Makinson, Leigh, Lancashire; E. P. Miles, Guildford; W. Minifie, junr., Bridgnorth; H. Norman, Hasland, Chesterfield; B. Oliver, Walton-on-Thames; H. J. T. Paige, Heage, near Belper; G. O. W. Palmer, Cambridge; R. H. Parkins, Barnet; A. C. Patching, Worthing; K. L. M. K. Pierson, Shoreham; J. L. Porter, Colwyn Bay; J. L. Postlethwaite, Doncaster; G. P. Price, Birmingham; N. F. Proctor, Chiswick, W.; R. J. Prydderch, Leeswood, near Mold; J. W. A. Pyper, Bath; D. Rayner, Cambridge; R. G. Redington, Great Ryburgh, Norfolk; J. C. Roberts, Carnarvon; H. P. Ruthven, Aldershot; E. M. Sant, Stansted, Essex; T. A. Sims, Salisbury; G. A. M. C. Smales, Whitfield, Dover; P. G. Sneath, Hampstead, N.W.; A. Stocker, Fulham, S.W.; C. A. E. Stredder, Acton, W.; R. E. Symonds, Norwich; T. O. Teasdale, Carlisle; N. Thacker, Lypiatt, near Stroud; T. H. Walter, Forest Hill, S.E.; P. L. Ward, Bere Alston, S. Devon; W. C. G. Warne, Faringdon, Berks; N. A. C. Weir, Old Trafford, Manchester; G. Weston, Bedford; H. E. Whorwell, Dover; L. O. Wilkes, Redditch; H. C. Williams, Harborne, Birmingham; F. G. Wilsher, Brighton; A. F. Wyeth, Epsom.

SCOTTISH CANDIDATES.

Messrs. T. Craig, Cross-hill, Glasgow; T. Fulton, junr., Kilbarchan.

The Expenses of Delegates.—The Finance Committee of Kensington Borough Council recently addressed to the Local Government Board a letter inquiring whether the council were legally entitled to defray the reasonable expenses of the chief sanitary inspector if he attended the Royal Sanitary Institute Congress as their delegate. The board replied stating that they are not aware of any provision in the general law enabling the council of a metropolitan borough to defray out of general rate the expenses of any person appointed to attend as their representative at the congress in question. Feeling that the position in this matter is an extremely unsatisfactory one, the council agreed to bring it before the Metropolitan Boroughs Standing Joint Committee to see whether some concerted action could not be taken with a view to securing amending legislation to allow of the metropolitan borough councils defraying the reasonable expenses of members or officers who may be appointed to act as delegates at conferences or congresses.

* Head of list.

Society of Engineers.

PRESIDENTIAL ADDRESS OF MR. H. C. H. SHENTON.*

It is necessary for me, in the first place, to express my sincere thanks to the society for electing me as their president for this year, and to state my great appreciation of this kindness and also of the responsibilities which attach to the position.

A society like our own, which, if we consider the age of the two amalgamated societies, has been in existence for sixty years, and which is open to all engineers, whether civil or mechanical, has evidently a good reason for its existence, and has a great work to do—viz., to consider and promote the welfare of all engineers, irrespective of their exact calling or rank. It is a question whether the growth of a large number of new engineering societies is for the ultimate good of the profession. Indeed, unless they co-operate they must inevitably tend to reduce each other's vigour



MR. H. C. H. SHENTON.

and consequent usefulness. Greater co-operation and more friendly intercourse is, therefore, very desirable, for it is perfectly obvious that the energy of each individual is limited, and that, with the multiplication of societies and their meetings, the attendance at each meeting must be less, and that mediocre and indifferent results will be produced unless there is some sort of combination. Friendly intercourse is, therefore, desirable and essential.

THE ORGANISATION OF THE ENGINEERING PROFESSION.

There are many signs that there is need for better organisation in the profession. This is to be observed both in England and in America, and a great deal of consideration has been given to the matter; but at the present time many of the efforts made are individual and spasmodic, the work done by the largest body of all—viz., the Institution of Civil Engineers—being, in a great measure, unknown to the vast body of engineers. Some societies make such work the nominal object of their existence, and incidentally it may be observed that the mere existence of any society of engineers should tend in the direction of proper organisation of the profession, for the first rule of that society should be that its members shall be engineers.

Engineering is an honoured profession, and good engineers receive quite as much consideration and respect from the general public as they either desire or deserve. No better organisation of the profession

will increase the respect with which a properly trained and qualified engineer is regarded at the present time. There is nothing in the profession as it stands which makes it in any way less honourable than the highest professional calling. The trouble is that the general public often regard persons as engineers who have absolutely no claim to the title, such persons being allowed to call themselves engineers without hindrance.

The Society of Engineers is at the present time devoting considerable attention to the subject referred to—viz., the organisation of the profession, and the well-being of the engineer—and will spare no pains in the future to promote this object. Such work is being considered not as an isolated effort in opposition to what is being done in the same direction by other societies and institutions, but is taken up with the object of ultimately securing a combined effort of the whole profession, and the formation of a controlling body representative of every branch of the profession, which would thus be in a position to accomplish effectively the reforms which are generally admitted to be necessary. This is not a selfish undertaking done simply for our own honour and glory, neither are we arrogating to ourselves a right which belongs equally to other societies, but it is a genuine effort to increase the interest of engineers in a movement to their own advantage, and to support loyally any satisfactory effort that may be made by others.

Although there is nothing wrong with engineering as a profession, there are a great many difficulties with which the engineer has to contend which come under consideration. The employment of persons who are not engineers to do engineering work is one of them; the employment of engineers at an improper rate of payment is another—to give only two instances. In the legal profession no unqualified person may practise as a solicitor under a penalty, yet in the engineering profession, where human life is sometimes dependent upon the work, no such safeguard is to be found. It is quite a common thing to find an over-worked surveyor in a rural district receiving a salary of perhaps £60 or £70 a year, dealing with the spending of very large sums of money on purely engineering work. If the profession were properly organised such a person could not be found. If he were competent he would not be allowed to work for insufficient pay, and if he were not an engineer he would not be allowed to do the work.

I would therefore urge that all engineers, whether they are members of this society or not, should regard the serious effort that is being made for the better organisation of the profession, and that they should assist us by bringing matters pertaining to the subject to our notice and by working in friendly conjunction, and should remember that we, as a society, are anxious to assist them in anything that can have a useful bearing on the subject.

WASTE OF PUBLIC MONEY.

Much public money is wasted owing to these causes, and taking only one expense—viz., that of the work done for local authorities by persons who are not engineers—the fact is perfectly plain, and it is therefore necessary in the public interest that engineers should combine in the endeavour to make it impossible that their work should be given to persons outside the profession. Again—and here I speak on my own subject—it is equally important that such works as those of sewerage, sewage disposal, and water supply should be carried out by engineers who have special knowledge and experience of these particular subjects. At the present time this country is full of instances where the public money has been wasted by the construction of works which are quite unsuitable for their purpose. If the list of failures in sewage disposal works and in water supply works were recorded, together with the names of those responsible for the work done, the result would be very instructive.

Again, this appears to be an age in which any person, without respect to his qualifications, may pose as an authority, and write a text-book for the use of students. There are to hand at the present time examples of recently published books on engineering matters, and especially upon the subjects of water supply and sewage disposal, which are full of obvious

* Delivered on Monday evening last.

errors. Such books may be useful enough to the engineer of experience who can discriminate between right and wrong, but it is grossly unfair to the student to put into his hands a text-book calculated to lead him astray. It seems as if all that is required at the present day is for a person to make an assertion. The assertion goes forward, frequently without comment, as a fact, and becomes a source of error. The authority is generally unquestioned. This is an unreasonable attitude on the part of the public, including sometimes engineers. If a great engineer of world-wide reputation makes an assertion, that is merely his opinion, but we have it on good authority, and it is therefore of great value; but if an unknown person of inconsiderable attainments writes a book and makes various hard-and-fast rules and assertions, these ought not to be allowed to go forward for the guidance of students without proof. It seems as if some sort of Press censorship is desirable. A department might be formed for the careful reading of new books written by unknown authors, with a view to their inclusion in a list of text-books suitable for students preparing for examinations. Naturally, when a student visits such a library as that of the Institution of Civil Engineers, he is inclined to regard the books in that library as having received the approval of the institution, whereas such libraries receive books both good and bad. I have certainly come across books and writings recently which bear traces of the mental aberration of the author, but such books frequently receive no proper criticism in the engineering press, and may be accepted as among the number of ordinary text-books.

Again, some of these books are written, if not by manufacturers themselves, by those who appear to be willing to advertise the goods of a special manufacturer. A book upon water supply, for instance, may, under the heading of "Water Purification," speak of a certain make of mechanical filter as if that filter were the only one of its kind, and may entirely omit to mention the large number of other methods which exist for the purification and treatment of water.

WATER SUPPLY.

At the present time there are certain definite lines of policy that are observed in connection with water supply, and certain principles have also been accepted which will have a far-reaching effect upon engineering work in the future. These are of various kinds, and are the outcome of general experience, research work, the work of the Royal Commissions, and other causes. It has been established within the last few years, and has been definitely confirmed by the Fifth Report of the Royal Commission on Sewage Disposal, that water authorities must be responsible for purifying waters drawn from a river, while the local authority discharging sewage into a river need only purify that sewage to such a degree as to prevent actual nuisance. Considerable doubt existed not so very long ago as to whether it would not be incumbent upon the local authorities to purify sewage to such a degree that all possibility of disease germs entering the river was removed. There was a feeling that an authority like the Metropolitan Water Board ought to pay part of the cost of the works of local authorities in the Thames and Lea valleys discharging effluents above the Water Board's intakes, and claims were made by local authorities who considered that such assistance should be given them. In particular, the author had some experience with regard to this matter in connection with the works for the Sawbridgeworth Urban District Council, in Hertfordshire, where such a claim was actually made, which became a test case, and where much consideration was given to the matter before it was finally decided that the Metropolitan Water Board should not contribute to the cost of the works.

It is also now generally acknowledged that there is need for the collection throughout the country of data as to sources of supply. A systematic hydrographical survey is required. We need to have fuller particulars with regard to rainfall, the run-off of the land, and the yield of streams and rivers. The formation of a central authority and of water boards is required so that the national supply shall be considered as a whole, and although legislation is slow, there can be no doubt that we shall ultimately obtain what is required, and that eventually the whole matter will be administered much more satisfactorily and economically than is at present the case; for it is obviously very wasteful when one large community, which happens to be divided into two or more districts, is allowed to spend money upon two or more

separate schemes, when one large scheme would have met the requirements of the case much more satisfactorily. The combination of districts is to be desired; the appropriation of the sources of supply and gathering grounds by one water authority to the detriment of others is to be deprecated, and the enormous expenditure of money, owing to the conflicting interests that takes place whenever any scheme is brought forward, ought to be avoided. As things stand at present it is generally acknowledged that reform is required.

ECONOMY OF SCIENTIFIC TREATMENT.

Another even more important point that has not yet received the general acceptance that it will receive in the future, is the absolute need of water supply problems being placed in every case in the hands of those who can deal with the matter scientifically, making use of the most recent knowledge and experience on the subject.

It is becoming more and more evident that the engineer must work with the chemist and bacteriologist. To give a few instances: If the water supply of London had not received this thorough attention we should long ago have had to abandon our present sources of supply, and enormous expense would have been incurred in bringing water from a source further afield, but owing to the fact that the whole question has received the very best attention, we have a combination of districts, a reduction of waste, a water drawn from sewage polluted rivers rendered fit for drinking purposes, and what would at first sight appear to be quite impossible brought to successful fulfilment. The same thing applies exactly in other cases. For though the smaller works are of less importance, regarded collectively, from a national standpoint, they are of greater importance even than the supply of London. It is not sufficient for the engineer to obtain a supply of water free from disease germs, obvious pollution, discoloration or objectionable mineral constituents. A water which is apparently desirable in every respect may yet cause very serious corrosion in mains, and algal troubles in the reservoirs, may be productive of animal and vegetable growths in the mains, and may clog the filters. The conditions need to be much more carefully considered than has formerly been usual, and in this the engineer needs very considerable assistance from the chemist and bacteriologist. We are well aware that hard water may be softened, and the fact that plumb-solvent waters may be treated with lime so as to remove this quality is fairly well known, but it is quite a new idea and one that was only recently brought forward in a paper read before this society by Dr. Eric Rideal, that a water may be treated in such a manner as to provide a protective coating to the interior of an iron main, so that corrosion shall not take place. In a report issued by the Institute of Metals such treatment of water was recommended in connection with boiler tubes, but it did not appear that anyone had suggested that it could be applied satisfactorily in the case of water mains. The protection of the interior of water pipes is not an easy matter, and if it can be effected by the treatment of the water it is clear that there will be a saving of expense, because this treatment would only be required at long intervals of time.

The manufacturers and patentees of various processes act upon scientific advice in many cases, but they are naturally special pleaders for their own particular systems, and as commercial men cannot be expected to give the disinterested advice that is given by the private engineer. Unfortunately it is quite a common thing for work to get into the hands of persons who, possessing insufficient knowledge, rely entirely upon advice obtained from manufacturers. This is particularly so in the case of water treatment, and it is also true to some extent in the case of other matters, such as reinforced concrete, which matters will be again referred to.

It has hitherto been generally taken for granted that if a certain water produces corrosion or clogging of iron mains, the only cure for the difficulty would be to put in mains which are of such a character that they will not corrode. Thus pipes are coated with preservative solutions, sometimes with Portland cement, metallurgists seek to find a metal which will not corrode, reinforced concrete pipes, wood stave pipes, and so forth are suggested, but all recent experience tends to show that it is not so much the pipe which is at fault as the water, and that if the matter is dealt with scientifically the corrosive qualities can be removed. This is but one example

of the importance of the question being dealt with as a whole, carefully and separately in each case, by the best scientific advisers, including engineers, chemists and bacteriologists. In cases where underground supplies are in question it goes without saying that the assistance of the geologist is also required.

THE CONSULTING ENGINEER.

On small works the work of the engineer-specialist, the consulting engineer proper, ought to be very carefully distinguished. It certainly seems that the use of the consulting engineer on such work is not properly understood by his clients. Such an engineer is called in to prepare a scheme, and to advise as to the expenditure of a large sum of money to the best advantage. Unless he has considerable knowledge and experience he cannot do such work. It is work of the first importance, and should be highly paid. On the other hand, when the works have been designed, when all the difficulties of the preliminary investigations have been settled, the constructional work does not necessarily require this degree of knowledge. A man of very average attainments can look after the laying of a good many miles of water main quite satisfactorily, and supervise the construction of works which have been properly designed and specified. Such work does not deserve payment at the same rate as that of the consulting engineer, but if we look at the facts of the case we see that, whereas the consulting engineer is expected to prepare his preliminary report and scheme at a very low fee, that he generally has no difficulty in obtaining a fairly large one—viz., 5 per cent upon the cost of the constructional works—in carrying them out. Thus, local authorities have adopted the plan of asking a number of engineers to state the fee at which they are willing to prepare a scheme, and accept the lowest bidder, or at any rate they haggle over the cost of the preparation of the most important part of the work. They refuse to pay the fees of other scientific advisers, and, as a consequence, the best engineers cannot take up such work, and those who do take up the work have to obtain their fee later from the commission on the money paid for its construction. The folly of this generally accepted method is so great that it ought to be the work of engineering institutions and societies to educate the public to a better sense of its duties. If a consulting engineer were employed at a proper fee—and it would certainly have to be a large one—to prepare a scheme of water supply, sewerage, or sewage disposal, the actual construction of the work might very often be left with advantage to the district surveyor under the guidance of the consulting engineer in case of any particular difficulty. To expect a great consulting engineer to be able to give much personal attention to the laying of long lines of small-sized water main or pipe sewer, the construction of man-holes and such-like, is quite as foolish as expecting a consulting physician to make pills with his own hands. He can, of course, employ competent assistants to do the work, but seeing that the consulting engineer is capable of giving advice upon matters of high importance where his opinion is of the greatest value, he should be properly paid for his legitimate work, and the practice of local authorities in endeavouring to cut down his fees or to eliminate them altogether is wasteful in the extreme. More money must be spent in the future upon obtaining the best possible scientific advice, and this will result in a very great economy in the cost of the works, whereby the money spent on the specialist will be saved many times over.

It is also entirely wrong, especially in the case of smaller works, that the more expensive the scheme the greater should be the fee of the engineer, and that the more personal attention he gives to the scheme the less will be his rate of payment, for it is certainly possible, by giving one's best work, to devise a scheme which will be very economical. Thus the careless or incompetent person who designs works of an unnecessarily expensive character will receive a much larger fee than the better engineer who works out a thoroughly economical scheme. It is the duty of a society like our own to take steps to educate public opinion in this matter. It is not to be supposed that such work can be done quickly; it will undoubtedly take many years, but those who have the welfare of the profession and the general public welfare at heart will see the necessity of working on these lines.

As a striking example of the folly of approaching waterworks problems unscientifically may be instanced the large number of dams which have failed in America and elsewhere. In most cases these failures have been due to lack of geological knowledge.

The dams themselves have been quite strong enough to withstand the water pressure, but the water has managed to find its way underneath them. We have many instances in this country as well as abroad of the difficulties which have occurred owing to the particular geological conformation of the ground.

It is wrong to take the view that the engineer can be a specialist in all subjects, and it is perfectly correct, for instance, for the municipal engineer to call in the consultant to advise him or his council in case of need, in the same way as the town clerk will require to have counsel's opinion upon any difficult point of law, and it is also perfectly correct for the consulting engineer to require the advice of other engineer-specialists, of chemists, geologists, bacteriologists, and so forth, as the case may require. If the profession is to be properly organised, the consulting engineer ought not to undertake personal work for which he does not specialise. It will at once be urged that under such conditions it might be impossible for him to earn a living; but this is not so, for if each man undertook to do only the work for which he was specially fitted, and if other engineers refused to do that work, it stands to reason that he must of necessity receive a great deal more of his proper work, and that he would do this with greater advantage to himself and to his clients than could possibly happen in the case of work that rightly belonged to some other engineer. He would have to pass on such work as he was not personally well qualified to do, and for which he has even now to pay away the bulk of his profits to skilled assistants, if he carries it out properly. It is still worse for an engineer to take up work which he does not understand, and to obtain advice from manufacturers who, in some cases, even go so far as to call themselves consulting engineers.

ADVICE GIVEN BY MANUFACTURERS.

These manufacturing firms employ expert assistants, but they give designs and advice free of charge in order to sell their appliances, and although they, the manufacturers, may receive disinterested advice from the engineers whom they employ they must recoup themselves, and if they, as commercial men, do not give disinterested advice they cannot be blamed. This is particularly the case with regard to reinforced concrete. Many persons, having a reinforced-concrete structure to build, obtain their designs free of charge from the manufacturers of reinforcing material. If they possessed the knowledge required they would design their own structures, and if they cannot do this they ought to consult a specialist and work with him, and pay him for his advice. The Local Government Board have very properly raised very serious objections to the reinforced-concrete designs brought forward by the officers of local authorities when it was perfectly clear that such officers had a very imperfect knowledge of the subject, and relied entirely upon advice given by manufacturers.

Similarly in water purification or sewage disposal there are many instances of persons obtaining direct from manufacturing firms designs which may or may not be the best for the purpose, but which of necessity are designed by the manufacturers in order to sell their particular appliances. If this system of obtaining designs free of charge from manufacturers is to be admitted as being in conformity with the rules of the engineering profession, it follows that any person of organising capacity, however limited his knowledge of engineering may be, may carry out very large works which are really designed by other people, and about which he is quite incompetent to express an opinion, and to charge the full fees of a consulting engineer for doing so. Moreover, the system is most unfair to the manufacturers, who, in order to keep their trade, must prepare a very large number of designs which are never used, without making any charge for them, such designs frequently being required merely for estimating purposes. If the profession recognised its responsibility in such matters, and could educate public opinion in the right direction, there would be a great saving in time and money to the manufacturer, and only the properly qualified engineer would be able to take up work.

It may be urged that these ideas are impracticable, but if we cannot attain our ideals within a lifetime we may yet work towards them. We have not to consider what is easy of accomplishment, but what is right.

RECENT DEVELOPMENTS IN WATER ENGINEERING.

Of recent developments in water engineering the various methods for the treatment and purification of water are very remarkable. The possibilities seem almost infinite, as if there were no water, however

impure, which could not be raised to a high standard of purity by adequate treatment. The growing practice of purifying swimming bath water, and using it over and over again for months demonstrates extraordinary possibilities. It has been found that, after many months' use, water so treated is quite equal in quality to the ordinary town supply. The use of the mechanical filter, together with chemical treatment, has increased enormously, and there are many instances of the employment of such filters dealing with several million gallons a day, some of them being in this country. There are also many other filters of various types which have their uses according to special conditions, and the slow sand filter is still very largely employed. Sterilisation of water by means of hypochlorite has been very generally adopted in America, and also, to some extent, in this country, notably as an after treatment with the mechanical filter, and there is abundant evidence to show that the typhoid death-rate has been lowered, and sometimes lowered to zero, as the result of this treatment. Ozone sterilisation is in use on the Continent at a good many large installations, and the ultra-violet rays have also been applied to the sterilisation of comparatively large town supplies in France. It cannot be said that these methods have made much headway in this country, the reason being that our supplies as a rule are not open to the objection of gross pollution. It is, however, notable that Dr. Houston has advised the Metropolitan Water Board to sterilise the flood waters flowing into the storage reservoirs by means of an overdose of lime, and it is also notable that the ordinary lime treatment seems to include sterilisation apparently unsuspected hitherto, at any rate in some cases.

REPLENISHMENT OF UNDERGROUND SUPPLIES.

A recent Memoir of the Geological Survey, dealing with the wells in the London district, contains the suggestion that the water-bearing stratum—viz., the chalk under London—should be replenished artificially with water, and it is suggested that the water falling upon the impervious stratum surrounding London should be drained into dumb wells carried down to the level of the Thanet sands. An enormous quantity of water which now runs to waste would thus be collected. This would be stored in the fissures of the chalk, and would raise the level of the water throughout the London district, which level has fallen 100 ft. or more within recent times, owing to the enormous amount of water which is pumped therefrom. The advice is based upon Mr. Bryan's experiment at Lea Bridge, where a large quantity of filtered Lea water was run into the wells, with the result that the well supply was materially improved during the drier periods of the year. This is certainly a very interesting suggestion, and the principle probably has many other applications.

THE WORK OF STATE DEPARTMENTS.

The value of hydrographical surveys and of State consideration of water supplies is shown at present chiefly by the work done abroad. The work in America is well known, while in our own Colonies we have such examples as the case of Western Australia, where the State engineer, having reported a large sub-artesian basin existing under the drier districts, boreholes were sunk throughout the sandy plain, with the result that good supplies were secured at depths of from 20 ft. to 100 ft. The good work was assisted by the Government, who lent the settlers hand-boring plant. Thus great advantages were derived and many wells and reservoirs were made. It is questionable whether the same degree of praise is to be given to the German Government, who recently sent a water diviner to South Africa "to practise under State patronage the cult of the divining rod."

PUMPING.

One of the most important changes in connection with water engineering has been in pumping. The use of the high speed engine, the steam turbine, the internal combustion engine, and the electric motor has resulted in the development of the rotary pump. Centrifugal pumps are now largely used, and by running in series are found to be efficient and useful for very high lifts. Producer gas is found to give economical results for large and small powers, and its application is very marked. Further, we have the Humphrey explosion pump, which does away entirely with the engine and most of the working parts of the pump, of which the Chingford installation provides an example near to hand. This pump is also being used for sewage lifting, and apparently has an appli-

cation for both small and large supplies where a moderate lift is required.

WATER WASTE.

An interesting point relating to some of the older systems supplied from new sources under great pressure is the effect which a largely increased pressure has upon the old mains, services, valves and fittings. This is particularly the case with regard to New York, where it is feared that the increased pressure may lead to a considerable loss of water from various causes. It is certainly a point to be borne in mind where a new supply at a higher pressure is provided. In London we have a splendid example of what may be done by careful inspection and scientific management in reducing the loss of water due to waste, but such methods are not by any means universally adopted. In American cities the waste is apparently enormous, and a great deal of interesting work is being done in order to reduce this waste. The pitometer is a simple instrument which has been proved to be exceedingly useful in measuring the flow in water mains, and by its use a great deal of waste has been discovered. Great carelessness is sometimes shown in this country with regard to waste. In one instance within the writer's experience a small town whose population had not increased in any marked degree since the waterworks were constructed, found it necessary to duplicate its well, reservoir and pumping to the insufficiency of the supply. It was clear, however, that enormous waste was taking place, and eventually a 4-in. main was discovered at the lowest part of the system broken in half, discharging into the river, but the great point is that this discovery was not made until the works had been duplicated.

WATER MAINS AND RESERVOIRS.

The use of steel mains is largely on the increase, and although the Local Government Board will sanction only a short-period loan for them, they appear to be taking the place of cast-iron mains in a great many cases.

With regard to reservoirs, the chief advance is in connection with reinforced concrete, which is undoubtedly a very economical and useful material, and it is evident that a large number of reinforced concrete reservoirs, some of them of large capacity, are being built in this country. In this case, again, the Local Government Board will not sanction a loan for a long period, but the saving which accompanies the use of this material is so great in some cases as to do away with the inconvenience that would otherwise be experienced from the repayment of a loan during a short period, that is to say, the annual payments are sometimes found to be very little larger in the case of the short loan for the reinforced concrete than for the long period loan with a masonry structure.

One of the most noteworthy features of recent practice is the increased use of cement injection. We see, for instance, in the case of the Catskill aqueduct, that the pipes were made of concrete, and that these were made watertight by systematically injecting cement grout under pressure behind the walls of the tunnels. There are several instances where extensive fissures causing leakage under reservoir dams have been satisfactorily filled with cement grout forced in under pressure through borings. The same method is sometimes adopted in order to form masses of concrete for foundations where clean gravel exists under water. Some interesting experiments have recently been carried out with regard to this matter. The rendering of surfaces by means of the cement gun, wherewith cement is thrown out under pressure from a nozzle and applied to the surface to be treated is worthy of note. The method has also been used for lining large pipes.

With regard to the storage reservoirs and the construction of dams, recent progress shows that very much more attention is being given to geological considerations than was formerly the case, and that it is worth while to give very much greater attention to preliminary investigations with regard to the site of the reservoir, and to prove by every possible means its suitability before starting the work. Sir Alexander Binnie, in his recently published book, has laid the greatest stress on this point.

Dr. Houston has shown in the case of London that storage reservoirs may be used for water purification, it being found that a few weeks' storage is sufficient to kill or to devitalise harmful germs. The method is hardly likely to be very generally applied, because the water probably does not need such purification, and,

moreover, the cost of constructing the reservoirs makes the system prohibitive in the majority of cases. There are also possibilities of trouble with regard to algal growths in the water.

PRIVATE SUPPLIES.

One of the most remarkable points that may be noted regarding our present system of water supply in this country is the manner in which, in the middle of a water district, the private individual is at liberty to make his own well and obtain his own private supply. The fact that in London there are a very large and increasing number of wells supplying works, institutions, offices and the like, in the middle of the district of the Metropolitan Water Board, suggests that there is something amiss. It seems as if there is a waste of energy in this duplication of works, and while the private owner relies upon the public mains for the protection of his building in case of fire, he appears to be exempt from his responsibility of paying for it if he has his own private wells. Interesting as all these private supplies may be, there seems to be something amiss in the general control of affairs that they should be necessary.

SEWERAGE AND SEWAGE DISPOSAL.

With regard to sewerage and sewage disposal, we are in a much more satisfactory condition than was the case only a few years ago. The first reports of the Royal Commission on Sewage Disposal were certainly open to criticism, but there is no doubt that their work has been an education to the officers of the commission, and consequently the later reports have been of much greater value, and have removed many misconceptions. It has been found that there are a number of methods of sewage disposal, none of which are applicable to all conditions, but which have each their special uses. Sewage can be certainly purified to any required degree, and the Fifth Report of the Royal Commission dealt very fully with the various possibilities. However, the existing conditions throughout the country still gave rise to very great dissatisfaction. It was seen that purification works were demanded for various towns regardless of the local conditions. There were instances such as that of Erith, where an effluent of a high standard of purity was made to discharge just below and within sight of the Barking and Crossness Metropolitan outfalls, where sewage of very much greater volume is discharged in a very impure condition. Practically no attention was paid to the question of whether a nuisance was caused by the discharge of sewage or not. The publication of the Eighth Report of the Royal Commission, however, shows that this matter has received considerable attention. The officers of the commission, as will be seen in the Appendix to the Eighth Report, suggested that the quality of the sewage discharged was not the chief matter to be considered, but that the stream itself ought to be the ultimate arbiter in the case. Thus, if a stream or river, after the discharge of sewage or effluent into it, were found to be unharmed—that is to say, if it showed no signs of nuisance, and if it retained a certain degree of dissolved oxygen—this should be taken as proof that the sewage required no further treatment. Further, experiments carried out with great care showed that if sufficient dilution were given to screened sewage entering a river, purification was effected by this dilution. The commissioners did not actually adopt this suggestion made by their officers, but advised that the law should be altered so that a person discharging sewage into a stream should not be deemed to have committed an offence, provided that the sewage conformed to a certain standard. They suggested for this general standard that the sewage discharged should not contain more than 3 parts per 100,000 of suspended matter, and with its suspended matters included should not take up at 65 deg. Fahr. more than 2 parts per 100,000 of dissolved oxygen in five days; but they also advised that special standards, demanding either a higher or lower degree of purity, should be made applicable as local circumstances might require or permit. Thus, if the dilution afforded by the stream were very low, the standard would have to be raised, but if the dilution were very great the standard might be relaxed or suspended altogether, and that if the dilution should be over 500 volumes all tests might be dispensed with, and crude sewage from which the solids had been removed might be discharged. These are most important recommendations, and will no doubt be acted upon at some time in the future. It must not be thought that there is any probability of persons or authorities being allowed to discharge unscreened crude sewage into rivers which serve as sources of

water supply, though it is quite conceivable that in some cases where the dilution is sufficient filters may be omitted.

BACTERIAL POLLUTION OF RIVERS.

Experiments in the Great Lakes of America have shown that harmful bacteria from sewage may be carried out for several miles from the shore, and may contaminate water at intakes situated in places which one would imagine to be in absolutely safe positions. The Royal Commissioners do not say anything about the possibilities of bacterial pollution in their Eighth Report, but it is probable that in the case of the American outfalls the reason why harmful bacteria are carried to such great distances in the water is because the sewage is unscreened; for it is certain that with floating solid matters there is no limit to the distance to which disease germs may be carried, and this may account for the many serious typhoid epidemics in America, while we in London, drinking water which is admittedly sewage polluted, apparently suffer no ill-effects, and typhoid germs are not found even in the raw waters. If even a small proportion of the sewage passing into the Thames and Lea were unscreened, there is very little doubt that conditions would be very different.

STAND-BY TANKS.

One of the most useful recommendations contained in the Fifth Report of the Royal Commission was that referring to the use of stand-by tanks for storm water at the disposal works. In the older works filters were generally designed to deal with a certain volume flowing down at a certain rate, and every time this rate of flow was exceeded the sewage escaped over the storm overflow. Now all such sudden rushes are either dealt with partly on the filters, and any excess is intercepted in the stand-by tanks for further treatment.

GENERAL PURIFICATION.

The usual principle at the present time is that of keeping back the sludge by screening, settlement or precipitation assisted by the use of chemicals, so that an effluent containing as little suspended matter as possible has to be treated by the filters. The treatment of this liquid is a matter which has been brought to perfection. It can be filtered and treated till it conforms to any required standard of purity, the degree of purity being limited only by the degree of treatment given. If, owing to exceptional conditions, it is necessary to sterilise the effluent, this can be done without any great trouble, as is practically demonstrated by various works where it has been adopted. It may be added that, although when the sterilisation of sewage was first suggested the idea was ridiculed, the process is now among generally accepted methods, although it is very rarely that there is any need to apply this process. It has been found possible to construct filters of various types in such a manner that they do not clog up. The black, earthy matter that forms in a well-designed filter which has been properly worked is discharged with the effluent, and can be intercepted in settling or humus tanks, which tanks, if properly designed, are very effective in clarifying the liquid. Indeed, it is to be noted that in the case of Hertford, where it was proposed to use sand filters for the final purification of the effluent, the Metropolitan Water Board, who were the party chiefly concerned in the matter, and the Local Government Board decided that it would be better to use humus tanks instead of sand filters.

SLATE BEDS AND CONTACT BEDS.

The value of the Dibdin slate bed has been proved, as may be seen in the Seventh Report of the Royal Commission on Sewage Disposal. It is there shown that such beds dealing with crude sewage will, if properly worked, retain their original capacity for an indefinite period, provided that the sludge is regularly and carefully run off. The slate bed thus answers the purpose of the settling tank; but it does more, for, putting aside the question of the reduction of the sludge in volume, it is found that the slate-bed sludge "possesses only a slight odour," and this statement is quoted from the Royal Commission Report. It is much to be regretted that, owing to the simplicity of the principle upon which they work, the slate bed and the contact bed have very often—one might almost say generally—been badly constructed and improperly worked. Thus bad results have been produced, and discredit has been thrown upon a system which should be of very great value to the engineer. The author having constructed many contact beds in different parts of the country, and carried out a considerable number of experiments both in working and construc-

tion, during the last ten years, has found that with proper working contact beds will give excellent results, and are specially useful for the treatment of sewage containing a large proportion of brewery refuse. Further, it is possible to fill the beds in such a manner that no crude sewage or effluent likely to cause a smell is exposed to air, and thus one of the chief troubles of the sprinkler filter is overcome. It is not suggested that contact beds are better or more economical in construction than sprinkler filters, but it is suggested that under many conditions, especially at small works, they will be found to give very much more satisfactory results. This presupposes that the same amount of care as is generally given to the construction and working of the filter is given to the contact bed. The nuisance from smell experienced with the sprinkler filter is in the majority of cases not very great, and, as a rule, freedom from smell may be attained by careful preliminary treatment.

TANKS.

It would seem that, having regard to the recommendations contained in the Eight Report of the Royal Commission, the settlement of sewage and various methods for the elimination of sludge will receive even more consideration in the future than they have done in the past, and that filtration may not always be required. Tanks of many kinds are in use, such as the septic tank, the continuous flow sedimentation tank, the quiescent sedimentation tank, chemical precipitation tanks, the hydrolytic tank, and a large number of others too numerous to mention, and it seems probable that, in the future, tanks of the Imhoff type will be largely used. In this type of tank the object is to allow the fresh liquid sewage to pass through rapidly so as to avoid septic action, while the solid matters are retained and held in a separate chamber, where they remain for some time, being drawn off, without emptying the tank, at convenient intervals. It is found that the sludge, after retention in such a tank for a certain time, loses much of its offensive character, and is thus comparatively inoffensive when it is drawn off; but here, again, the whole process is dependent upon careful management.

THE SEWAGE WORKS MANAGER.

The calling of sewage works manager is one of growing importance. The Association of Managers of Sewage Disposal Works is doing excellent work in bringing together a number of men of superior knowledge and experience whose practical work is of such a character that they have earned the highest respect of the engineers whose works are put in their charge, and of all others who have to do with the question. It cannot be urged too strongly that the whole success of sewage disposal works depends upon the employment of the right men to look after them.

SLUDGE TREATMENT.

Several processes are in use for the treatment of sludge, and great attention is being given to the matter. Dr. Bostock Hill and Mr. J. D. Watson, of Birmingham, have each recently dealt very fully with the subject in presidential addresses delivered respectively before the Association of Managers of Sewage Disposal Works and the Institute of Sanitary Engineers. Owing to the pressing need for fertilisers on the one hand, and to the sludge nuisance on the other, there is a growing feeling that the hopes of the idealist may yet be realised, and that this matter, which is now a waste product, a nuisance and an expense, may become a source of income to local authorities.

SEWAGE LIFTING.

The lifting of sewage is also a matter in which considerable interest is displayed. The centrifugal pump has been improved to such a degree that it will lift even large blocks of stone. Naturally, the efficiency is not very great under such circumstances, but attention is drawn to the matter in order to show that there is every reason for the growing practice of employing centrifugal pumps for sewage lifting. The use of the small electrically driven centrifugal pump is also noticeable in isolated positions where it performs the work of an ejector, being automatically controlled. This electrical arrangement has been much improved, and it is rather remarkable that so little is heard of it having regard to the remarkable activity upon the part of manufacturers of sewage ejectors. The automatic sewage lift is, under the right conditions, by far the most economical appliance in use.

The Parsons stereophagus pump, a centrifugal pump designed especially for sewage lifting, is also worthy of note.

SEWER VENTILATION.

The report of the Local Government Board on the intercepting trap tended to demonstrate the comparative harmlessness of sewer gas in general. If the teachings of this report, which has been much criticised, are accepted, it appears that very little more is required in the ordinary system of sewers than to arrange that there may be no pressure of gas in the sewer, which, as a matter of fact, is really all that is done as a rule in any ordinary town system. It does not justify any relaxation in the efforts made to ventilate sewers, but it is some consolation to be told that the dangers of an ill-ventilated sewer are not so great from a health point of view as was generally believed. The abolition of the intercepting trap suggested is an accomplished fact in some places, which seem none the worse for the change. Whether the principle is of universal application is another matter.

EFFECT OF TRAFFIC.

The altered conditions of road traffic and the enormous loads which now come upon road surfaces, and upon manhole covers in particular, should be taken into careful consideration by engineers. There is increasing need for soundness of construction of sewers and manholes and for strength in manhole covers.

PRESENTATION OF PREMIUMS.

At a meeting of the Society of Engineers at which the foregoing address was delivered the premiums awarded for papers published during 1913 were presented.

The immediate past-president, Mr. Arthur Valon, M. INST. C.E., presented the premiums as below:—

The President's Gold Medal to Dr. Eric K. Rideal for his paper on "The Corrosion and Rusting of Iron." [THE SURVEYOR, December 5, 1913.]

The Bessemer Premium, value £5 5s., to Mr. Bernard L. Rigden for his paper on "The South-Eastern Coalfield."

The Clarke Premium, value £5 5s., to Mr. Gerald O. Case for his paper on "Accretion at Estuary Harbours on the South Coast of England." [THE SURVEYOR, November 7, 1913.]

A Society's Premium, value £3 3s., to Mr. Wm. Yorath Lewis for his paper on "The Tram r. 'Bus Controversy." [THE SURVEYOR, February 14, 1913.]

Dampness in Rough Casting.—Rough casting seems to be particularly liable to the penetration of dampness, so much so that many architects are specifying the powder Pudlo to be incorporated in the cement for this class of work. One of the latest users is the architect for the Middleton Sanatorium, near Wakefield. We understand that the architect specified it for the Bradley new schools.

British Appliances in Canada.—As suggesting interesting possibilities, we note that in the city of New Westminster, British Columbia, British goods have been largely used, and may instance Messrs. Ham, Baker's horse brooms, tumbler carts, mud scrapers, &c.; Messrs. Ruston & Proctor's steam roller; and Foden steam wagons (two). Messrs. Glenfield & Kennedy's valves were used throughout on the 25-in. water main, and from the same firm have been ordered four 48-in. sewer sluice valves.

Roads in Jamaica.—The roads of Kingston, Jamaica, states Dr. Angus Macdonald, medical officer of health for that city, in a paper which he contributes to the current issue of the *Journal of State Medicine*—the official journal of the Royal Institute of Public Health—are mainly laid with the local yellow limestone which is an abundant formation in the island. It quickly disintegrates under the tropical sun (and perhaps more rapidly on watered streets), yielding a fine grey dust that is widely distributed and penetrating. Certain city streets are laid with firebrick, which wears well under the comparatively light traffic of the city. Some of the macadamised roads have been finished off with coal tar produced at local gasworks, poured cold, sand-sprinkled and rolled in. Tared surface makes a fairly durable road and a street moderately free from dust, and if the spreading ulcers into which it wears were methodically patched it gives evidence of preserving a good surface with comparative economy. The roadways in the main, however, contribute considerable dust for daily removal.

WORKING-CLASS DWELLINGS IN ATHERSTONE.

By H. J. COLEBY,

Engineer and Surveyor to the Rural District Council.

Owing to the congestion which exists in the courts and yards of the town of Atherstone, some of which have a density of population of over 500 persons per acre, a housing scheme has become imperative, and as a first instalment the Atherstone Rural District Council have just completed ten houses, particulars of the actual cost of which are given below.



ATHERSTONE WORKMEN'S DWELLINGS.

The land for these ten houses cost 3s. per square yard, or at the rate of £726 per acre, but as it abuts on a new road, recently made and sewered by the vendors, the cost of the land really includes the cost of street works.

The site has a rather big fall from front to back.



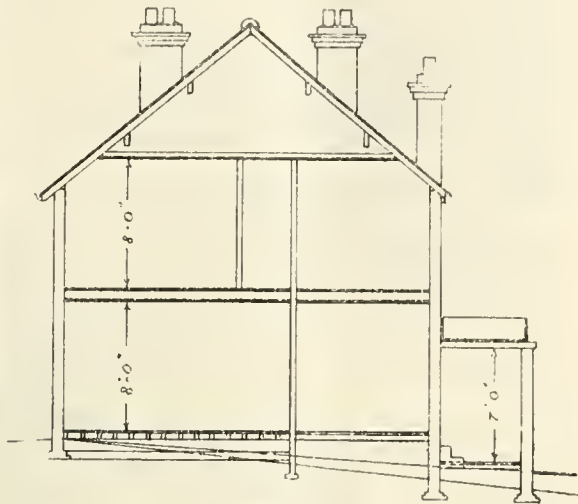
Back Elevation.



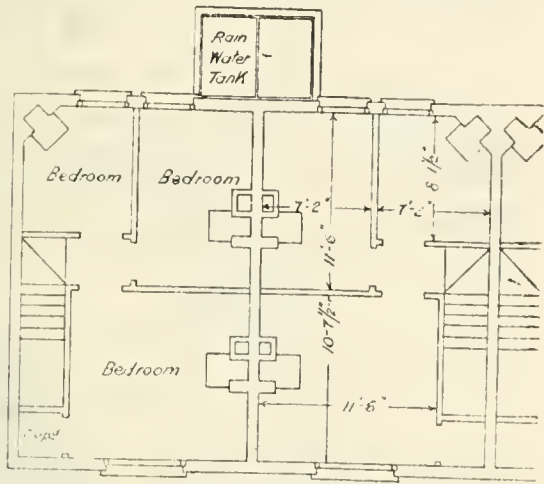
Front Elevation.

built in a continuous row, broken only by a covered entry in the middle. There is, however, ample space in the rear for gardens, and the houses number just over twenty-two to the acre.

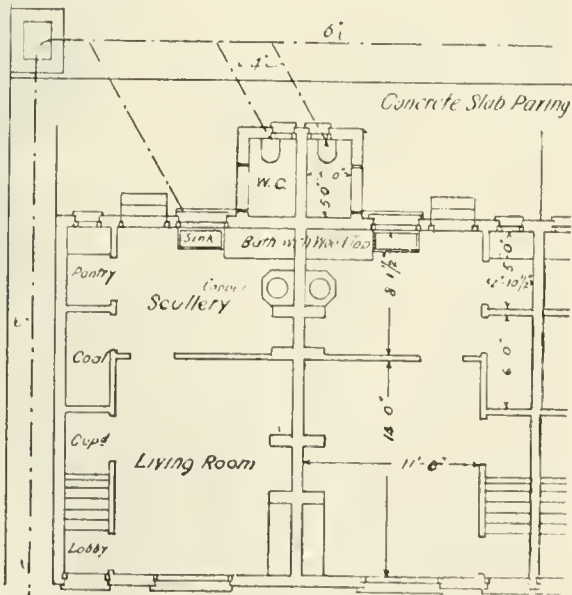
The planning calls for no particular remark, except



Section



Bedroom Plan.



Ground Plan.

SCALE



ATHERSTONE WORKMEN'S DWELLINGS.

necessitating deep excavations for the footings of the walls, and for this reason was not an economical site for building purposes.

As the frontage was restricted the houses had to be

that an effort has been made to include under the main roof all the domestic offices except the water-closet.

The houses are of the five-room type, each contain-

ing a front living kitchen with range, a scullery at the back containing sink, copper and a bath (with a hinged wooden cover), and three bedrooms.

Water is laid on from the town mains to the sinks and water-closets, and large rain-water cisterns, having a draw-off tap over each sink, are provided.

The walls are built with local pressed bricks, faced in front with Haunchwood Reds up to the string-course, the part above this being rendered in cement and dashed with white spa chippings.

The walls internally have been plastered, except those in the scullery and offices, which have been lime-washed; but no papering or distemping has been done.

The actual cost of the ten houses is as follows:—

	£	s.	d.
Builder's contract price	1,395	0	0
Additional work	8	12	7
Firegrates	33	10	6
Water services	16	4	0
	£1,453	7	1
Fencing	36	8	0
	£1,489	15	1

Cost per house = £148 19s. 6d

This works out at 3·945d. per cubic foot.

The houses are let at a rental of 5s. per week each, and from the balance-sheet given below it will be seen that, after allowing 7½ per cent for empties and losses, there will be only a small margin of £7 5s. 6d. per annum for repairs.

BALANCE SHEET.		Annual Receipts.		Annual Expenditure.			
	£	s.	d.		£	s.	d.
From rents of 10 houses at 5s. per week each = £13 per annum	130	0	0	Repayment of principal and interest at 3½%			
Less allowance of 7½% for empties and losses	9	15	0	(a) In respect of land, &c., £330 for 80 years	12	6	9
	4120	5	0	(b) In respect of buildings, £1,489 7s. 1d. for 60 years	58	5	4
				(c) In respect of fencing, £36 8s. for 15 years	3	3	3
				Rates	23	12	6
				Taxes	6	6	8
				Water-rate	1	10	0
				Insurance	1	5	0
				Collection of rents	6	10	0
					4112	19	6
				Balance for repairs, &c.	7	5	6
					4120	5	0

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times*.

Thrust Bearings.—“The Problem of the Thrust Bearing” was the title of a paper read on Tuesday evening by Mr. H. T. Newbigin, ASSOC. M. INST. C.E., at a meeting of the Institution of Civil Engineers. The inefficiency of thrust bearings as compared with journal bearings was pointed out by the author, together with its disadvantage, especially in high-speed machinery. A comparison was made between Coulomb's laws of friction and the late Prof. Osborne Reynolds's hydrodynamic theory of lubrication, and coefficients of friction in bearings of various forms were given. The way in which the friction in a journal bearing changed from dry or greasy friction to perfect lubrication as the speed increased was discussed, and the late Mr. Beauchamp Tower's discovery of liquid pressure in the oil film was described. Viscosity was defined, and the resulting general formula was compared with the results of Mr. Tower's and Prof. Goodman's experiments. The conditions necessary for the maintenance of liquid pressure in an oil film were examined and defined. The subsequent developments of Reynolds's hydrodynamic theory of lubrication were referred to, and Mr. A. G. M. Michell's formulæ for the resistance of lubricated plane surfaces were cited, and the paper concluded with descriptions of thrust bearings constructed on Michell's principle, with illustrations and the results of tests.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

INSTITUTION OF MUNICIPAL ENGINEERS.

NORTH-WESTERN DISTRICT MEETING AT MANCHESTER.

A meeting of the North-Western District of the Institution was held at Manchester on Saturday last. Mr. Horace Boot, president of the institution, was in the chair, and the members present included Messrs. A. R. Bleazard (chairman of the District), T. Fogg (Heywood), J. W. Wiles (Manchester), A. Elder (Oldham), Wilson Briggs (Stockport), K. Grimshaw (Stockport), S. R. Aspinall (Manchester), P. Morris (Doncaster), John T. Shield (Blackburn), R. J. McKenn (Heywood), E. Walker (Stretford), A. Foster (Salford), A. Dempsey, junr. (Eccles), John Liddell (Furness Vale), James T. Davies (Little Hulton), G. H. Hopkinson (Chorley), J. W. Sunderland (Norden), J. W. Gleave (Heywood), and B. Wyand, secretary of the institution.

The first business on the agenda was the election of district officers. Mr. Fogg proposed that Mr. Bleazard continue his office of district chairman, and that Mr. McKenn be elected hon. district secretary, in the place of Mr. Gleave, who had been compelled to resign owing to pressure of work. Both propositions were carried unanimously, and the proposer expressed the hope that Mr. Bleazard would see his way to hold the office for a still further period. A vote of thanks to past hon. district secretaries—Messrs. Thos. Green, Geo. Hayes and J. W. Gleave—was passed.

It was decided that meetings should be held at Leeds, Chester, Oldham and Halifax, the Leeds meeting, in view of the fact that arrangements were already being made for it by the Northern District, being a joint one of the two districts.

A district committee, consisting of the district chairman, hon. district secretary, and Messrs. W. Briggs, A. Dempsey, J. W. Gleave, G. H. Hopkinson, E. Walker and J. W. Wiles was appointed, such committee to meet monthly, and its duties to include the arrangement of meetings and visits. The question of local Yorkshire meetings was brought forward by Mr. Percy Morris, and it was decided that it should be deferred until the Leeds meeting, when a number of Yorkshire members would be present.

The president, in replying to a cordial vote of thanks, said that he was only doing his duty in coming North among the members, and he felt himself specially fortunate in having the opportunity of meeting them there that day. As regards the profession which they followed, it had, he was afraid, to be regarded largely as a labour of love. Other walks of life held out great rewards. Given the same expenditure of talent, resource and hard work in the cotton industry, say, or stockbroking, and a fortune might be realised; but municipal engineers were much in the position of doctors in that the compensation given them for their work was utterly inadequate. Happily, the municipal engineer was a man whose interest lay in his work, and that in itself was no mean satisfaction. All around the engineer was actual evidence of what he had accomplished, and among the many things that this institution (or any similar body for the matter of that) had to do was to bring home to the public the fact that for its comfort and well-being it depended very greatly indeed upon the municipal engineer. The institution which he had the honour to serve as president was the first to move on really progressive lines, and if imitation was really a form of flattery their efforts had been recognised in the most striking manner elsewhere. The institution would still progress, both as regards usefulness and numbers. Life was a stern problem, and only by mutual sympathy, fellowship and assistance could its burden be lightened for the many; and he hoped that the members of the institution would agree with him that such a body as theirs should aim at becoming a real brotherhood.

At the conclusion of the business meeting the members visited the Stuart-street station of the Manchester Corporation electricity works, by kind permission of Mr. S. L. Pearce, the chief engineer. The whole of the work and processes were explained to them by Mr. J. H. Baxter, under whose able guidance they went round.

COUNCIL MEETING.

At a meeting of the council held in London on January 28th, two of the applicants who had been recommended for admission to membership were elected.

ASSOCIATE CLASS.—The report of the scrutineers of

the postal vote was received, and the council have to report that the affirmative votes fell short by one of the three-fifths required by the by-laws. The proposal to form the new class was therefore not carried.

HIGHWAY ENGINEERING.—It was decided that a delegate be appointed to represent the institution on the committee of the Roads Improvement Association.

ARCHITECTS' REGISTRATION BILL.—This Bill is under consideration by the General Purposes Committee, who will present their report at an early date.

CORRESPONDENCE

*Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2.

ROAD DIRECTION SIGNS.

To the Editor of THE SURVEYOR.

SIR,—It is with much pleasure that I have read the remarks contained in the various articles that have appeared on the system of road direction signs that, in conjunction with my assistant, Mr. Bowen, I have designed. One owes much to critics, and these signs could have no better recommendation than that they

turnings; they also indicate those turnings which can be easily rounded, so that much skidding that now takes place would be avoided; (5) by means of signs placed on the direction arms, the necessity for the ordinary Automobile Association signs is obviated; (6) by a simple method of signs on the arms, the distance to the nearest doctor, garage or hotel can be shown.

If a post and direction arms be removed and placed face upwards at the centre of the intersection to which it relates, the arms and post will point in the direction of each of the roads indicated; in fact, the sign is practically a rough plan of the intersection. In working at these signs on the 11th ultimo, it occurred to me that if plans of the intersection were substituted for arms, far better information would be afforded approaching traffic. Thus, a plan 3 ft. diameter, to a scale of 8 ft. to 1 in., will embrace 288 ft.; on this a 40-ft. road appears 5 in. in width, and allows 4-in. letters, easily readable at a distance of 200 ft. Where a post could be observed from each road, plans can be placed on such post facing these roads, and so avoid a multiplicity of posts. If transparent faces are used with a light, these plans might be illuminated at night.

I give an illustration of such plan signs applied to Whatton Bridge, Notts, where Mr. and Mrs. Sansom and Mr. F. W. Holden were killed in December last.—Yours, &c.,

C. H. COOPER, M. INST. C. E.,
Borough Engineer,
Wimbledon.

February 2, 1914.

JOURNAL OR VOLUME?

To the Editor of THE SURVEYOR.

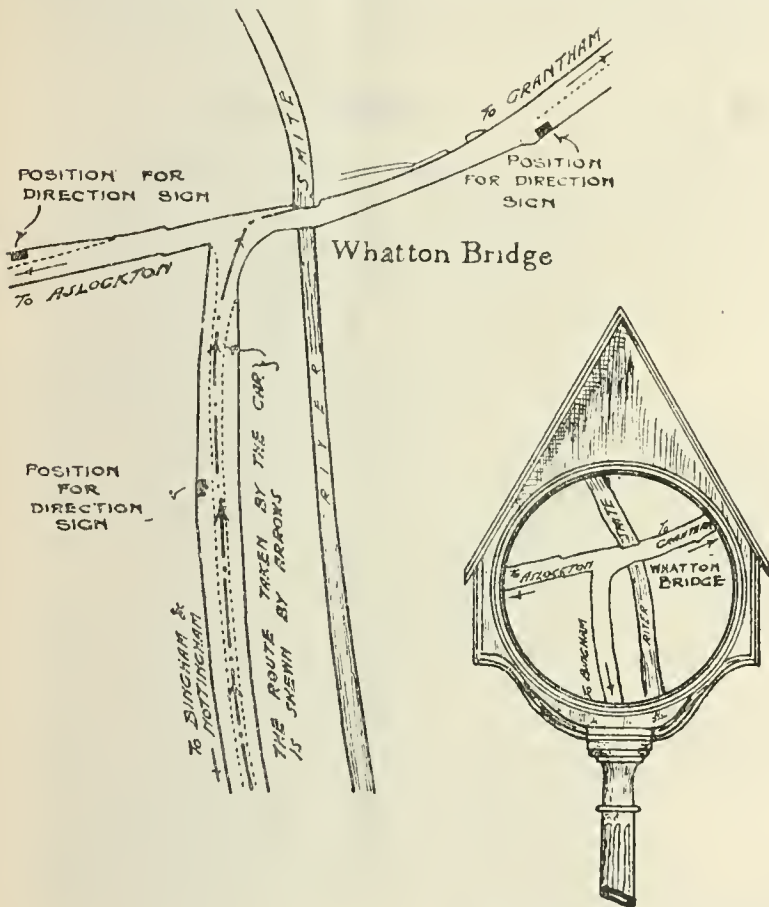
SIR,—I am entirely in accord with the reasoning of your correspondent in your last issue.

We are still obtaining more news from your paper about our institution, and much earlier than the "Journal" can give us—as, for instance, the question of the retiring allowance to be paid to Mr. Cole and the handsome salary to be paid to the new secretary. I wonder why this was never inserted in the "Journal"?

I know that the general feeling among the members is that the clock has been put back at least ten years by the reversal to the "Journal," and I hope at the next annual meeting the council will receive further instructions to reinstate the valuable and good old volume which has been, and would continue to be, a credit to everybody concerned.—Yours, &c.,

A. ROTHERA.

Council Offices,
Liversedge.
February 4, 1914.



DIRECTION SIGN

MR. C. H. COOPER'S PLAN ROAD DIRECTION SIGN.

are "for the convenience of the scorching motorist," admitting that my signs can be read from the most rapid traffic. That such signs would entail unnecessary expense to the ratepayer is, however, not a fact, unless the present unsatisfactory system is allowed to remain. The arrangement of arms is cheaper than that proposed in any of the published designs submitted for competition at the late Road Congress, and as regards the efficiency of the system, none of the designs provided the following, which are essential for rapid traffic: (1) That approaching traffic should have a maximum opportunity of obtaining full information as regards road intersections before reaching same (this is afforded by a direction post placed in each road 100 ft. from such intersection); (2) the arms are applicable to any junction, no matter how intricate it may be, and to parallel intersections; (3) as the direction arms are all placed in one plane directly opposite approaching traffic, they can be easily read; (4) the angles at which the arms are fixed indicate acute, or what are commonly termed "concealed,"

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Commercial Motor Vehicles.—The latest information with regard to the construction, use and cost in service of commercial motor vehicles is to be found in the special overseas edition of the *Commercial Motor* for 1914 (price 6d.). For convenience and ready reference the issue is divided into six broad sections dealing, respectively, with steam goods transport, petrol goods transport, passenger transport, fire engines and municipal motors, wheels and tyres and components, accessories and plant. As a reference book to the particular industry with which it is concerned, it is probably unique, and a production which users of commercial motor vehicles should find of the utmost value.

Our 1914 Annual Issue: An Example to Others.

—A county surveyor writes, under date January 31st: "I am in receipt of the twenty-third annual issue of THE SURVEYOR, which is undoubtedly an excellent edition and contains some most useful information. Will you please send me five additional copies, and charge them on your account? The copies are for the chairman of the county council, the chairman of the Highways Committee, and three other influential members of my committee, all of whom will, I am sure, be greatly interested in the matter contained in this excellent issue."

REFUSE DISPOSAL IN THE WEST INDIES.

[The following notes are extracted from an interesting paper on sanitary conservancy in Kingston, Jamaica, by Dr. Angus Macdonald, the medical officer of health for that city, which appears in the February issue of the *Journal of State Medicine*—the official journal of the Royal Institute of Public Health.]

In bygone years disposal of refuse took place on waste ground where accumulation has raised a mound covering a few acres and some 50 ft. in height. This is now more or less surrounded by property, and has been abandoned in recent years. The refuse deposited here during different *regimes* was either fired where deposited or deposited without being fired. Until recently, also, the deposit of nightsoil took place in deep pits dug in this old refuse mound.

A few years ago, with the view of reclaiming swamp land, a commencement was made of depositing the refuse in swamps to the west of the city. The refuse was here deposited without any treatment, and the result was an unsightly area of fetid, decomposing vegetable *debris*, and masses of paper blowing about, and heaps of broken bottles, kerosene tins, milk cans and old iron scattered irregularly through the mass. The unsatisfactory result of this procedure and the ulterior danger of offence in years to come from gases given off by the decomposition of so much organic *debris* in the swamp caused the writer to consider the advisability of erecting destructors to incinerate the refuse.

It was agreed that high-power destructors . . . were at once ruled out of court because of the great expense of importation and erection, but chiefly on account of the needlessness of these to deal with the type of refuse handled. Probably 90 per cent of the household refuse is readily inflammable, and with a little skill and orderliness the inflammable can be collected separately from the non-flammable; besides which, rain is, unfortunately for other reasons, so rare and so seasonably restricted when it comes, that the combustibility of the material is rarely interfered with.

Experiment was made with

A SMALL INCINERATOR

built after a simple type suggested by Sir Robert Boyce, who had witnessed its use in West Africa.

It consisted in a single brick cell, length and breadth and height about 8 ft. internally, and domed over on top to a chimney fitted with baffles designed to prevent dispersal of burning material. The floor of iron bars had a slight slope from back to front, where there was a folding iron door and rake hole. The grated floor was raised a foot or more off the ground to admit of draught and form an ashpit. Rubble and refuse was embanked to allow approach to the back, where feeding was accomplished through a door in the domed roof. Combustion was satisfactory; feeding was disturbed by emission of smoke and flame; the ash was cumbersome to cope with, owing to the admixture of a certain amount of incombustible street sweepings.

The incinerator was tested for some weeks, and in the result the following conclusions and action were come to:—

Combustion in the incinerator was little more complete than could be obtained in the open.

Firing in the open could be carried on more expeditiously; labourers with pitchforks could readily fling aside the combustible material, most of the incombustible earthy matter falling out during the process of turning over.

Labour engaged on deposit and firing in the open was less than that required for feeding and raking and clearing up around the incinerator.

Ready sale for ash was not to be had, and the initial expenditure of building several incinerators and accommodation for dealing with the ash, together with the cost of labour, was not sufficiently justified.

Besides, for the purpose of mosquito limitation there were the swamps to fill up.

PRESENT METHODS.

The question of incinerators has been for the present abandoned, and the result of the system of disposal now adopted is so far freedom from nuisance, economy and satisfactory mosquito limitation. The method of disposal is simply the orderly filling up of the swamp with the combusted refuse, and is proceeded with as follows:—

The mass of incombustible material—chiefly trade refuse, old iron, tin cans, bottles, brick rubble, &c.—is roughly sorted out at the edge of the swamp and dumped first. Next the combustible material of all sorts is fired on the edge, and as it is fired the ash

deposits on the layer of incombustible rubbish. The surface is next covered over with incombustible street sweepings, mainly limestone dust, and whatever brick rubble and building refuse is brought to the dump.

In this way an irregular and unsightly surface is avoided by deposit of the gross incombustible refuse in the bottom of the swamp. The great bulk of the organic matter undergoes combustion, and future nuisance from decomposition should be averted.

A finished surface is left covered with dust, and freed from the dismal tin can, broken bottle and old iron accumulations that are a frequent unsightly accompaniment of city deposit grounds. The burial of all tin cans removes possible breeding places of *steomyia*. The smoke of the burning material blows daily and a little by night between the swamp and the city, and may prove a barrier to the flight of, at any rate, some mosquitoes.

The reclamation of swamp is less rapid than it was without combustion, but the reclamation of a few acres each year with safety and satisfaction is better than the filling in of three times as much with uncertainty of result. The land will never be used for residential building without the consent of the Health Authority; some of it may come under cultivation, and the seaboard will no doubt in time be utilised in the construction of wharves, piers and store premises. Not a fly is to be seen on the deposit ground—a great advantage seeing that the average dumping grounds of city refuse swarm with myriads of flies.

CONCRETE INSTITUTE.

A STANDARD METHOD OF MEASUREMENT.

The forty-third ordinary general meeting of the Concrete Institute was held at Denison House, Westminster, on Thursday, January 29th, when the following reports were submitted by Mr. S. Bylander, as vice-chairman of the Reinforced Concrete Practice Standing Committee of the Concrete Institute:—

(1) Draft report of the Joint Committee of Representatives of the Quantity Surveyors' Association, the quantity surveyor members of the Concrete Institute and the Reinforced Concrete Practice Standing Committee of the Concrete Institute on a "Standard Method of Measurement for Reinforced Concrete."

(2) Draft report of the Reinforced Concrete Practice Standing Committee of the Concrete Institute on a suggested "Tabulated Form for Preparing Quantities for Reinforced Concrete."

The reports were submitted in the draft form in order that criticisms might be received before the final reports were issued.

The first-named report gave a number of headings consisting of a list of parts of construction, classified under the three main headings of (a) concrete, (b) centering, shuttering, &c., (c) reinforcement—the unit of measurement to be employed for each being set out together with the manner of measurement. Generally, it was proposed that the work on each floor should be kept separate, stating the height from the ground to the several floors. The concrete, centering and reinforcement for each floor should be kept together. No reinforcement should be deducted from the concrete, otherwise all measurements to be net unless stated, and notwithstanding any trade custom to the contrary.

With a view to simplification and convenience, it was proposed that the units of measurement throughout should be the foot and the cwt. This basis is not departed from by the recommendation that centering for large areas should be measured "per square," for that conforms to the decimal system, being merely a decimal multiple of the foot.

The report also included a suggestion for the manner in which, in cases in which the working details were not complete, engineers should indicate (by drawings) for the guidance of their surveyors when preparing the quantities, the thicknesses and weights of reinforcements.

The reports now revert to the committee for reconsideration. Final reports will be issued in due course.

Roads in Ontario. During 1913 £150,000 has been expended on the roads of Ontario, and 220 miles of highways have been added to the transportation facilities. The style of road (says the *Contract Record*) is macadam and gravel, of a type which is giving satisfaction to the provincial highway engineer, Mr. W. A. McLean. The share borne by the Government in the construction and supervision of the work is one-third.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words, as *noms de plume*. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

RIGHTS OF RIPARIAN OWNERS.—"Q" writes: A large weir attached to a disused corn mill has recently been washed away, and the river now flows on its original bed, as it used to over 100 years ago. The water in the river was held up at the weir about 12 ft., and the water level tailed out to 2 ft. 1½ miles up stream. Half a mile up stream, above the old weir, is a soapworks, the proprietors of which turn a filthy liquid into the river 7 ft. below the water level. The owner of the disused corn mill does not intend to rebuild his weir, and the proprietors of the soapworks are commencing to build a weir in the stream 400 yds. below the pipe which discharges the filthy liquid from their works into the stream. The proprietors of the soapworks are owners of the lands on both sides of the river where they are constructing their weir. On the banks of the stream, between the soapworks and the old weir, there is a village of 1,000 inhabitants, who looked upon the washing away of the old weir as a godsend, because in summer time, when the water in the river became stagnant, the stench arising from it became abominable. Now the proprietors of the soapworks intend to perpetuate the nuisance, and the villagers are up in arms, and have called upon my council to prevent the erection of a new weir. The proprietors of the soapworks have been approached by the council, and they contend (a) that, as riparian owners, they have a right to use the water in the stream for manufacturing purposes; (b) that they have now acquired a prescriptive right to maintain the water opposite their works at the level it was at before the old weir was washed away, and (c) that they have a right to construct a weir in the stream for this purpose. It is a well-known fact that the proprietors of the soapworks do not use the water from the stream for manufacturing purposes, and that they wish the stream to be again dammed up to enable them to discharge their filthy liquids gradually, or as opportunity arises, into a big bulk of water 7 ft. below water level, and thus avoid detection. My council have longed to deal with the public nuisance which has existed for the past forty years, but they have been advised that they could not proceed against the owner of the weir, as he did not create the public nuisance, nor could they take action against the proprietors of the soapworks owing to the difficulty of proving that they polluted the stream. My council wish to know (1) whether the proprietors of the soapworks can be restrained from erecting a weir in the stream by my council or by riparian owners immediately above the soapworks whose lands are damaged by floods (in consequence of the weir) when the river rises; (2) whether the proprietors of the soapworks have acquired a prescriptive right to maintain the water at the level it was at before the old weir was washed away; (3) what remedy the council or the riparian owners above the soapworks have against the proprietors of the soapworks when their new weir is completed.

(1) Unless the proprietors of the soap works (hereinafter referred to as "S") have acquired a prescriptive right (as to which see answer to No. (2)), any riparian owner who is prejudiced can bring an action to restrain them from building the weir. And if the river is navigable at this point the erection of the weir would be a public nuisance, in respect of which the council, with the concurrence of the Attorney-General, could take action. A right to commit a public nuisance cannot be acquired by prescription. (2) In my opinion they have not. The mill owners (or their predecessors in title) presumably acquired a prescriptive right to maintain the weir at the mill. But such a right was adverse to the right of S (or their predecessors in title) as riparian owners, and in my opinion could not and did not confer any rights upon S. But even assuming (for the sake of argument only) that this view is wrong, and that S have acquired some right to maintain the water at the old level, they could not (in my opinion) exercise such right in such a manner as to place any other riparian owner in a worse position than he was in before the destruction of the mill weir. (3) Any riparian owner who is prejudiced can bring an action for an injunction. And if the river is navigable the council, with the concurrence of the Attorney-General, could bring a similar action.

SEWAGE FARM: FAULTY CONVEYANCE OF LAND.—"V. L." writes: Some thirteen years ago a rural district council purchased from an owner two plots of land, A and B, for the purpose of a sewage farm. The conveyance for the plot A contains the following clause: "Together with the free right of passage and running of water from the said piece of land hereby assured through the drain or watercourse shown on the said plan, and thereon coloured blue, the council, their successors or assigns cleansing and repairing or renewing the same whenever necessary, and using the same so as not to create a nuisance to the vendor or his tenants. . . ." In the conveyance of plot B no provision of any kind is made for the passage of the effluent, which, as counsel said at the trial, must be due to a slip. The land can only be used for a sewage farm, and the original owner has an option to buy the land back on terms when the land ceases to be used for this purpose. The land has been used for the past ten years as a sewage farm, but the present owner issued a writ against the rural district council for using his ditch for their effluent. The judge has held that the rural district council have neither an express nor an implied grant to use the ditch for their sewage effluent, and that the ditch is not a public sewer or watercourse. He decided against the rural district council, and gave the owner his costs, an injunction, and trivial damages. The rural district council has charged the costs of the action against the parish, for which the sewage farm is used, and a rate has been laid to raise the whole costs of the proceedings. Various points might be raised, and you are asked to give your opinion on the following points: (1) Is the rural district council entitled to charge the whole costs of the case against the contributory parish? (2) Is the rural district council responsible for the omission from the conveyances of proper provision for carrying the effluent away? (3) If so, what is the proper procedure for making the rural district council personally responsible for the cost?

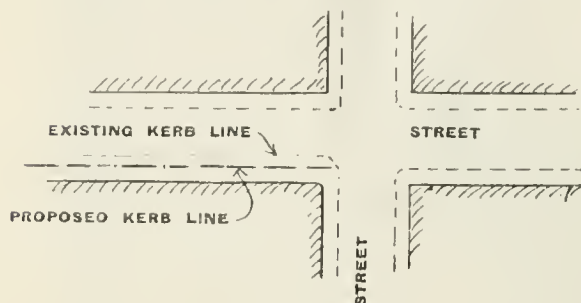
(1) Under sec. 229 of the Public Health Act, 1875, these costs will not be "special expenses" chargeable against the contributory place unless so determined by order of the Local Government Board. (2) In my opinion the council are not responsible, assuming that they employed a properly qualified practitioner to prepare the conveyance and gave him proper instructions. (3) If the amount is allowed by the auditor any ratepayer can test the matter by appealing to the Local Government Board or applying for a writ of *certiorari*.

HIGHWAY: REPAIR.—"L. C." writes: My council have received applications from two ratepayers to effect certain repairs to a road which, up to the present, has been regarded as a right of way only. The road is about 1½ miles long, and connects two main roads. At one end, for a distance of about 340 yds., repairs are carried out, but nothing has been done to the other portion that the council are aware of. A statement has been made, however, that stone was spread and certain repairs were done about thirty years ago, but the council have, up to the present, been unable to verify this. About half way along the road is a very bad and dangerous spot, a drain at one time having been broken in and never repaired. This spot makes it impossible for carts to pass along the road. (1) The road being a right of way to the public, have the council power to repair the drain and make good the road where dangerous? (2) If this can legally be done, does this make the council responsible for the whole of the road, and for any future repairs that may become necessary? (3) If the dangerous spot is not repaired, are the council liable for damage or injury to the public? No evidence can be found that the road was ever dedicated formally to the public, and in three places there are remains of gates that were formerly fixed across the road.

(1) If the road was made and dedicated to public use before August 31, 1835, it is repairable by the inhabitants at large, and in that case the council are bound to repair it. If made after that date, and if there was never any formal dedication, then it would appear that the council have no power to repair it, except as follows: (a) If sec.

150 of the Public Health Act, 1875, or the Private Street Works Act, 1892, is in force in the district the council can make up the road, at the expense of the frontagers, in accordance with the section or Act in force; (b) or if sec. 19 of the Public Health Acts Amendment Act, 1892, is in force urgent repairs can be enforced at the like expense. As to the drain, the powers of the council depend upon the nature of the drain. Unless it is used for the drainage of one building only or premises within the same curtilage it is a "sewer," and in that case unless it falls within one of the exceptions specified in sec. 13 of the Public Health Act, 1875, it is vested in the council, and they have not only power to repair it but are bound to do so. (2 and 3) No.

REDUCING WIDTH OF FOOTWAY.—"Brixton" writes: An urban district council proposes to reduce the width of a footway in an adopted street, as shown in the accompanying sketch. Will you kindly say if the



council have power to do so without the consent of the owners of the property fronting on the footway, and if so under what Act?

Where the relative proportions of the roadway and footways have been intentionally determined by the owners of the soil, the local authority cannot alter the relative widths thereof in the course of making up the street under sec. 150 of the Public Health Act, 1875 (*Robertson v. Bristol Corporation*, 1900, 2 Q.B., 198). But they can do so where such relative positions have not been so determined (*Stretford Urban District Council v. Manchester, &c., Railway Company*, 68 J.P., 59).

These decisions, it will be seen, apply where the local authority are making up a private street under their statutory powers. Where a street in an urban district has been adopted and become a highway repairable by the inhabitants at large, the street and the pavement stones and other materials thereof are vested in the urban district council under sec. 149 of the Act. In the course of the arguments in the Bristol case (*supra*) it was suggested that after the corporation had taken over the street under this section they could alter the width of the footpaths, subject to paying compensation under sec. 308 to any one sustaining damage. It was not, however, necessary to determine this point for the purposes of the case, and it was not referred to in the judgments, nor does it appear to have ever been decided. Seeing, however, that the street and its materials become vested in the urban district council under this section, and that they are thereby expressly authorised to cause the street to be "altered," as occasion may require, in my opinion they can reduce the width of the footpaths of a street vested in them under the section subject to making compensation as above.

PRIVATE STREET WORKS: PUBLIC FOOTPATH.—"Mere" writes: An urban district council is about to make up a private street in their district under the Private Street Works Act, 1892. At present there is only one footpath in the street, and this is a means of access to a footbridge which crosses the railway close by. The path is a public one, and has been repaired by the district council. I should be glad if you would inform me how this affects the apportionment of the cost of making up the road. (1) Would the district council be legally bound to contribute any sum in respect of the kerbing and making up of the path, or can the whole cost of this be levied on the frontage owners? (2) Do the properties abutting on the path front, adjoin or abut on the private street within the meaning of the Act? If there are any decided cases on this point I shall be glad if you would refer to them.

(1) If the footpath is a highway repairable by the inhabitants at large the cost of making it up cannot be charged to the frontagers. (2) Not if the path is a highway repairable by the inhabitants at large. Under the last clause of sec. 150 of the Public Health Act, the frontagers on the path would have been liable (*Evans v. Newport Sanitary Authority*, 24 Q.B.D., 264); but there is no corresponding clause in the Act of 1892.

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

INSTITUTE OF SANITARY ENGINEERS.

THE ANNUAL DINNER.

The annual dinner of the Institute of Sanitary Engineers took place on Wednesday night at the Holborn Restaurant, and was attended by a large company, including many ladies. The president, Mr. John D. Watson, M.INST.C.E., F.R.SAN.I., who took the chair, was supported by Sir William Ramsay, Prof. H. Adams, Mr. H. Percy Boulnois, M.INST.C.E. (past-president), Mrs. Boulnois, Prof. H. Kenwood, Dr. Wynter Blyth, Mr. T. W. Aldwinckie, Mr. H. C. H. Shenton, Mr. H. T. Wakelam, M.INST.C.E. (county engineer of Middlesex), and Mr. E. H. Blake, F.R.SAN.I. (chairman of council).

Mr. H. PERCY BOULNOIS proposed "Our Public Health Authorities," and in doing so said he ventured to think he was the right man for the post. He would tell them why. He had been associated with public health authorities all his life, and beyond that had made his living out of them; and beyond that again he hoped to continue to make his living out of them. As some of them knew who heard his reminiscences a few weeks ago, he started life as a pupil of Sir Joseph Bazalgette. Then he became city surveyor of Exeter, afterwards borough engineer of Portsmouth, and next city engineer of Liverpool. There his direct association with municipalities ceased, and he went to the Local Government Board. He had been a poacher all his life, then he became a gamekeeper. (Laughter.) He would ask them to believe that the public health authorities were not as black as they were painted. They heard more of what they did not do than what they did; but his experience was that the majority of the authorities were there for the purpose of improving the human race; that their whole purpose was to keep the town or district in a thoroughly healthy and sound condition. There might be some members who were grinding their own axe; if so it was the fault of the ratepayers for sending them where they wore. There were a great number of health authorities. On the last occasion when he proposed virtually the same toast as this he mentioned the number, and Prof. Bostock Hill took exception to his figures, and told him that certain authorities were not health authorities. As his figures were criticised he looked up the matter, and he gave it them as he found it, excluding Scotland and Ireland. As a matter of fact, he did not know what might happen in the latter country in a few years. There were 335 municipal corporations, 28 metropolitan boroughs, 809 urban district councils, 658 rural district councils, and 61 port sanitary authorities, making 1,891, or in round figures nearly 1,900 authorities looking after the health of this country. With all that municipal machinery looking after our public health we ought to be an exceedingly clean and healthy nation. Carlyle divided the human race some years ago into anvils and hammers. He (Mr. Boulnois) did not know which of these he was. He had tried to be a hammer all his life, but he had sometimes been an anvil. But he thought they might divide the human race into inspectors and the inspected. There he was more at home, for all his life he had been an inspector, and he was now one of the inspected. He forgot to mention when quoting his figures that there were 650 boards of guardians. He did not know whether these would be called health authorities, or whether the 300 parish councils would be placed in that category. It would be admitted, he thought, that they were well looked after; but, in spite of that, people were not healthy, and had vague ideas of what health meant. Their past-president, Mr. Martin, who, he regretted exceedingly, was unable to be with them that night through illness, suggested the great boom of Health Week, and he believed it would be a great success this year. The Royal Sanitary Institute and the Agenda Club had taken the matter in hand, and he must say that there was great need for such a movement. He read in the papers not long ago about a man who pasted up all the windows and stuffed the chimneys with straw to keep the measles out. Then there was the story of the woman who wrote to the school authorities that she did not want her Tommy to have no bath, as she had sewn him up for the winter." (Laughter.) Only that morning he read in the *Daily Mail* an interview which one of their peripatetic and ubiquitous reporters had with a hygienic hawkler in the Strand, who had enclosed the sweetstuffs he was selling in a glass-covered case in

The Surveyor

And Municipal and County Engineer.

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order to keep out the microbes. The hawker probably did not care twopence about these microbes, but he knew that people wanted their sweets clean, and he resorted to this expedient in order to push his trade. When the lower orders were beginning to wake up to the importance of these matters it was manifest there was something in sanitation. In conclusion, he had great pleasure in proposing the toast.

Dr. H. R. KENWOOD, in responding, said he believed the local authorities had done great work in the past, were doing greater work now than they did in the past, and were destined to do greater work yet in the future. All things considered, they had done this work with clean hands.

Mr. H. T. WAKELAM, who also acknowledged the toast, remarked that he did not agree with the suggestion that there were too many local authorities. Indeed, he thought there should be more, because they would find more work for the members of the professions he saw around him. He had had a great deal to do with public authorities, and he confessed it was sometimes rather difficult to keep one's temper. He was once interviewed by members of a local authority with respect to a proposed contribution towards a wood-paving scheme. "Don't you think," one of them said, "if we put our heads together we could get some wood blocks?" He (Mr. Wakelam) answered that he thought they would. (Laughter.) Adverting to the speech of Mr. Boulnois, he recalled that when he was a young man seeking promotion, as all young men should, he asked that gentleman to support his application for a certain position. Mr. Boulnois replied that he would be very happy indeed to do so, and he was quite sure it was owing a great deal to his recommendation that he succeeded in obtaining the appointment. The recollection of that incident was very pleasant to him, and he should always remember it as long as he lived. Mr. Wakelam, in conclusion, reverted to the difficulty sometimes of getting on with members of local authorities, and told of an official who, after a brief experience, was asked how he was getting on. He replied that "as one half of the council would not speak to him, and he would see the other half further before he spoke to them, he was getting on very well indeed." (Laughter.) In conclusion, he expressed a cordial hope that the public authorities would prosper, and that they would in the future do more than they had done in the past for the maintenance and improvement of public health.

Sir WILLIAM RAMSAY next proposed "The Institute of Sanitary Engineers." In the course of his remarks he said it appeared to him that the members of the Institute of Sanitary Engineers had a very difficult task. They had to know something of everything. They might, perhaps, be likened to the physiologist,

who had not only to be an anatomist, but something of a chemist and something of a physicist. Another and very difficult task was that they had to keep on good terms with a number of public bodies. In general terms, they laid themselves out to better the health of the whole community. They had to look after sanitation—not merely defending the public from the attacks of disease germs, but also making things more convenient in all sorts of ways. After commenting upon what he termed the "coddling" of people by the State, and the feeding and clothing of school children, Sir William asked: "Where is it going to stop? And are we going to stop the production of these children? That is the kind of question which will face us some day or other. Thinking these things over, however, it seems to me that the solution is to be found, as usual, in a happy medium. It wants a great deal of judicious handling." Sir William coupled with the toast the name of the chairman, Mr. John D. Watson.

The PRESIDENT, in reply, said that, as institutions went, theirs was comparatively young and vigorous. It had between 500 and 600 members, all active exponents of that branch of applied science which related to public health works. The importance of their work a few intelligent people failed to appreciate, and a great many more did not appraise it at its true value. As sanitary inspectors it was their duty to be in the van of progress. Considerable responsibility rested upon them, individually and collectively. The lead they gave to public opinion might create the driving power required to convert a public health measure into an Act of Parliament; or it might take another direction and tend to educate the people to form habits which were even more powerful than Acts of Parliament. Nothing was so much required in this country as healthy dwellings for workmen. Every sanitarian had been of that opinion for years, and yet their efforts to enforce their convictions upon the Legislature had been feeble, and almost calculated to make them ashamed of their power. Their influence was less than it ought to be, and their aim should be to increase that influence as much as possible with a view to forwarding the objects for which they stood.

The toast "Kindred Institutions" was submitted by Mr. E. H. BLAKE, and acknowledged by Mr. E. T. HALL and Mr. H. C. H. SHENTON, the latter of whom advocated professional unity. The Society of Engineers, he added, was doing what it could to organise the profession, and they hoped to get engineers of all kinds to help them in an effort that was directed to the formation of a controlling body from all the engineering societies.

Prof. H. ADAMS proposed "The Visitors."

Mrs. H. PERCY BOULNOIS, in reply, urged that women were now called upon to take upon themselves responsibilities, and to take an intelligent interest in the questions of the day. Among other things, they were called upon to be articulate, and put their thoughts into words just as men did. There was, perhaps, a disadvantage in this inasmuch as if they said silly things it was said "Oh, it's only a woman." That was the sort of comment she wished to object to. There was, in fact, no difference between the two. They were, both men and women, persons, and as persons they had an equal right to be suitably trained as citizens. Women could give sanitarians trouble, or take trouble away from them. They were the house-keepers, and had to see that the refuse was put in its proper place, and not left to accumulate in the wrong place. It was no use their arranging for septic tanks if the women kept the refuse in and about their kitchens. Women were, therefore, real sanitarians. Sir William Ramsay had objected to the feeding of school children and giving boots to them. [Sir William was understood to dissent.] It had to be borne in mind that the object was to grow suitable citizens. It was all very well to talk about parental responsibility. She was a strong Conservative politically, but she was anxious to see children grow up healthy citizens, and if boots were requisite it would be all the better for them. Personally, she liked the Scottish fashion of children going barefooted, but she would not deny boots and warm clothes in the interests of the national physique. Mrs. Boulnois advised women to interest themselves in questions of the day, and added that, in her opinion, nothing in life would be complete unless they all worked together as their capabilities enabled them to do.

Sir WILLIAM RAMSAY also acknowledged the toast in a brief speech.

The programme of music and recitations was carried out by Miss Mabel Abbott, Miss Minnie Blake, Mr. John Higgs and Mr. Cyril Dexter.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

The premium for January is divided between

Mr. W. H. HALL,
Town Hall,
Southwark,

and Mr. T. W. PHILLIPS,
Town Hall,
Bexhill-on-Sea,

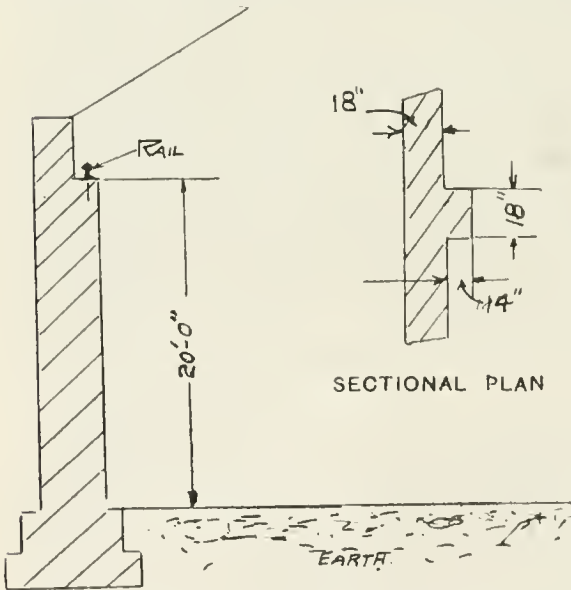
whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

370. Temporary Building Design.—A temporary building is required, 50 ft. long, 30 ft. wide, and 10 ft. to eaves. Design a suitable structure, with steel trusses and stanchions, to be covered with corrugated iron on boards and felt, the bays to be filled in with 4-in. reinforced brickwork. (J. M. N., *Hitchin*.)

377. Machine Shop.—An electric crane is to be fitted in a machine shop on existing piers, as shown in sketch. The piers are bonded into the wall, and about



VERTICAL SECTION THROUGH WALL AND PIER.

12 ft. centres. Assuming the foundations are good, and the work is in Staffordshire brick set in cement and sand, what is the safe load these piers will withstand? (H. W., *Cradley Heath*.)

378. Cost of Running Steam Engine.—Compare the cost of running a steam engine with that of an electric motor in the following circumstances: The horsepower required is 30; electricity costs 1d. per unit, coal (best steam) costs 18s. per ton delivered; the engine is required to drive a stone crusher working an average of eight hours per day for five days per week. (Crusher.)

379. Testing Pipes.—What tests should stoneware pipes be subjected to before they are accepted for use? What defects are often thereby disclosed? (B. W., *Tadcaster*.)

380. Belt Gearing.—A belt running at 1,500 ft. per minute transmits 80-horse power. Find the difference of tension of the two sides of the belt. (T. R.)

REPLIES TO QUESTIONS.

375. Working-class Dwellings.—Twenty working-class dwellings have been built at a cost of £3,500 for the buildings and £250 for the land. What must the rental be to ensure that the income will defray

all loans, &c., charges? Give details as to how the allowances for empties, taxes, insurance, repairs, &c., are arrived at in the estimate. The money has been borrowed from the Public Works Loan Board at 3½ per cent for the usual periods. The poor and district rates are 6s. 8d. in the £ per annum. (Togun.)

The appended balance-sheet is to show how the scheme can be made self-supporting, the figures being based on actual practice in Cornwall, where wages are low. Taking the rental of each house at 5s. per week, we get a total rental of £260 per annum for the twenty houses. The allowance of £10 for empties and loss is taken as being sufficient to meet the case.

The sums of £3,500 and £250 are borrowed for periods of sixty and eighty years respectively, these being the maximum terms allowed by the Local Government Board for repayment of loans on houses and land. This on being worked out shows an annual repayment of £140 and £9 6s. 8d. respectively.

The rateable value of £8 is arrived at as follows:—

	£	s.	d.
Gross rent	13	0	0
Less rates paid by owners	3	0	0
Gross estimated rental	10	0	0
Less 20 per cent for repairs, insurance and other expenses	2	0	0
Rateable value	£8	0	0

The general district rate is taken at 3s. 2d., leaving 3s. 6d. for the poor rate; therefore assuming this to be the case we get the general district rates to be:—

Number of houses	20		
Rateable value per house	£8		
		£	s. d.
		£160	at 3s. 2d. = 25 6 8
Less the usual 50 per cent allowance to owners (Sec. 211, 1 (a), P.H.A. 1875)...		12	13 4
		£12	13 4

Similarly we get the poor rates to be £22.

The property tax, water rate, maintenance, and collection of rates are taken at the usual rates in this part.

ESTIMATED BALANCE SHEET. COST OF HOUSES, £3,500; LAND, £250.

	£	s.	d.	£	s.	d.
Rents. 20 houses at 5s. per week	260	0	0			
Less allowance for empties and losses...	10	0	0			
Repayment of loan at 3½ per cent in equal half-yearly instalments						
(a) In respect of land (£250 for 80 years)				9	6	8
(b) In respect of houses (£3,500 for 60 years)				140	0	0
Rates. — Compounded rateable value £8.						
District rate at 3s. 2d. (less 50 per cent allowance to owners)				12	13	4
Poor Rate at 3s. 6d. (less 25 per cent allowance to owners)				22	0	0
Property Tax at 1s. 2d. on £166 13s. 4d.; gross estimated rental (i.e., £260 less 10th for repairs)				9	14	5
Insurance on £3,500 at 1s. 6d. per cent				2	12	6
Water Rate at 10s. per house				10	0	0
Repairs and maintenance at 7½ per cent on £260				19	10	0
Supervision and collection of rents at 6 per cent				13	0	0
Contingencies				11	3	1
	£250	0	0	£250	0	0

(H. B., *Falmouth*.)

The question is not complete for a full reply, owing to no mention being made of the sewers and roads. Assuming that no portion of the money has been expended on roads or sewers (as shorter periods of repayment are granted for them), and that the

ESTIMATED RECEIPTS.		ESTIMATED EXPENDITURE.	
£ s. d.		£ s. d.	
From rents—		Repayments of loan	
20 houses at weekly		(principal and interest) in respect of	
rental of 5s.	260 0 0	buildings, superintendence, and loan costs—	
		Buildings £3,500 0 0	
		Loan costs	
		at £1 3 6	
		per cent	11 2 6
			£3,541 2 6
		Say—	
		£3,550 for 60 years at	
		3½ per cent	111 18 6
		Land (including all fees	
		and charges)—£250	
		for 60 years at 3½ per	
		cent	9 6 8
		Rates, 6s. 8d. in the £	
		on, say, £8 (rateable	
		value)	53 6 8
		If compounding is	
		the practice in the dis-	
		trict, 25 per cent and	
		50 per cent may be	
		taken off the General	
		District and Poor Rates	
		respectively.	
		Income Tax on, say,	
		£9 10s. (gross), at	
		1s. 2d. = 20s. 1s. 1d.	11 1 8
		Insurance, £3,500 at	
		1s. 6d. per cent ...	2 12 6
		Repairs, cost of collec-	
		tion of rents, inspec-	
		tion, allowances for	
		vacancies and con-	
		tingencies, 15 per	
		cent on £260	39 0 0
		Profit	2 14 0
			£260 0 0

annuity method of repayment is taken—viz., repayment of principal and interest by half-yearly instalments—the rental may be arrived at as above.

(G. H. T.)

RAPID DRILLING WITH A PERCUSSION OUTFIT.

We have received from the Perkins Macintosh Petroleum Tool and Boring Company, Limited, of St. Albans, Herts, a short report of the drilling operations for water this firm have undertaken for the Sheerness Council under instructions from Mr. F. W. T. Stanton, Assoc.M.Inst.C.E., to augment the water supply of the town. The firm are using a rig and derrick built on the Canadian-Galician pole percussion system, such as they supply for the prospective drilling for oil; and the drilling is being conducted under the personal supervision of Mr. Cyrus F. Perkins, a director of the firm.

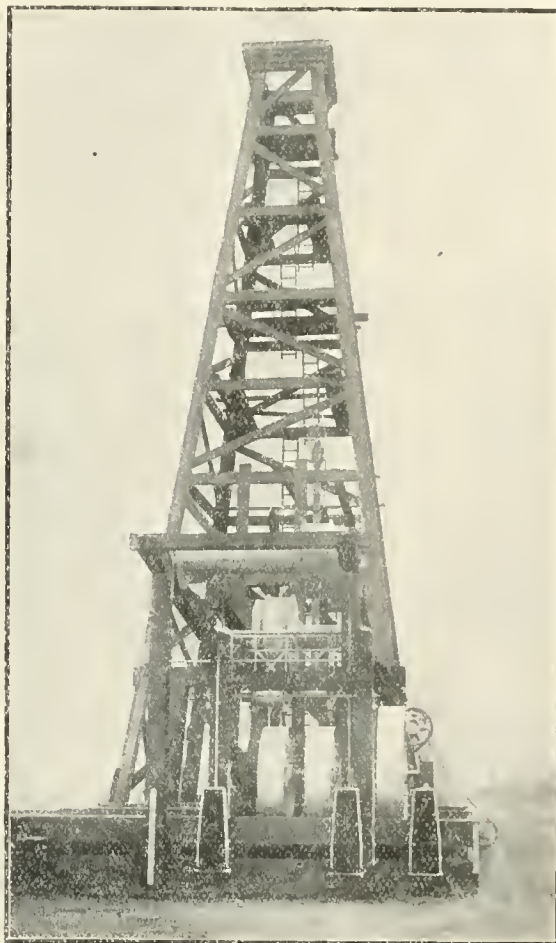
The drilling was commenced on November 26th last with a bore sufficiently large to take 16-in. i/d tubing, and by December 13th had reached a depth of 322 ft. 6 in. On December 15th, 16th and 17th the drilling operations were suspended for the purpose of overhauling the boiler and inserting 320 ft. of tubing, and drilling was resumed on the night of December 17th, and by December 31st had reached a depth of 691 ft., with a 14-in. hole. Since that date up to January 29th a further 405 ft. have been drilled, making a total depth of 1,096 ft., the hole being still 14 in.

The engineer to the council has expressed his astonishment at the rapid manner with which the work is being carried on, and states that it reflects great credit upon the contractors, a remark which, in view of the anxiety of the council to obtain a large supply of pure water, was endorsed by the council at a recent meeting. The drilling from 950 ft. has been in a very difficult formation, consisting of chalk intermixed with hard flints, and as the bore becomes deeper the difficulties of drilling are naturally increased and the rate of progress is retarded. Notwithstanding this, the drilling operations are being carried on with rapidity.

In view of the high price now charged for water, it is somewhat surprising that firms who are large users of this essential commodity do not more often sink their own wells and obtain their own supplies; for,

although the first cost might be heavy, this would soon be recouped by the saving made between the price of water ordinarily supplied and that obtained from a well.

It is not generally known that this firm, in addition to manufacturing their well-known oil well drilling outfits, make a speciality of deep drilling for water in this country, and have put down a number of wells, including one at Shoeburyness for the War Office, and one which reached 2,225 ft. We understand that the well at Sheerness is to be ultimately carried to a



CANADIAN-GALICIAN RIG AND DERRICK FOR DRILLING TO DEPTH OF 6,000 FT.

depth of 1,400 to 1,500 ft., and at the present rate of drilling the result should easily constitute a record for this country.

The accompanying illustration shows a heavy Canadian-Galician rig and derrick used for deep borings up to 6,000 ft., and presents the view of the draw works. The derrick is 56 ft. high from base to crown. The outfit used by the firm at the boring at Sheerness is of lighter construction, but is built upon the same principle.

Doncaster Water Supply.—The poll of Leeds rate-payers on that portion of the Corporation Bill giving the necessary authority for the Doncaster water scheme has resulted in the rejection of the scheme.

Bound Volumes of "The Surveyor" for the six months ended December last can now be obtained from the publishers, The St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, E.C. The contents, as usual, are made easy of reference by an exhaustive index, and comprise nearly 1,000 pages of matter of the greatest interest and value to municipal and county engineers and surveyors. The price of the volume is 16s. 6d.

Models of Old London.—Mr. John B. Thorp's models of old London are becoming so well known that it is not surprising to find further additions being made from time to time; but his latest production—a model of the Tower of London as it appeared in 1600—is certainly one of the finest pieces of work that he has executed. The model, which is being presented to the London Museum by Mr. J. G. Joicey, has been built to a scale of one-hundredth full size, and covers an area of nearly 150 sq. ft. It will be first seen by the public when the museum is opened in the early spring at its new quarters at Stafford House.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Dulverton R.D.C. (January 28th. Mr. P. M. Crosthwaite).—£770 for proposed sewage disposal works at Brushford. Mr. R. Sowton Barrow, for the council, said within the past nine years eleven new cottages, a villa residence, and a large motor garage had been erected over a small area adjacent to the railway station. The population of this was estimated between sixty and seventy, and before long other houses would probably be erected on the sites near.

Hatfield R.D.C. (January 5th. Mr. F. H. Tulloch).—£2,200 for works of private street improvement in Cooper's-road, Frampton-road, and Thornton-road, Little Heath.—The surveyor, Mr. H. T. Sidwell, said he proposed that the roads should be made up with 4 in. of brick foundation, 2 in. of gravel rolled, and 3 in. of granite. The kerbing would be 12-in. by 6-in. granite, and the channelling would be 10 in. by 5 in., with a 6-in. concrete foundation.

Holywood (Ireland) U.D.C. (January 14th. Mr. P. C. Cowan).—£4,500 for the purpose of providing an additional storage reservoir and other works in connection with the district waterworks.—Mr. James A. Hanna, surveyor, of Holywood, said there was only one objection to the site, and that was not a serious one. It was of such a flat nature that the water spread over a larger area, and the amount of land necessary to be taken was greater than he would have liked. Consequently the reservoir in parts would be comparatively shallow, but to get over this difficulty he had planned a reservoir of greater capacity than the immediate requirements demanded, and one that could easily be increased at any time. The provision of an additional filter almost similar to the existing two filters had become necessary. The new reservoir would hold 22,000,000 gallons with top water fixed at 500 ft. above ordnance datum, and when raised to 505 ft. above ordnance datum for future requirements it would hold 36,000,000 gallons.

Hursley R.D.C. (January 20th. Mr. A. G. Drury).—£10,000 for drainage works at Chandler's Ford. Mr. Weston, engineer, Southampton, stated that the main scheme provided for 340 houses, and a secondary one for the fifteen on Mount Pleasant. He explained his proposals with the aid of his plans, and expressed the opinion that when the sewerage was carried out the population of Chandler's Ford would grow. Since 1912 nine houses had been built.

Sheffield T.C. (January 29th. Mr. M. K. North).—£2,100 and £5,000 for works of street improvements, and £10,093 for paving works.—Alderman H. P. Marsh, chairman of the Improvement Committee, stated that it is proposed to widen Waingate to 80 ft. from Exchange-street to Lady's Bridge. Alderman Marsh also explained the scheme for widening Chesterfield-road to 80 ft. for a length of 590 ft., at an estimated cost, including price of land and street works, &c., of £5,000. Councillor Gainsford, chairman of the Highway and Sewerage Committee, gave evidence on behalf of the council with respect to the application for a paving loan of £10,093. He stated that it has been, and is, the policy of the committee to repave bouldered streets as quickly as possible, and to substitute a modern and more satisfactory form of paving. In the case of nine of the streets included in the application there was bouldered paving, which had become very unsatisfactory. The remaining street—St. Thomas'-road—is paved with gritstone, which is now worn out. All the streets are satisfactorily sewered.

APPLICATIONS FOR LOANS.

Bromley T.C.—£766 for a new fire alarm system.
Carlisle T.C.—£7,050 for a new school.
Chorley T.C.—£10,582 for gas extensions.
Durham C.C.—£18,903 for alterations to school premises.
Finchley U.D.C.—£93,443 for 300 workmen's dwellings.
Haslingden T.C.—£7,200, in respect of the electricity undertaking.
Holland (Lincs) C.C.—£2,700 for the erection of police cottages.
Lancaster T.C.—£1,120 for the public baths.
Lowestoft T.C.—£400 for additions to a school.

Newton Abbot R.D.C.—£1,500 for a new water supply.

Peterborough T.C.—£5,700 for electricity purposes.

Riccall R.D.C.—£3,000 for a water supply scheme.

Southgate U.D.C.—£350 for a bath attendant's cottage.

Staffs C.C.—£5,390 for the erection of a police station, and £2,175 for a new school.

Todmorden T.C.—£3,900 for paving works.

Walthamstow U.D.C.—£26,900 for resurfacing certain roads, and £4,888 for a storm-water tank and filter bed.

Walton-on-the-Naze U.D.C.—£200 for the purchase of land for a depot.

LOANS SANCTIONED.

Fareham R.D.C.—£11,725 for sewage disposal works at Lee.

Iford U.D.C.—£21,598 for a refuse destructor.

Lymm U.D.C.—£254 for the purchase of land for an ash tip.

Oldham T.C.—£3,300 for the erection of public washhouses.

Penge U.D.C.—£800 for street improvements.

FORTHCOMING INQUIRIES.

FEBRUARY.

	£
9.— March. For the provision of workmen's dwellings (Mr. W. H. Collin)	2,900
9.— Merton. For the purposes of a fire station and depot (Mr. R. H. Bieknel)	2,175
10.— Bexhill. For the provision of public walks (Mr. F. H. Tulloch)	3,710
10.— Foots Cray. For the erection of new council offices (Major J. Stewart)	—
10.— Kettering. For the electricity undertaking (Mr. H. R. Hooper)	10,000
10.— Rhyl. For the purposes of electricity, gas, and water supply (Mr. T. C. Ekin)	5,942
10.— Saltash. For street improvement purposes (Mr. W. O. E. Meade-King)	175
11.— Bradford. For a housing scheme (Mr. W. H. Collin)	10,300
11.— Croydon. For the purposes of fire appliances, public baths, and sewage disposal (Mr. R. G. Hetherington)	22,480
11.— Faversham. For sewerage and storm-water drainage (Mr. P. M. Crosthwaite)	3,363
11.— Hessle. For the erection of workmen's dwellings (Mr. E. Leonard)	1,200
11.— Ipswich. For the electricity undertaking (Mr. H. R. Hooper)	33,500
11.— Kingsbridge. For the provision of a cattle market (Mr. W. O. E. Meade-King)	300
11.— Mexborough. For laying out a park (Mr. M. K. North)	830
11.— Turton. For sewage disposal purposes (Mr. F. O. Stanford)	8,364
12.— Blean. For works of sewerage (Mr. P. M. Crosthwaite)	580
12.— Croydon. For street improvement (Mr. F. H. Tulloch)	2,209
12.— Exmouth. For the provision of tennis courts (Mr. W. O. E. Meade-King)	1,050
12.— Hendon. For works of sewage disposal (Mr. R. G. Hetherington)	28,019
12.— Mansfield. For street widening and the provision of an open space (Mr. M. K. North)	1,200
12.— St. Helens. For works of sewerage (Mr. F. O. Stanford)	670
12.— Warrington. For electricity purposes (Mr. T. C. Ekin)	14,551
13.— Bridgwater. For works of water supply (Mr. W. O. E. Meade-King)	1,400
13.— Hammersmith. For the provision of a public convenience (Mr. F. H. Tulloch)	220
13.— Iford. For electricity purposes (Mr. H. R. Hooper)	4,100
13.— Milton. For works of water supply (Mr. P. M. Crosthwaite)	250
13.— Sowerby. For works of sewerage (Mr. F. O. Stanford)	4,300
16.— Guildford. For the erection of workmen's dwellings (Mr. C. H. Eyles)	4,300

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Housing and town planning—Hereford; roads and materials—Wandsworth; sewerage and sewage disposal—Birmingham £41,260, Skelmersdale £12,250; water, gas and electricity—Bradford £180,000.—Particulars of other works projected will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Edinburgh T.C.—It has been agreed to construct four houses for corporation employees at the Braid Hills. The plans have been prepared by the superintendent of works, Mr. J. A. Williamson, and the estimated cost of the houses is £1,250.

Exeter T.C.—The infectious diseases hospital is being supplied with Shorland's double-fronted patent Manchester stoves, with descending smoke flues and special inlet ventilators, by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

Nottingham T.C.—It has been agreed to provide a movable floor at the public bath at Swinton; also a cinematograph operator's chamber at a total cost of £1,000.

HOUSING AND TOWN PLANNING.

Hereford T.C.—The council on Tuesday decided to erect sixteen cottages on a part of the Eign Mill site, the cottages to be let at not more than 4s. each per week inclusive; also to erect four cottages on the Crozens site, to be let at 5s. per week.

PARKS AND OPEN SPACES.

Grompton (Lancs) U.D.C.—The council have approved the plans of the surveyor, Mr. F. F. Gartside, for a bowling green, bowls house, shelter and tools house at Dun Wood, at an estimated cost of £170.

REFUSE COLLECTION AND DISPOSAL.

Risca (Mon.) U.D.C.—It has been agreed to invite tenders for the scavenging of the district. The surveyor, Mr. A. J. Dardis, replying to criticisms with respect to the cost of cleansing (£10 17s. 6d.) per week, said he considered the council were at present doing the cleansing work very cheaply. The outlay included four horses and the wages of four hauliers, and two men employed in sweeping the roads. He did not wish to say a word against contractors, but if they engaged contractors they would not have the work under their own supervision to the same extent as to-day, when they had the yard and stables adjoining the council offices. The council nevertheless decided, as already stated, to invite tenders, and the surveyor was asked to prepare a statement of what he required.

ROADS AND MATERIALS.

Abergele and Pensarn U.D.C.—It has been agreed to construct an asphalt path 2 ft. wide in the centre of the promenade footway.

Birmingham T.C.—At the council meeting on Tuesday it was agreed to proceed with the scheme for widening the Pershore road between Edgbaston-road and Pebble Mill-road, at an estimated cost of £1,864.

Chertsey R.D.C.—The tender of Mr. Warren Parker has been accepted for the kerbing of Byfleet.

Cookstown R.D.C.—The Road Board have promised a grant of £250 for road improvement.

Croydon R.D.C.—The tenders of Mr. E. Yewen, Croydon, at £1,085 and £131, have been accepted for making up and the construction of surface-water drainage in Warren-road, Coulsdon.

Hampstead B.C.—The Works Committee have had under consideration the question of the special paving works which it is desirable should be executed during the financial years 1914-15 and 1915-16. In several cases the works it is proposed to carry out are rendered necessary on account of the damage caused to the roads by fast and heavy motor traffic, and the council have decided to approach the Road Board with a view to obtaining their assistance towards the execution of the works. The total expenditure involved is £10,206 for the year 1914-15, and £8,097 for the year 1915-16.

Hereford T.C.—It was agreed on Tuesday last to construct a new road from Monkmoor-street to Barr's-court railway station.

Kensington B.C.—An application has been received for permission to suspend certain advertisements from the projecting arms of the council's street lamps in the more important thoroughfares, but the council have endorsed the opinion of the Works Committee, which has previously been expressed by them, that the street lamps should not be used for advertising purposes.

Kirkcaldy T.C.—It has been resolved to proceed with the scheme for the Kirkcaldy extension of the foreshore, leaving the eastern portion for future consideration. The main object is the provision of a marine esplanade.

North Riding C.C.—The Road Board have agreed to make a grant of £475 towards the cost of the proposed diversion of the Scarborough and Filey main road at Caton Bay.

Stepney B.C.—The tender of Mr. George Battersley, at £2,640, has been accepted for the squaring and redressing of old paving material. Mr. J. J. Prior, of Limehouse, has secured the contract, at £3,013, for the supply of ballast and shingle. The contract for paving material, at £10,953, has been given to Messrs. W. Griffiths & Co.

Stoke Newington B.C.—The purchase of the several interests acquired by the council for the Church-street widening, between Park-street and Lordship-road, has been completed, and the council have formally decided to proceed with the widening, at an estimated cost of £550.

Wandsworth B.C.—The council have under consideration a road paving scheme estimated to cost £30,512. Towards this it is proposed to ask the Road Board for a grant of £10,000 and a loan of £10,000, free of interest.

SEWERAGE AND SEWAGE DISPOSAL.

Belper R.D.C.—For the construction of the sewers and sewage disposal works for Openwood Gate, in the parish of Denby, the surveyor, Mr. Robert C. Cordon, has received instructions to carry out the works of section No. 1 departmentally, at an estimated cost of £350.

Berkhamsted R.D.C.—Messrs. Wilson & Raikes have received instructions to prepare a sewerage scheme for Long Marston.

Birmingham T.C.—It has been decided to proceed with a sewerage scheme for dealing with the area of the Hall Green and Yardley Wood district lying between Titterford Mill and the city boundary. The cost is estimated at £24,400. It has also been agreed to proceed with a sewerage scheme for the area between Bournville and the valley of the Griffin's Brook, at an estimated nett cost of £16,860.

Chertsey R.D.C.—The surveyor, Mr. H. Beeney, at the recent council meeting, called attention to the presence of petrol in the Byfleet and Pyrford sewers, which was strictly prohibited under the council's regulations. It was not only detrimental to the disposal works, but exceedingly dangerous to the health of the men working in the sewers, while there was also the danger of explosion and fire. He recommended that a legal notice be served on all the engineering firms in the district calling attention to the danger resulting from the practice, and giving warning that proceedings would be taken against any person offending in future.

Elland (Yorks) U.D.C.—Under pressure from the West Riding Rivers Board steps are under consideration for the improvement of the effluent from the sewage works.

Skelmersdale U.D.C.—The council have accepted a scheme of intercepting sewers and sewage disposal works, estimated to cost £12,250. The works will be on the bacterial system, and thoroughly up to date. The engineers are Messrs. Taylor & Wallin, of Newcastle-upon-Tyne and London. The plans have been sent to the Local Government Board, and the council are now awaiting the inquiry.

WATER, GAS, AND ELECTRICITY.

Belper R.D.C.—The council have accepted the tender of Messrs. Ookes & Co., Alfreton Ironworks, for the supply of 6½ tons of cast-iron water mains.

Bewdley T.C.—It was reported at a meeting of Bewdley Town Council on Monday that the new bore-hole had been completed, and had proved that there was an abundance of water of excellent quality. The council decided to apply to the Local Government Board for sanction for the remainder of the loan of £3,000 for the carrying out of the necessary work with as little delay as possible.

Bradford T.C.—The Waterworks Committee have decided that the inverted syphons on the line of pipes from the Nidd Valley should be doubled, at a total estimated cost of £180,000.

Builth Wells U.D.C.—The clerk has received instructions to obtain particulars in the matter of the proposed purchase of the gasworks.

Burton T.C.—The Gas and Electricity Committee have decided to advertise for tenders for a new alternator at the generating station. The electrical engineer, Mr. Hall, in reporting upon the matter, said it was very necessary that the purchase and erection of a duplicate turbine alternator should be proceeded with as soon as possible, as, owing to the large amount of business done, the available spare plant was rapidly being overtaken. He estimated that the cost would amount to £6,000.

Dundalk U.D.C.—Mr. P. A. Spalding, chief electrical engineer, last week submitted his first annual report dealing with the progress of the council's electric lighting undertaking for ten months prior to March 31st. The total revenue earned during the period which came within the financial year was £2,491. The gross profit was £1,224, while the nett deficit, after meeting all capital charges of interest and sinking fund, was £162. The result was very satisfactory, and for the present year he anticipated that the undertaking would show a nett profit.

Lampeter T.C.—The Local Government Board have, subject to certain minor modifications, sanctioned the scheme for a water supply.

Millom U.D.C.—It has been agreed to purchase Knott End Farm for the sum of £1,750 for water supply purposes.

Redditch U.D.C.—The council on Tuesday resolved that a consulting engineer be appointed to report upon the position of the electricity undertaking, and make recommendations for its development.

Stafford T.C.—The tender of Messrs. C. & W. Walker, at £11,841, has been accepted for the construction of a gasholder and tank of 1,000,000 ft. capacity, and the tender of Messrs. F. Espley & Sons, at £896, for the construction of the foundations.

Stepney B.C.—In answer to a question at a recent meeting of the council, it was stated that the cost of lighting the public highways was £187 per street mile, while in Poplar and Bethnal Green it was £107 and £165 respectively.

Tuam U.D.C. The tender of Messrs. Crossley Brothers, at £272, has been accepted for the erection of an oil engine at the waterworks.

MISCELLANEOUS.

Birmingham T.C.—The General Purposes Committee recommend that the several committees of the council should be instructed to pay a minimum rate of 6½d. per hour to all navvies employed direct by the corporation as from January 1, 1914.

Edinburgh T.C.—The question of acquiring the site of the old gasworks for a wholesale fruit and vegetable market has been referred to a sub-committee to act in conjunction with the Lord Provost's Committee, and to bring up a report.

Devonshire Park, Eastbourne.—The poll of the Eastbourne ratepayers on the question of the purchase of Devonshire Park for £100,000 has resulted in the opposition increasing the majority they obtained exactly a year ago.

Association of Consulting Engineers.—A report of the inaugural dinner of this body, which took place on Monday evening at the Whitehall Club, Westminster, under the presidency of Mr. G. Midgley Taylor, is unavoidably held over owing to pressure on our space.

PERSONAL.

Mr. V. Turner, surveyor to the Bilston Urban District Council, has been voted an increased salary of £25 per annum.

Mr. O. G. Laban, Loughborough, has been appointed surveyor to the Leake Rural District Council at a salary of £90, rising to £110.

Mr. H. J. Hawkins, borough electrical engineer of Salford, has resigned. The corporation have decided to offer a salary of £1,000 to his successor.

Mr. W. J. B. Leech, Hunslet, has been appointed manager of the Leeds city gasworks, in succession to the late Mr. Townsley, at a salary of £800 a year.

Mr. G. Gregson, surveyor and inspector to the Durham Rural District Council, has had his salary increased by £50 per annum to enable him to keep or hire a motor car.

Mr. Fred Hatcher, deputy borough and water engineer of Neath, has been granted an increase of £40 in his salary, £20 from the sanitary department and £20 from the water department.

Mr. A. W. Humpherson, borough surveyor of Bewdley, has had his salary increased by £35 a year, and has also been voted a grant of £25 for extra work done in connection with the water supply.

Mr. G. T. Forrest, architect to the Northumberland Education Committee for the last eight years, has been appointed county architect for Essex. Prior to going to Northumberland, Mr. Forrest was with the West Riding Education Committee at Wakefield.

Mr. Ernest Ridsdale, deputy chief inspector of nuisances to the York Corporation, has been recommended by the Sanitary and Sewage Committee of the Margate Town Council for the post of chief inspector of nuisances to that council. The salary commences at £200 per annum, rising to £250. There were 261 applicants for the post.

Mr. H. C. H. Shenton, who on Monday evening delivered his inaugural address as president of the Society of Engineers, is the senior partner in the firm of Messrs. Shenton & Easdale, civil engineers. He was born in 1870, and was educated at private and public schools and at the Crystal Palace School of Practical Engineering. He was articled to the late Sir William Shelford, and worked afterwards with him as an assistant. He also worked in the capacity of an assistant for eighteen months in the Works Department of the Admiralty at Portsmouth Dockyard, and four years with Mr. Frederick H. Anson, of Westminster; also for eighteen months in the Admiralty Works Department at Chatham Dockyard. In the year 1900 he entered into partnership in private practice with Mr. Frederick H. Anson, engineer to the Herts and Essex Waterworks Company (now retired), and since that time Mr. Shenton has worked in private practice in Westminster, dealing chiefly with waterworks and with sewerage and sewage disposal works, both at home and abroad. A portrait of Mr. Shenton appears on another page with the report of his presidential address.

CHANGE OF TELEPHONE NUMBER.—Readers are requested to note that "The Surveyor" telephone number is now City 1046.

FOR OTHER ADVERTISEMENTS

See End of Paper.

WANTED, at once, for a period of about 12 months, a Junior Assistant in the Surveyor's Department of an Urban District Council. Salary £54 12s. per annum. Works in hand: Extension of Sewage Disposal Works, Extensions of Sewers, Private Street Works, Road Improvements, &c. Applications, stating age and experience, with two recent testimonials to be sent in not later than Friday, the 13th inst. Box 1,377, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,264)

WANTED, for Municipal Office, a Competent Draughtsman who has had a good theoretical training, and is capable of working out details of Sewers, Roads, Quantities, &c. One who has had actual experience on such works preferred. Address, stating age, experience and salary required, to Box 1,378, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,265)

METROPOLITAN BOROUGH OF ISLINGTON.
INSPECTOR OF ROADS.

The Works Committee of this Council are prepared to receive applications for the Appointment of an Inspector of Roads.

Candidates must have practical experience in, and a thorough knowledge of, the following subjects: Levelling, masons' and paviors' work, the selection of materials, setting out and measuring up works, making estimates and sketches, squaring dimensions, and in making, maintaining, cleansing, and watering roads. None but those who have been engaged in a similar capacity need apply. The person appointed will be required to devote the whole of his time to the duties of the situation, particulars of which can be obtained on application to the Borough Engineer, Mr. J. Patten Barber, at the Town Hall, Upper-street, N., and will be required to pass a medical examination as to his constitutional fitness for the appointment. Salary to commence at 50s. per week, rising by two annual increments of 5s. a week to a maximum of £3 per week.

Application, in the handwriting of the candidates, stating age, which must not exceed 36 years, past and present employment, and accompanied by copies of not more than three testimonials of recent date, must be delivered to the undersigned, endorsed "Roads Inspector," not later than 12 noon on Saturday, the 21st February, 1914.

WM. F. DEWEY,
Town Clerk.

Town Hall,
Upper-street, Islington, N.
February, 1914. (1,258)

ASSISTANT (22) desires appointment in Surveyor's Office. Experienced in surveying, levelling, construction and maintenance of roads, building construction and draughtsmanship. Moderate salary. Free immediately. Excellent testimonials.—Apply Box 1,376, office of THE SURVEYOR, 21 Bride-lane, Fleet-street, E.C. (1,257)

COUNTY BOROUGH OF BELFAST.
WORKS DEPARTMENT.

TENDERS FOR STORES, WORK, AND UNIFORM CLOTHING.

The Works Committee are prepared to receive Tenders for the supply of the following Stores, Work, and Uniform Clothing for a year, commencing on 1st April, 1914.:

Earthenware Sewer Pipes.	Shovels, Spades, Graipes and Buckets.
Timber.	and Buckets.
Slates.	Scavenging Brushes.
Hardwood.	Glazed Bricks.
Iron Castings.	Artificial Flags.
Plumbers' Work.	Lime.
Nails, &c.	Pitch, Felt, Tar, &c.
Iron and Steel.	Sea Sand, Sea Gravel, and Lough Neagh Sand.
Paints, Oils, &c.	Cement.
Glazing.	Uniform Clothing & Hats.
Mill Furnishings.	

Forms of Tender and particulars may be obtained from Mr. Hector F. Gullan, M.A.S.T.C.E., Superintendent of Works, City Hall.

Sealed Tenders, on Official Forms only, endorsed "Tender for—," to be lodged in my Office before 11 a.m. on 18th February, 1914.

The Lowest or any Tender will not necessarily be accepted.

A Tender, if sent by post, must be registered; if delivered by hand, an Official receipt must be obtained for it; otherwise the undersigned will not be responsible.

R. MEYER,
Town Clerk.

EAST SUFFOLK COUNTY COUNCIL.
MAIN ROADS.

TENDERS FOR TAR FOR SURFACE TARRING.

The above Council invite Tenders for the supply of Refined or Dehydrated Coal Tar, delivered to the various railway stations, wharves, docks, &c., within the county, in such quantities and at such times as directed during the year ending 31st March, 1915.

Specification and Form of Tender can be obtained on application to the undersigned, and applicants are requested to state for which grade of Tar they wish to tender.

The Council does not bind itself to accept the lowest or any Tender, and reserves the right to accept Tenders for any portion of the requirements.

Tenders, endorsed "Tar," must be delivered at the County Hall, Ipswich, on or before the 14th day of February, 1914.

W. JERVIS,
County Road Surveyor.

County Hall,
Ipswich.
February 5, 1914. (1,271)

COUNTY BOROUGH OF STOKE-ON-TRENT.

The Council invite Tenders for the supply of Materials and Goods for the year ending March 31st 1915, as under:—

1. Portland Cement.
2. Blue Paving Bricks and Common Bricks.
3. Sanitary Pipes and Gullies.
4. Kerbs and Setts.
5. Macadam and Chippings.
6. Pitch and Oil.
7. Cast-iron Work.
8. Picks, Shovels and General Ironware.
9. Paints and Oils.
10. Soap, Soda, &c.
11. Brooms and Brushes.
12. Bath Towels, Dusters, &c.
13. Ironmongery and General Stores.
14. Disinfectants.

Specifications, Conditions and Forms of Tender may be obtained on application to the Borough Surveyor, Town Hall, Stoke-on-Trent, and Tenders, sealed and endorsed, must be delivered to him on or before 20th February, 1914.

E. B. SHARPLEY,
Town Clerk.

Town Hall,
Stoke-on-Trent.
February, 1914. (1,261)

CITY OF LEEDS.
ANNUAL CONTRACTS FOR STORES.

The Sewerage Committee invite Tenders for the Supply of the following Stores during the twelve months ending March 31st, 1915:—

- Cement.
- Earthenware Drain Pipes, &c.
- Sewer Ironwork.
- Galvanised Dirt Boxes.
- Sewer Ventilating Columns.

Forms of Tender, Schedules, and all particulars may be obtained at the Office of the undersigned.

Tenders must be on the Official Forms, properly endorsed, and delivered at the Town Clerk's Office, Great George-street, Leeds, not later than 10 a.m. on Thursday, February 26th, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender.

W. T. LANCASHIRE,
City Engineer.

Municipal Buildings,
Leeds.
February 4, 1914. (1,269)

EPSOM RURAL DISTRICT COUNCIL.

The above-named Council invite Tenders for—
(a) Flints, Fine Gravel, Sand, Coal, Coke, Cement, Stoneware Pipes and Granite Kerb.

(b) For Carting of Materials, and

(c) For Watering during the year ending 31st March, 1915.

Particulars and Forms of Tender may be had on application to Mr. T. E. Ware, Surveyor to the Council, Watertoo-road, Epsom.

Sealed Tenders, endorsed "Tender," must be received by the undersigned not later than 10 o'clock a.m. on Monday, the 23rd day of February, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

ARTHUR R. COTTON,
Clerk to the Council.

Gynsdale,
Watertoo-road,
Epsom.
February 4, 1914. (1,268)

EPSOM URBAN DISTRICT COUNCIL. TENDERS FOR STORES.

The Council are prepared to receive Tenders from persons willing to enter into Contract for Work and for the supply of Stores, &c., for the period of one year or under, commencing 1st April, 1914—viz.:

Sewerage Ironwork.
Gully Gradings.
Shovels, Picks, Brooms, Forks, Dust Skeps, &c.
Disinfectants.
Portland Cement.
Stoneware Pipes and Gullies, &c.
Kerbing and Channelling.
Setts.
Broken Granite, Chippings and Limestone Dust.
Tar Paving and Tarred Macadam.
Coal and Coke.
Hay, Corn, Bran and Straw.
Bricks.
Paraffin.
Artificial Stone Paving.
Thames Ballast and Thames Sand.
Veterinary Surgeon's Services (inclusive).
Tar, Pitch, &c.
Team Labour.

Forms of Tender, with Schedule, may be obtained, and Specification seen, upon application to the Office of Mr. Edward R. Capon, Surveyor, Bromley Hurst, Church-street, Epsom, between the hours of 9 a.m. and 5 p.m., Saturdays excepted, when the hours will be 9 a.m. till 1 p.m. Sealed Tenders, addressed to the Clerk of the Council, and endorsed "Tenders for Stores," to be delivered at the Clerk's Office on or before 5 o'clock p.m. on Tuesday, March 3rd, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

E. G. WILSON,
Clerk to the Council.

"Duncannon,"
Church-street,
Epsom. (1,262)

ALFRETON URBAN DISTRICT COUNCIL.

The Alfreton Urban District Council invites Tenders for the supply of a 10-ton Compound Steam Road Roller fitted with Scarifier, Water-spraying Apparatus and Canopy.

Every Tender must be accompanied by a Specification of the machine to be supplied, stating the time required for delivery.

Sealed Tenders, endorsed "Roller," must be delivered to the undersigned on or before Monday, February 16th.

The Council does not bind itself to accept the lowest or any Tender.

R. F. WARD,
Surveyor to the Council.

Council Offices,
King-street,
Alfreton. (1,266)

CITY OF WESTMINSTER. BARGING.

The Westminster City Council invite Tenders for Barging Refuse from the Council's Wharves during one year, or two years, or three years, from the 1st April, 1914.

The Council are prepared to consider Tenders for Barging Refuse from any one Wharf only, as well from all three of the Council's Wharves.

Form of Tender, with General Conditions of Contract, Specification, and Schedule attached, may be obtained on application at the City Hall, between 10 a.m. and 4 p.m. (Saturdays 10 a.m. and 12 noon).

The Contractors will be bound by the Contract in the case of all workmen employed by them to pay wages at rates not less, and to observe hours of labour not greater, than the rates and hours recognised by the Associations of Employers and Employees, and in practice obtained in the district where the work is to be executed.

Tenderers are prohibited from directly or indirectly canvassing Members or Officials of the Council in reference to any Tender, and the Tender of any person who does so canvass will be rejected.

Each Tender, on the Official Form Supplied, is to be delivered at the City Hall in a sealed cover addressed to the Town Clerk, and marked "Tender for Barging." Tenders may be placed by, or on behalf of tenderers, in a locked box at the City Hall provided for the purpose.

No Tender will be received after 9.30 a.m. on Friday, the 20th February, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

JOHN HUNT,
Town Clerk.

Westminster City Hall, W.C.
February 4, 1914. (1,270)

CITY OF WESTMINSTER.

The Westminster City Council invite Tenders from persons willing to Contract for the Execution of the undermentioned Works and the Supply of the undermentioned Materials, Articles, &c., for the 12 months ending the 31st March, 1915:—

1. Ballast and Sand.
2. Barging (one, two, or three years).
3. Boots, &c. (new and repairs) (one year or three years).
4. Bricks.
5. Brooms and Brushes.
6. Carriageway and Footway Repairs (asphalt).
7. Carriageway Repairs (macadam).
8. Carriageway Repairs (granite sett pavement).
9. Carriageway Repairs (wood pavement).
10. Cement and Lime.
11. Christchurch-yard Garden Maintenance.
12. Coal and Coke (three months only, ending 30th June, 1914).
13. Disinfectants.
14. Drysaltery, Soaps, and Sundries.
15. Dust Baskets (new and repairs).
16. Flags (sandstone and artificial).
17. Footway and Channel (masons' work).
18. Gas and Hot-water Fittings.
19. Granite (broken).
20. Granite Setts, Kerb and Channels.
21. Gullies (stoneware) Construction.
22. Harness (new and repairs).
23. Hats, Caps, &c.
- 24.
25. Horse Hire and Cartage Work.
26. Hose Pipe (new and repairs), Leather.
27. Iron Castings.
28. Petroleum Spirit.
29. Painters' Materials and Miscellaneous Oils.
30. Pitch and Creosote Oil.
31. Plates, Sheets, Bolts, &c., Tree Guards, and Sundries.
32. Retyring Wheels, Repairing Springs, &c.
33. Rubber and Waterproof Goods.
34. Sewerage and Drainage (minor works).
35. Shovels, Picks, Sewer Implements, and Edge Tools.
36. Stencil Paper, Ink, &c., for Duplicating Machines.
37. Stoneware Goods.
38. Street Name-plates (supply and fixing).
39. Tarpaulin.
40. Timber.
41. Tool Handles.
42. Towels.
43. Uniform Clothing (one year or three years).
44. Wood Paving Blocks.
45. Washing Towels.

Specifications and Forms of Tender may be obtained on application at the City Hall between 10 a.m. and 4 p.m. (Saturdays 10 a.m. and 12 noon). Each Tender on the Official Form supplied is to be delivered at the City Hall in a sealed cover, addressed to the Town Clerk, and marked with the name of the Tender. Tenders may be placed by or on behalf of tenderers in a locked box at the City Hall provided for the purpose. No Tender will be received after 9.30 a.m. on Friday, the 20th February, 1914.

The Contractors will be bound by the Contract, in the case of all workmen employed by them, to pay wages at rates not less and to observe hours of labour not greater than the rates and hours recognised by the Association of Employers and Employees, and in practice obtained in the district where the work is to be executed.

Tenderers are prohibited from directly or indirectly canvassing Members or Officials of the Council in reference to any Tender, and the Tender of any person who does so canvass will be rejected. The Council do not bind themselves to accept the lowest or any Tender.

JOHN HUNT,
Town Clerk.

Westminster City Hall,
Charing Cross-road, London, W.C.
February 4, 1914. (1,263)

Some Recent Publications.*

THE CONSTRUCTIONS OF ROADS AND STREETS. By Henry Law and D. K. Clark, M.M.INST.C.E. Revised, with additional chapters, by A. J. Wallis-Taylor, ASSOC.M.INST.C.E., M.S.A. (Eighth Edition.) Price 6s. London: Crosby Lockwood & Son.

In the preface to the sixth edition (1901) of this well-known work the following sentence occurred: "The earlier portion of the work is mainly historical, or else concerned only with principles of road construction, and has therefore not required revision except on one or two minor points; but Part II., which deals with later practice, has been subjected by Mr. Wallis-Taylor to careful revision throughout. He has rewritten (wholly or in part) those of the original chapters which needed such treatment, and has added several new chapters dealing with the latest developments of the subject." The work was thus enlarged by about 120 pages. In the preface to the eighth (1913) edition it is pointed out that the changes which have taken place in traffic conditions have rendered it advisable "again to revise this book for the eighth edition, and to bring it more up to modern requirements." Mr. Wallis-Taylor has, accordingly, added a new chapter on roads for modern traffic—forty-five pages—has added to one of the chapters on wood paving matter relating to preserved wood paving in the United States, and to wood paving in Germany, and has included some account of certain kinds of wood paving blocks. Descriptions of road rollers driven by internal combustion engines, and of a stamping machine for consolidating broken-stone roads, have been inserted in the appendix, and Road Board specifications have replaced other matter of less importance. "In addition to this," it is stated, "the other portions of the book have been subjected to careful revision," and several illustrations have been added.

A quite wrong impression of the result would be formed if the word "revision" above were understood to imply that notes are added throughout, at important places, in order to bring the matter up to date. The bulk of the work is either such as is fairly described in the first passage quoted above, or that which was brought up to date in 1901. The operation performed in 1901 was not, however, repeated in 1913, and the reader must realise that the really new matter is almost entirely confined to those portions added in the lump. The least satisfactory parts of the book, therefore, are those dealing with matters which were in process of development in 1901, and it may as well be said at once that the space allotted to more recent matter is not sufficient to render this part of the work so valuable or so important as are those portions which deal with principles of road construction, and details relating to the making and maintaining of water-bound broken-stone road crusts. The value of some of the chapters would have been greatly increased by the addition of a few notes, but in view of the probability that a further edition of the work may be prepared, it is only fair to point out that some of the chapters might well be replaced by entirely fresh matter, leaving the really classic part of the book untouched, or expanded at suitable intervals by new matter clearly distinguished from the old, and dated. Perhaps it would be better still to present the volume in two parts, the new portion being written, as it were, parallel with the old up to a certain point, and thereafter devoted to modern developments. This amounts, it is fully realised, to an adverse criticism of the present edition, and it may be stated, therefore, that the new matter is, on the whole, well selected, and is in itself of direct value.

The nature of the contents of the whole volume may briefly be indicated as follows: It begins with an historical sketch—twenty pages—chiefly relating to English roads and streets in the early part of the nineteenth century. In Chapter I. some of the elementary considerations to be taken into account in laying out a road are considered, and the manner in which plans and sections are prepared is explained. Chapter II.—twelve pages—deals briefly with earthwork and drainage; some of the measures recommended are now practically obsolete, and the chapter is not important. The facts and opinions relating to resistance to traction in Chapter III.—fourteen pages—form a part of

a complete study of this subject, and are by no means to be passed over as though they bore no relation to the problems of the present day. Chapter IV.—fourteen pages—is mainly devoted to a study of the width and transverse section of the road. The views herein expressed as to excessive camber have now been generally accepted, but in some districts only very recently. On an important point, however, practice of to-day is still behind the advanced thinkers of two or three generations ago, as is shown by the following extract from "The Practice of Making and Repairing Roads," by Thomas Hughes, 1838. This passage runs: "I have never been able to discover why the sides of the road should be at all inferior to the middle in hardness and solidity." At the present day it is sometimes an advantage to use harder material for the middle than that which is employed for the sides of the road crust, chiefly on roads in the open country, and subject to a considerable amount of long-distance motor traffic. The necessity for having the sides at least as good as the middle as regards their "solidity" is, however, as great to-day as it ever was; but the idea that a road crust may be thinner towards the edges than it is in the middle has not yet died out in this country, and is widely prevalent in the United States. Chapter V.—fourteen pages—relates chiefly to the materials of the road crust, and contains a number of suggestions of value at the present day. The use of lime in making up a water-bound crust is recommended, for instance (by Charles Penfold and Mr. Walker), and the use of iron filings was recommended by Mr. Walker in 1819, the object being to make the binder ferruginous. Chapter VI., on "Repairing and Improving Roads," consists of only eleven pages, partly taken up with descriptions and illustrations of instruments and tools. Some useful hints are, however, to be found in this chapter. About four pages are given to hedges and fences, the author associating himself with the almost fanatical views usually held on this subject in the nineteenth century. Five pages on paved roads and streets may be considered as obsolete, though not misleading, the subject receiving consideration further on, and some seven pages, including a two-page table, are devoted to estimates of quantities of earthwork, this matter being sufficient as a brief introduction to the subject. This concludes Part I.

In Part II. the first chapter is on "Materials Employed in the Construction of Roads and Streets"—that is, in actual fact, the materials of the road crust and of the paving. The descriptive matter relating to road stones is somewhat lacking in method, and the tables of crushing strengths, &c., might well have been supplemented by more recent data. The note on woods is quite obsolete, both as regards the species used and their relative importance. Chapter II. consists of four pages of considerable historical interest on macadam roads. The following chapter, twelve pages, on the wear of macadam roads, is well worth study. Chapter IV., on the cost of macadam roads, relates, apparently, to no date later than 1876, and with a short chapter of two pages on concrete roads, may be considered as of merely historical interest. The next four pages, with three cross-sections of French and Belgian roads, are, however, of considerable interest at the present day, the types shown being very good ones. The next three chapters on stone pavements in London, Liverpool, and Manchester, and the following chapter on the wear of granite pavements, are of some technical importance as well as of historic interest, the data relating chiefly to the middle of the nineteenth century, with nothing of recent date. Chapter XI., on stone tramways in streets, is worth attention, for the advent of the wire-bus renders the adoption of such a system at least possible under modern conditions, apart from its use under special circumstances in various countries. In Chapters XII. to XVII., fifty-six pages, wood pavements are described, the matter being largely taken from papers and reports published between 1840 and 1900, and more especially between 1870 and 1896. There are nine pages of technical interest describing methods employed in Germany and in the United States. Some four pages of fresh matter are devoted to descriptions of the "Acme sectional" paving and the "Shuman" wood paving, and Valles expansion plug; but these additions do not affect the general character of this part of the book, which stops short of what is of live practical interest as regards

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

practice in Great Britain and with reference to the value of different kinds of wood paving at the present day. The matter is, of course, interesting to those who make a special study of wood paving, and the consideration applies also to Chapter XVIII., on the cost and wear of wood pavements, the data relating chiefly to the period between 1871 and 1901. The figures for the period from 1881 to 1901 are, of course, of practical value; but it is unfortunate that the opportunity to supplement this material with data relating to the last twelve years has not been taken, since great developments have taken place in the use of soft wood paving in that period. In Chapter XIX., twenty-six pages, an account of asphalt pavements is given, including an interesting description of early efforts to use this material, and of the development of sound principles in its application in London and in the United States. A table, occupying nearly four pages, presents traffic statistics of 1872 and 1873, and notes on the condition of asphalt pavements which had been laid for periods ranging up to three years and nine months. There are other tables relating, apparently, to no date later than 1877. A chapter of nine pages on "Brick Pavements" brings the subject up to 1901, it seems; and in view of the lack of any important development of this paving in the United Kingdom, it was perhaps unnecessary to extend the chapter in the present condition. It should be remembered, however, that in matters of detail some advance has been made in the United States during the past few years. In Chapter XXII., forty-two pages, the costs of different pavements are compared, but there seems to be nothing relating to practice of a date later than 1901 (or perhaps 1894). Chapter XXIII., on footpaths and crossings, contains a good general description of the principal materials and methods of the present day, employed in the construction of footpaths and of kerbing, and it forms one of the most practically useful parts of the work. Chapter XXIV., eighteen pages, on the cleansing of pavements, is worth study, for it contains data of considerable importance, the value of which is but little affected by recent changes in the conditions of street traffic, and such matter as has no direct bearing upon modern practice forms a part of the history of civic development. Chapter XXV., consists of eight pages of well-selected text and illustrations relating to mountain roads, and the grand trunk road of Northern India. The data obtained from classic experiments on the resistance to traction on common roads are given in Chapter XVI., after a brief introductory study of the mechanics of the subject.

The remaining forty-five pages, exclusive of appendixes, are devoted to the editor's contribution on the subject of "Roads for Modern Traffic." Much of the space is usefully devoted to a consideration of facts and figures set forth in papers read before the Institution of Civil Engineers, and especially in the contributions of Colonel R. E. Crompton, Mr. J. Walker-Smith, and Mr. H. P. Maybury; and use has also been made of articles and papers recently published in America and on the Continent. The matter is well selected, but the lack of any attempt to summarise the views of road engineers of the United Kingdom is noticeable. In his own observations Mr. Wallis-Taylor seems to have been influenced rather by the opinions of irresponsible critics than by those of experienced road surveyors. He has, however, noted a number of points of considerable significance, and has on the whole made good use of the space devoted to this review of recent developments. As regards the appendixes, it may be remarked that the old matter contains passages of considerable practical interest at the present day, as well as passages of historical importance, and they contain four pages of recent data relating to the cost of steam rolling, and, in addition, Road Board Specifications Nos. 1 to 6.

In conclusion, it may be suggested that as a work of reference the volume is one which should be upon the engineer's own bookshelf, and that it may be recommended to students on the understanding that it has not been brought up to date throughout, nor fully so in any particular, and is not an authoritative work, except as regards the periods to which the different parts specifically apply.

SURVEYORS' TABLES AND DIARY FOR 1914. Price 1s. paper, 2s. leather. London: Metchin & Son.

The tables included in this very useful little book, which, by the way, is of very convenient size for the pocket—contain much information which the sur-

veyor in practice will find very useful for daily reference. Among much other matter will be found a summary of the London Building Acts, a list of district surveyors and their fees, and many tables of use to quantity and building surveyors. The book forms a very neat and useful pocket remembrance and diary for all surveyors.

Vol. V. Part I. of the "Transactions" of the Concrete Institute contains, in addition to information regarding the personnel and work of the institute, papers and discussions on "The Settlement of Solids in Water and its Bearing on Concrete Work" (Dr. J. S. Owens); "Steel Frame Buildings in London" (Mr. S. Bylander); "Economy in Reinforced Concrete Design" (Mr. J. A. Davenport); "The Strength of Cement" (Mr. H. C. Johnson); and "Props and Beams in Mines" (Prof. S. M. Dixon).

One of the best reference books published is "Sell's Directory of Registered Telegraphic Addresses," and this year the volume for size and comprehensiveness surpasses all previous records. It contains 2,500 pages of the kind of information required at a moment's notice in convenient form by nearly all business men many times every day of the week. Telephone numbers, postal and telegraphic addresses are given after the name of each firm, and an index to the telegraphic addresses registered in every part of the United Kingdom forms the only clue published from official lists to the owners of such addresses. The trades of the United Kingdom are classified, and the names of manufacturers, merchants, and traders are collated in the division entitled "The National Directory of Commercial Houses." Here each name is inserted under a particular trade, and there are something like 100,000 names in this section of the book.

Street Lighting in Leicester.—It has been agreed to make an experiment in the West End of Leicester as to the relative merits of gas and electricity for public lighting purposes. In effect the scheme recommended will, if adopted, standardise the lighting of the town in three sections. Hitherto there has been no method or order in this respect, and the different types of illumination used in two thoroughfares of equal importance has led to one being better lighted than the other. A sub-committee of the Watch Committee directed special attention to this aspect of the matter, and under the new scheme the lighting will be more uniform. The most important thoroughfares will have one degree of lighting; those of second importance will be illuminated at slightly less capacity, while the "back" streets (as the smaller streets of the town are classed) will be lighted on a third standard. The committee have paid particular attention to this third class, and "back" streets will be better lighted than hitherto.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

MANCHESTER MEETING.

A meeting of the institution will be held in the North-Western District at the Town Hall, Manchester, on Friday and Saturday, February 20th and 21st.

PROGRAMME.

Friday, February 20, 1914.

- 12.30 p.m. Meeting of District Executive Committee.
1 p.m. Members of District Executive and members of council attending the meeting will lunch with the Lord Mayor and the chairman of the Improvement Committee and of the Town Planning Committee.
2.15 p.m. The members will assemble in the Manchester Town Hall, where they will be received by the Lord Mayor (Alderman McCabe) and Alderman Frowde (chairman of the Rivers Committee).
2.30 p.m. North-Western District meeting in the Town Hall, Manchester.
Minutes of the previous meeting.
Any other district business.
3 p.m. Description of some of the municipal works of the city of Manchester (illustrated by lantern slides) by Mr. T. de Courey Meade, M.INST.C.E., city surveyor of Manchester.

Drawings and photographs will be exhibited in the Lord Mayor's Parlour showing the works described and intended to be inspected.

A short paper on "The Future Government of Great Cities" (illustrated by lantern slides), by Councillor Joseph Swarbrick, M.INST.C.E.

6.30 p.m.—Dinner will be provided in the town hall at the invitation of the Lord Mayor and the Rivers Committee.

Saturday, February 21, 1914.

9 a.m.—Meet at Town Hall. Special tramcars (provided by the Tramways Committee) will leave Albert-square at 9.15 a.m. to convey members to any or all of the following works they may desire to inspect—viz.:—

Tramway car repairing works and permanent way depot, Hyde-road.

Intercepting sewers at Withington and Didsbury.

Outfall sewers in Stretford and Davyhulme.

Stuart-street subway and Coal Railway. Lakes in Platt Fields and Heaton Park.

1 p.m.—Luncheon, at the invitation of the Tramways and Improvement Committees, at the Grand Hotel, where members will be received by the respective chairmen: Alderman Bowes, J.P. (chairman of the Tramways Committee), and Alderman Wilson, J.P. (chairman of the Improvement Committee).

A. W. BRADLEY, M.INST.C.E.,
Hon. District Secretary

St. Helens, Lancs.

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District will be held at Wakefield on Saturday, March 21, 1914.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

THE ANNUAL MEETING.

The date for the annual meeting of the Institution of Municipal and County Engineers at Cheltenham has been fixed definitely for June 24th, 25th, 26th and 27th next. It has been decided to make a special feature of town planning and of roads, and, if possible, to arrange for an exhibition of town plans.

92 Victoria-street, S.W.
THOMAS COLE,
Secretary.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

EASTERN DISTRICT.

A meeting of the Eastern District of the institution will be held at Oundle on Saturday, February 21st.

PROGRAMME.

2.10 p.m.—Assemble at Oundle Railway Station and proceed to inspect the widening of the North Bridge (adjoining the station), under the direction of Mr. J. H. Dyson, clerk of works to the Northants County Council, who will give a brief description of the works.

3 p.m.—Visit of inspection to the schools of the Grocers' Company, by kind permission of the head master, Mr. F. W. Anderson, M.A.; also the new science and engineering block in course of erection by Messrs. Thompson & Sons, of Peterborough.

Time permitting, visits will also be paid to the Oundle Urban District Council's sewage disposal works, waterworks, cemetery, &c., under the direction of Mr. G. Belson Chilvers, surveyor and water engineer to the council.

4.15 p.m. Meeting at the council offices. Election of chairman and hon. district secretary.

Forthcoming meetings.

Paper, "The Municipal Undertakings of the Oundle Urban District Council," by Mr. G. Belson Chilvers.

4.50 p.m.—Tea at the Talbot Hotel.

P. S. BENNETT,
Hon. District Secretary.

Ramsay, Hunts.

FORTHCOMING MEETINGS.

Arrangements have been made for the following meetings: February 14th, Newcastle; February 21st, Oundle; February 25th, council meeting, London; June 13th, Tisbury. Meetings are being arranged also for Leeds and Birmingham during March.

NEXT COUNCIL MEETING.—The next meeting of the council will be held on Wednesday, February 25th.

MUTUAL AID AND DEFENCE FUND.

The attention of corporate members and students resident in the British Isles is directed to the fact that a half year's subscription to this fund fell due on January 1st, the amount being 1s. 3d. in the case of members and 6d. in that of students.

B. WYAND,
39 Victoria-street, S.W. *Secretary.*

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

CLERK OF WORKS.—February 7th.—Sussex County Council. £3 per week.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

INSPECTOR OF NUISANCES.—February 7th.—Hull and Goole Port Sanitary Authority. £150—£200 per annum.—Mr. J. Davie, clerk.

ASSISTANT SANITARY ENGINEERS.—February 7th.—Government of India. 890—1,000, 500—700 and 460—620 rupees a month.—Secretary, Revenue Department, India Office, London, S.W.

BRIDGE AND MAIN ROAD SURVEYOR.—February 9th.—Devon County Council. £400 a year, with £200 a year for expenses.—Mr. F. Bailey, clerk, The Castle, Exeter.

GAS ENGINEER AND MANAGER.—February 9th.—Swinton and Mexborough Gas Board. £200 per annum.—Mr. J. W. Hattersley, clerk, Mexborough, nr. Rotherham.

SURVEYOR AND INSPECTOR.—February 9th.—Leiston-cum-Sizewell Urban District Council. £150 per annum.—Mr. H. A. Mullens, clerk, Leiston, Suffolk.

SURVEYOR'S ASSISTANT.—February 9th.—Corporation of Luton. £80 per annum.—Borough Surveyor, Town Hall, Luton.

SURVEYOR'S GENERAL ASSISTANT.—February 10th.—The Maldens and Coombe Urban District Council. £100—£150 per annum.—Mr. J. W. Johnson, clerk, New Malden, Surrey.

COUNTY SURVEYOR.—February 10th.—Queen's County Council. £350 per annum.—Mr. J. Carey, secretary, Maryboro'.

QUANTITY SURVEYORS.—February 11th.—Metropolitan Water Board.—Chief Engineer, Savoy-street, Strand, W.C.

CLERK OF WORKS.—February 11th.—Orsett Rural District Council. £3 3s. per week.—Mr. James Beck, clerk, 2 Orsett-road, Grays, Essex.

HIGHWAY SURVEYOR.—February 12th.—Witney Rural District Council. £140 per annum, with £35 for a motor bicycle.—Mr. H. T. Ravenor, clerk.

SURVEYOR'S CLERK.—February 12th.—Corporation of St. Alban. £70 per annum.—Mr. E. P. Debenham, town clerk.

INSPECTOR OF NUISANCES.—February 12th.—Sittingbourne Urban District Council, and Milton Rural District Council. £125—£150.—Mr. C. B. Harris, clerk, Sittingbourne.

BOROUGH SURVEYOR'S CHIEF ASSISTANT.—February 12th.—Corporation of Stockport. £200—£260.—Mr. John Atkinson, borough surveyor.

ASSISTANT BOROUGH SURVEYOR.—February 13th.—Corporation of Guildford. £120—£150.—Mr. A. D. Jenkins, town clerk.

BOROUGH SURVEYOR AND INSPECTOR.—February 16th.—Dunstable Town Council. £225 per annum.—Mr. C. C. S. Benning, town clerk.

BUILDING INSPECTOR.—February 16th.—Corporation of Bolton. £110 per annum.—Mr. Samuel Parker, town clerk.

INSPECTOR OF NUISANCES.—February 16th.—Wortley Rural District Council. £120 per annum.—Mr. J. Morton, clerk, Grenoside, near Sheffield.

SUPERINTENDENT OF FIRE BRIGADE.—February 23th.—Municipality of Karachi. 200 rupees per month, with free quarters. Mr. Measham Lea, chief officer and chief engineer.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

FARNBOROUGH.—February 11th.—Designs for three types of artisans' dwellings, for the urban district council. Premium 20 guineas.—Mr. J. E. Hargroaves, surveyor.

WEYMOUTH.—February 15th.—Designs for twenty-two working-class dwellings, for the corporation. Mr. H. A. Huxtable, town clerk.

HENDON.—March 2nd.—Designs for public baths, for the urban district council. Premiums £100, £75, and £50.—The Clerk.

TWRCELYN.—March 9th.—Plans and specifications for a water supply and drainage scheme for Cemaes.—Mr. T. H. Hughes, clerk, Fir-grove, Menai Bridge.

BELFAST.—March 20th.—Designs for an art gallery and museum, for the corporation.—Mr. R. Meyer, town clerk.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

PONTYPRIDD.—February 9th.—For reservoir construction, for the Joint Water Board.—Mr. W. P. Nicholas, clerk, 49 Mill-street, Pontypridd.

HENDON.—February 9th.—For the erection of fifty dwellings, for the urban district council.—Mr. G. Hornblower, 2 Devonshire-terrace, Portland-place, London, W.

ATHERSTONE.—February 9th.—For the construction of a service reservoir in reinforced concrete, for the rural district council.—Mr. R. Fielders, clerk.

SWINDON.—February 9th.—For constructional work at electricity works, for the corporation. Mr. A. Dammaek, borough electrical engineer.

NEWTON ABBOT.—February 10th.—For extensions to hospital, for the Hospital Committee.—Mr. J. C. Beare, architect, Newton Abbot.

SPALDING.—February 10th.—For the erection of cottages, for the rural district council.—Mr. W. H. A. Davis, architect and surveyor, 6 Double-street, Spalding.

STOKE NEWINGTON.—February 11th.—For the erection of public wash-houses, for the borough council.—Town Clerk.

CAMBRIDGE.—February 11th.—For the erection of wards and pavilion at hospital, for the corporation.—Borough Surveyor.

YSTRADGYNLAIS.—February 11th.—For the erection of eighteen houses, for the rural district council.—Mr. J. C. Rees, architect, Parade Chambers, Neath.

CROMPTON.—February 11th.—For the erection of a bowling green, shelter, and pavilion, for the urban district council.—Mr. F. F. Gartside, clerk and surveyor.

DEVON.—February 11th.—For rebuilding two bridges in reinforced concrete, for the county council.—Mr. F. Bailey, clerk, The Castle, Exeter.

NORMANTON.—February 12th.—For the erection of seventy-six houses, for the urban district council.—Mr. A. Hartley, architect and surveyor.

LEEDS.—February 12th.—For the construction of transformer chambers, for the corporation. 1 White-hall-road, Leeds.

BOLLINGTON.—February 12th.—For the erection of a pumping station, for the urban district council.—Mr. S. Knight, clerk.

BEACONSFIELD.—February 14th.—For the erection of thirty-four cottages, for the urban district council.—Mr. H. Sargeant, surveyor.

MILFORD (Ireland).—February 14th.—For the erection of forty-two labourers' cottages, for the rural district council.—Mr. S. Watters, clerk.

MONMOUTH.—February 14th.—For the erection of new schools, for the county council.—Mr. J. Bain, County Council Offices, Newport.

LOWESTOFT.—February 16th.—For extensions to sanatorium, for the corporation.—Mr. G. H. Hamby, borough surveyor.

COVENTRY.—February 16th.—For the construction of a brick and concrete underground tar and liquor storage tank, for the corporation.—Mr. F. W. Stevenson, gas engineer.

SWANSEA.—February 16th.—For the erection of a temporary school, for the Education Committee.—Mr. E. E. Morgan, borough architect, 3 Prospect-place.

GLASGOW.—February 16th.—For alteration to tramway premises, for the corporation.—Mr. F. Burnet, 180 Hope-street, Glasgow.

DURHAM.—February 17th.—For the erection of a school, for the county council.—Mr. W. Rushworth, Shire Hall, Durham.

MAESTEG.—February 17th.—For the construction of river retaining wall and contingent works, for the urban district council.—Mr. S. J. Harpur, engineer.

BRADFORD.—February 19th.—For building a battery-room at electricity works, and erecting iron and steel work, for the corporation.—Mr. Thomas Roles, city electrical engineer.

HULL.—February 19th.—For the erection of a secondary school, for the Education Committee.—Mr. J. H. Hirst, city architect.

WARMINSTER.—February 20th.—For the erection of an isolation hospital, for the Joint Isolation Hospital Committee.—Mr. C. H. Lawson, architect, 32 High-street, Warminster.

WEST RIDING.—February 20th.—For the erection of a school, for the county council.—Education Architect, County Hall, Wakefield.

LANCASHIRE.—February 21st.—For the erection of a tuberculosis sanatorium at High Carley, for the county council.—Mr. Dean J. Brundritt, architect, County-square, Ulverston.

BISHOP'S STORTFORD.—February 24th.—For supplying and erecting 44-h.p. gas engine and suction gas plant, making repairs to existing machinery, erecting an engine-house at the waterworks, for the urban district council.—Mr. Robert S. Scott, engineer.

FEATHERSTONE.—February 28th.—For the erection of 149 working-class dwellings, for the urban district council.—Mr. S. Chesney, architect.

Iron and Steel.

STOURBRIDGE.—February 10th.—For the supply of gas mains, for the urban district council.—Mr. Charles H. Webb, engineer.

LLANDILOFAWR.—February 13th.—For laying water mains extensions, for the rural district council.—Mr. H. Herbert, Brynmarlais, Ammanford.

WARSAW.—February 16th.—For the supply of two vertical compound engines, with plunger, piston, or differential pumps, or of two turbines, with centrifugal or turbo pumps, for the Municipality.—Sir William H. Lindley, 29 Blittersdorpherplatz, Frankfurt-on-Maine.

MERTHYR.—February 16th.—For laying a 10-in. water main (cast-iron and steel), for the corporation.—Waterworks Engineer, 101 High-street.

BURNHAM-ON-CROUCH.—February 16th.—For laying cast-iron service and pumping main, hydrants, sluice valves, and pump connection, for the urban district council.—Mr. J. Cook, surveyor.

WALLASEY.—February 19th.—For the supply of 20 tons of rails, creosoted sleepers, and the construction of short railway siding, for the corporation.—Mr. J. H. Crowther, engineer.

MATLOCK.—February 28th.—For the erection of steel bridges over the river Derwent to carry steel tube sewers, for the urban district council.—Messrs. James Diggle & Son, 14 Victoria-street, Westminster, S.W.

Roads.

NORTHAMPTONSHIRE.—February 9th.—For the haulage of granite by motor wagons, for the county council.—Mr. C. S. Morris, county surveyor, Northampton.

NORTHAMPTONSHIRE.—February 9th.—For the supply of broken granite, for the county council.—Mr. C. S. Morris, county surveyor, Northampton.

HENDON.—February 9th.—For the supply of artificial stone, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor.

SOUTHAM.—February 9th.—For the supply of granite, for the rural district council.—Mr. H. Pickering, surveyor.

NEWARK.—February 9th.—For the supply of 850 tons of granite, 1,900 tons of slag, and 250 tons of tar-macadam, for the rural district council.—Mr. R. Oakden, junr., 27 Winchelsea-avenue, Newark.

BEVERLEY.—February 9th.—For the supply of about 3,000 to 4,000 tons of stone for macadamising, for the rural district council.—Mr. E. Picker, surveyor.

BIRKENHEAD.—February 9th.—For the supply of granite, Rawtenstall kerbs and channels, Penmaenmawr breaking stone, natural flags, paving setts and creosoted red deal paving blocks, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor.

SOUTHAMPTON.—February 9th.—For the supply of a 10-ton steam road roller fitted with Morrison's scarifier, for the corporation.—Mr. R. R. Linthorne, town clerk.

TIPTON.—February 9th.—For making up a street, for the urban district council.—Mr. W. H. Jukes, engineer and surveyor.

LINTHWAITE.—February 9th.—For making up three streets, for the urban district council.—Mr. J. Ainley, architect, Chapel-street, Slaithwaite.

TOWCESTER.—February 9th.—For the supply of granite and slag, for the rural district council.—Mr. W. Sheppard, surveyor.

TORPOINT.—February 10th.—For making good certain footpaths, for the urban district council.—The Surveyor.

SELBY.—February 10th.—For the supply of whinstone for one year, for the urban district council.—Mr. Bruce M. Gray, engineer and surveyor.

CHEADLE.—February 10th.—For private street improvement works, for the urban district council.—Mr. H. Sykes, council offices.

MALDEN AND COOMBE.—February 10th.—For work of making up and paving, for the urban district council.—Mr. R. H. Jeffes, engineer and surveyor, New Malden.

LONG SUTTON.—February 10th.—For the supply of road materials, for the urban district council.—Mr. S. S. Mossop, clerk.

ALSAGER.—February 10th.—For making up a private street, for the urban district council.—Mr. H. V. Lynam, surveyor.

SOUTHAMPTON.—February 10th.—For kerbing and making up footpath, for the corporation.—Borough Engineer.

LITTLEBOROUGH.—February 10th.—For the supply of 3,700 tons of 4-in. and 5-in. granite setts, for the urban district council.—The Surveyor.

HAYDOCK.—February 11th.—For making up certain streets, for the urban district council.—Mr. J. Dickinson, clerk.

STOKE.—February 11th.—For making up certain streets, for the corporation.—Borough Surveyor.

HEMSWORTH.—February 11th.—For making up a certain street, for the rural district council.—Mr. T. H. Richardson, surveyor.

ROCHDALE.—February 11th.—For making up certain streets, for the corporation.—Borough Surveyor.

WARWICKSHIRE.—February 11th.—For the haulage of main road material and general team labour, for the county council.—Mr. John Wilmot, county surveyor, 6 Waterloo-street, Birmingham.

BRADFORD.—February 11th.—For the supply of materials and cartage, for the corporation.—Mr. W. H. S. Dawson, city engineer and surveyor.

BARNET.—February 11th.—For repaving, rekerbing and channelling in Wood-street, for the urban district council.—Mr. W. F. Wilkins, surveyor.

CHELMSFORD.—February 12th.—For the supply of tar-macadam, for the corporation.—Mr. G. Melvin, town clerk.

LANCASTER.—February 13th.—For making up certain streets, for the corporation.—Mr. A. G. Bradshaw, borough surveyor.

PRESTON.—February 13th.—For making up a road, for the corporation.—Borough Surveyor.

HAM.—February 13th.—For the supply of 150 yds. of broken brown Kent flints, for the urban district council.—Mr. R. W. Hindhaugh, surveyor.

LANARK.—February 13th.—For the supply of tar and tar-macadam, for the Middle Ward.—Road Surveyor, Strathaven, Lanark.

KEYNSHAM.—February 13th.—For the supply of granite or basalt, for the rural district council.—Mr. T. Johnson, surveyor.

KINGSBURY.—February 14th.—For the supply of granite chippings, granite macadam, granite macadam screenings, ironstone slag and cartage, for the urban district council.—Mr. R. C. N. Newport, surveyor.

MILDSTONE.—February 14th.—For the supply of road material and team labour, for the rural district council.—Mr. T. A. Busbridge, surveyor.

HEADINGTON.—February 14th.—For the supply of granite and granite chippings, for the rural district council.—Mr. A. Walker, surveyor, Windmill-road, New Headington.

WISBECH.—February 14th.—For the supply of granite, limestone slag, gravel and ragstone, for the rural district council.—Mr. A. G. Catling, highway surveyor, 4 Post Office-lane.

MILFORD HAVEN.—February 14th.—For the supply of granite or other stone, for the urban district council.—Mr. T. H. Lewis, clerk.

ECCLES.—February 16th.—For the supply of setts, flags, kerbs, broken rubble, broken slag, and chippings, for the corporation.—Mr. T. S. Pieton, borough surveyor.

MARPLE.—February 16th.—For the supply of granite macadam, Macclesfield macadam, limestone macadam, setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor.

LOUTH.—February 16th.—For the supply of granite and slag, for the rural district council.—Mr. F. C. Chard, clerk.

FOOTS CRAY.—February 16th.—For the supply of tar-paving material, tar-macadam, pit flints, screened gravel, fine gravel, hardcore, broken granite, granite setts, granite kerb, channel and crude gas tar, for the urban district council.—Mr. W. A. Farnham, surveyor, Sidcup.

SURBITON.—February 16th.—For the supply of road materials, for the urban district council.—The Surveyor.

EASINGTON.—February 16th.—For making up certain streets, for the rural district council.—Mr. G. Waterhouse, surveyor.

WATFORD.—February 17th.—For making up certain roads, for the urban district council.—Mr. D. Waterhouse, engineer and surveyor.

LEWISHAM.—February 17th.—For making up a certain road, for the borough council.—Borough Surveyor.

EAST SUFFOLK.—February 17th.—For steam rolling main roads, for the county council.—Mr. W. Jervis, county road surveyor, Ipswich.

EGREMONT.—February 17th.—For the supply of material and laying kerbs, channels and flagging, for the urban district council.—Mr. James Cowan, surveyor.

THORNE.—February 17th.—For the supply of dross, screenings, granite and tar, for the rural district council.—Mr. G. Kenyon, clerk, Thorne, viâ Doncaster.

EASINGTON.—February 18th.—For making up certain streets, for the rural district council.—Mr. G. Waterhouse, surveyor.

CROYDON.—February 19th.—For treating road surfaces with Taryia, for the rural district council.—Mr. R. Chart, junr., highway surveyor.

BRIDGNORTH.—February 19th.—For the supply of road materials and haulage, for the rural district council.—The Surveyor.

HODDESDON.—February 19th.—For work of street watering, for the urban district council.—Mr. W. H. Flood, surveyor.

THAKELHAM.—February 19th.—For the supply of broken basalt or granite, and unbroken flints, for the rural district council.—Mr. W. Forester, surveyor.

HERTS.—February 20th.—For diverting portion of a main road, for the county council.—County Surveyor, Hatfield.

CHESHIRE.—February 21st.—For the supply of macadam, tar-macadam and chippings, for the county council.—Mr. W. Holland, deputy county surveyor, Chester.

HEREFORDSHIRE.—February 21st.—For the supply of tar-macadam, 2½-in. granite, 2½-in. slag, and 3-in. and 9-in. rough material for foundations, consisting of basalt, limestone, slag, or other suitable materials, for the county council.—Mr. G. H. Jack, county surveyor, Shire Hall, Hereford.

HIGHWORTH.—February 23rd.—For road repair and haulage, for the rural district council.—Mr. O. Kimber, surveyor, Kite Hill, Wanborough.

LONDON.—February 23rd.—For the supply of Channel Island granite, granite siftings, red pit sand, screened river sand, cockle shells, screened gravel, pea gravel, Kentish flints and Kentish rag, for H.M. Commissioners of Works.—The Secretary, Storey's-gate, S.W.

FINCHLEY.—February 23rd.—For the supply of grit for tar-painting, for the urban district council.—Mr. C. J. Jenkin, engineer.

FINCHLEY.—February 23rd.—For the supply of 55,000 gallons of tar for road surface treatment, for the urban district council.—Mr. E. H. Lister, clerk.

EPSOM.—February 23rd.—For making up Rosebery-road, Cheam, for the rural district council.—Mr. T. E. Ware, surveyor of highways.

MERIONETH.—February 23rd.—For road rolling and macadamising, for the county council.—Mr. E. Vaughan, county surveyor, Arthog, Dolgelly.

SEATON DELAVAL.—February 24th.—For the supply of tar-macadam, tarred slag, whinstone, and hire of steam roller, for the urban district council.—Mr. A. Dorin, surveyor.

ASHINGTON.—February 24th.—For work of making up, for the urban district council.—Mr. G. Beaty, surveyor.

DENBIGH.—February 25th.—For the supply of roadstone and tar-macadam, for the county council.—Mr. W. Jones, county surveyor, Eastern Division, Wrexham.

ASHINGTON.—February 27th.—For the supply of hand-broken whinstone, for the urban district council.—Mr. G. Beaty, surveyor.

OTLEY.—February 27th.—For the supply of granite macadam, furnace slag dust, kerbs and flags, limestone macadam, tar-macadam, brushes, pitch, and earthing road metal, for the urban district council.—Mr. C. F. Hodgson, surveyor.

HAYES (Middlesex).—March 7th.—For making up certain streets, for the urban district council.—Mr. D. C. Fidler, engineer and surveyor.

DROXFORD.—March 16th.—For the supply of 1,300 tons of granite or hard stone, for the rural district council.—Mr. A. V. Carter, surveyor.

Sanitary.

SMALLTHORNE.—February 9th.—For scavenging work, for the urban district council.—Mr. G. Phillips, clerk.

DALKEITH.—February 9th.—For the construction of sewers, sewage tanks and filters, for the corporation.—Messrs. Gilbert Thomson & Ferguson, 164 Bath-street, Glasgow.

ST. MELLONS.—February 9th.—For laying stoneware pipe sewer, manholes, and ventilators, for the rural district council.—Mr. C. S. Morgan, engineer, Pontypridd.

SHERINGHAM.—February 9th.—For the construction of stoneware pipe sewer and manholes, for the urban district council.—Mr. F. H. Smith, engineer.

GRIMSBY.—February 9th.—For the construction of 1,300 yds. of glazed pipes, 200 yds. of concrete tubes, and 600 yds. of brick culverts, for the corporation.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

BIRMINGHAM.—February 10th.—For the construction of sewage and surface-water sewers, for the corporation.—Mr. Henry E. Stilgoc, city engineer and surveyor.

GOSPORT.—February 10th.—For house drainage work, for the urban district council.—The Surveyor.

BLAYDON.—February 10th.—For scavenging work, for the urban district council.—Mr. R. Biggins, Clayton-on-Tyne.

BEDLINGTONSHIRE.—February 10th.—For the construction of sewers, manholes and gullies, for the urban district council.—Mr. J. E. Johnston, surveyor, Front-street, Bedlington.

ORSETT.—February 11th.—For the construction of stoneware sewers, manholes and junctions, for the urban district council.—Mr. C. F. W. Marsh, engineer and surveyor.

BEACONSFIELD.—February 14th.—For the construction of sewage disposal works and sewerage, for the urban district council.—Mr. H. Sergeant, surveyor.

TENTERDEN.—February 14th.—For the construction of 5 miles of stoneware and iron pipe intercepting sewers and appurtenances, for the corporation.—Messrs. John Taylor & Sons, Caxton House, Westminster.

HALE.—February 14th.—For the construction of sewers, for the urban district council.—Mr. T. Blagburn, surveyor.

TYLDESLEY-WITH-SHAKERLEY.—February 14th.—For the construction of No. 7 revolving distributors and appurtenances, cast-iron pipes, screening apparatus, 100-gallon capacity ejector, and concrete and stoneware sewer tubes, for the urban district council.—Mr. F. E. Jones, engineer and surveyor, Tyldesley.

TYLDESLEY-WITH-SHAKERLEY.—February 14th.—For the construction of main outfall sewer and sewage works extension, for the urban district council.—Mr. F. E. Jones, engineer and surveyor.

BATH.—February 14th.—For the construction of 12 miles of stoneware pipe sewers, and about 1 mile of cast-iron sewer, railway, canal, and river crossings, manholes, lampholes, and flushing chambers, for the rural district council.—Messrs. Wilcox & Raikes, Union Chambers, 63 Temple-row, Birmingham.

HALIFAX.—February 14th.—For the construction of cast-iron pipe sewers, for the corporation.—Mr. J. Lord, borough engineer.

SOUTHPORT.—February 16th.—For the construction of stoneware pipe sewers, surface-water drains, and other works, for the corporation.—Borough Engineer and Surveyor.

TURTON.—February 17th.—For the supply of sanitary, road and general stores, for the urban district council.—The Surveyor, Council Offices, Bromley Cross, near Bolton.

MALDON.—February 17th.—For the construction of 400 yds. of 9-in. sewer, with manholes, for the rural district council.—Mr. W. Almond, surveyor.

CROYDON.—February 19th.—For emptying cess-pools, for the rural district council.—Mr. E. J. Gowen, clerk.

OSWALDTWISTLE.—February 19th.—For the construction of outfall sewage works and other incidental works, for the urban district council.—Mr. R. N. Hunter, surveyor.

HODDESDON.—February 20th.—For scavenging work, for the urban district council.—Mr. W. H. Flood, surveyor.

ASHBY-DE-LA-ZOUCH.—February 21st.—For the construction of sewers, manholes and ventilators, for the rural district council.—Mr. T. L. McCarthy, Central Chambers, Coalville, near Leicester.

BATH.—February 26th.—For sewerage work, for the corporation.—Mr. W. H. Radiord, engineer, Albion Chambers, King-street, Nottingham.

ASHINGTON.—February 27th.—For work of sewerage, for the urban district council.—Mr. G. Beaty, surveyor.

READING.—February 28th.—For works of sewerage and surface-water drainage, for the corporation.—Mr. G. Midgley Taylor, Caxton House, Westminster.

SHIPSTON-ON-STOUR.—March 2nd.—For laying 3,632 yds. of 9-in. and 6-in. stoneware pipe sewers, and about 300 yds. of 5-in. cast-iron rising main, also the construction of manholes, lampholes, flushing chambers, engine-house, and other incidental works, for the rural district council.—Messrs. Wilcox & Raikes, 63 Temple-row, Birmingham.

COALVILLE.—March 2nd.—For laying 1 mile of 9-in. sewers and 490 yds. of 18-in. sewer, and 300 yds. of 4-in. cast-iron and steel main, for the urban district council. Mr. L. L. Baldwin, surveyor.

MADRAS.—March 24th.—For the supply and delivery of 2,000 cast-iron manhole covers and frames, for the corporation.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

Stores.

DARLINGTON.—February 9th.—For the supply of sanitary and road materials and team labour, for the rural district council.—Mr. John Robinson, highway surveyor, Union Offices, Darlington.

ILFORD.—February 9th.—For the supply of granite macadam, broken flints, tar-paving, Portland cement, lime, stock and other bricks, Thames ballast, stoneware pipes, iron castings, coal and coke, provender, horse hire and cartage, oils, paints, wheelwrights' timber, tools, general timber, brooms, brushes, baskets, engineers' sundries, pitch, creosote oil, and disinfectants, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

PONTYPRIDD.—February 9th.—For the supply of stores and materials in the surveyor's department, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor.

SHEFFIELD.—February 10th.—For the supply of iron, steel, nuts, bolts, washers, ironmongery, electrical fittings, brushes, engineering goods, and cleansing materials, for the corporation.—Cleansing Superintendent.

STEPNEY.—February 10th.—For the supply of bricks, lime, fireclay, brooms, cast-iron work, colours, varnishes, painters' brushes, drainage materials, oilman's goods, Portland cement, pitch, tar, green oil, bitumen, timber, tools, implements, ironmongery, wheelwrights' materials, ballast, shingle, sand, hoggin, flints, uniform clothing, boots, disinfectants, paving materials, horse hire, and squaring and re-dressing old paving materials, for the borough council.—Mr. M. W. Jameson, borough engineer.

DEPTFORD.—February 10th.—For the supply of sewer connections and jobbing works, road materials, brooms, disinfectants, cement, and ironmongery, for the borough council.—Mr. Arthur Purkis, town clerk.

HUDDERSFIELD.—February 11th.—For the supply of road, sanitary, and general materials, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

WOOLWICH.—February 11th.—For the supply of ballast, sand, brooms, brushes, cement, chandlery, drain pipes, forage, granite kerb, harness, ironmongery, road material, sewer ironwork, and timber, for the borough council.—Mr. J. Rush Dixon, borough engineer.

BATTERSEA.—February 11th.—For the supply of veterinary attendance, horse hire, materials for cart and van covers, harness, paints, tools, ironmongery, macadam, chippings, slag macadam, tarred paving material for footpaths, chippings, York paving, Thames ballast, sand, stoneware pipes, timber, bricks, cement, iron castings, iron bars, disinfectants, coal, coke, soap and oils, for the borough council.—Mr. W. Marcus Wilkins, town clerk.

REIGATE.—February 13th.—For the supply of granite, flints, Kentish ragstone, tar-macadam, gravel, chalk, kerbing, haulage, cartage, team labour, tools, oils, fuel, bricks, cement, iron and stoneware pipes, and tar-washing surfaces of roads, for the rural district council.—Mr. Arthur J. Head, surveyor.

LEEDS.—February 16th.—For the supply of iron, chemical, and other materials, for the Tramways Committee.—Mr. J. B. Hamilton, general manager.

HALIFAX.—February 16th.—For the supply of materials required in the electricity department, for the corporation.—Borough Electrical Engineer.

MARPLE.—February 16th.—For the supply of granite macadam, Macclefield macadam, limestone

macadam, 6-in. setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor.

SHOREDITCH.—February 17th.—For laying patent or manufactured stone, asphalt, and supplying broken granite, plumbers' and smiths' work, drain pipes, junctions, bends, drain rods, rails, ropes, timber, sewer ironwork, street posts, lime, cement, general cartage, street name plates, notice boards, ballast, hoggin, shingle, sand, scavenging, and miscellaneous requisites, for the borough council.—Mr. J. A. D. Milne, town clerk.

ECCLES.—February 17th.—For the supply of setts, flags, kerbs, broken rubble, broken slag, granite macadam and chippings, prepared tarred slag, prepared tarred limestone, limestone cube chippings, gravel, cinders, castings, pitch, creosote and tar, Simpson's patent street gullies, stoneware passage gullies, stoneware pipes, bends and junctions, mortar, and channel stones, for the corporation.—Mr. Thomas S. Pictou, borough surveyor.

RAWTENSTALL.—February 19th.—For the supply of road metal, earthenware pipes, gullies, timber, pitch, creosote oil, disinfectants, Portland cement, iron castings, local stone, tools, scavenging brushes, horse-shoeing, printing, stationery, and newspapers, for the corporation.—Mr. James Whalley, town clerk.

GOOLE.—February 19th.—For the supply of road metal (Guernsey granite and chippings), granite setts, slag (broken and unbroken), hardcore (broken and unbroken for foundations), concrete flags, York flags, kerb, channel, stoneware pipes, bends, Portland cement, tar-macadam, gravel, coal, and bricks, for the urban district council.—Mr. C. G. Bradley, engineer and surveyor.

OSSETT.—February 21st.—For the supply of materials, stores, and workmen's tools required in highways, gas, lighting, water, sanitary and educational departments, for the corporation.—Borough Surveyor.

FINSBURY.—February 21st.—For the supply of fodder, carbolic acid, castings, chandlery, granite, horse and cart hire, pitch, creosote oil, Portland cement, sand ballast, stoneware goods, timber, wood paving blocks, York paving and patent stone, for the borough council.—Borough Surveyor.

MANSFIELD.—February 23rd.—For the supply of granite, slag and tar-macadam, natural flags, kerbing, concrete flags, Portland cement, stoneware pipes, junction bends, timber, sewer ironwork, castings, coal, ironmongery, paints, brooms, brushes, disinfectants, and harness, for the corporation.—Mr. Thos. P. Collinge, borough engineer and surveyor.

SOUTHEND-ON-SEA.—February 25th.—For the supply of stoneware pipes, bends, flints, bricks, gravel, sand, timber, ironmongery, paints, oils, colours, cement, lime, chalk, team labour, forage, tar-paving, tar-macadam, iron castings, granite kerb, channel, broken Guernsey granite, broken granite, pitch, creosote oil, harness supplies, brooms, brushes, iron, steel, and disinfectants, for the corporation.—Mr. E. J. Elford, borough surveyor.

HAMPTON.—February 26th.—For the supply of hand-broken granite, granite chippings, broken Kentish brown flints, Derbyshire limestone, marble, tar-paving material, forage, coal and scavengers' bass brooms, for the urban district council.—Mr. Sidney H. Chambers, surveyor.

OTLEY.—February 27th.—For the supply of granite macadam, furnace slag, dust, kerbs, flags, limestone macadam, tar-macadam, brushes, pitch, and carting road material, for the urban district council.—Mr. C. F. Hodgson, surveyor.

WINCHESTER.—February 27th.—For the supply of broken granite, chippings, bass brooms, Portland cement, coal, coke, stoneware drain pipes, and concrete paving slabs, for the corporation.—Mr. Walter V. Anderson, city engineer.

Miscellaneous.

BECKENHAM.—February 9th.—For the supply of a petrol-driven motor fire engine, escape and ladders, for the urban district council. Mr. John A. Angell, surveyor.

WOODFORD.—February 10th.—For a "Halliford" motor fire hose van, fitted with 40-ft. fire escape, for the urban district council.—Mr. W. Farrington, surveyor.

BARNES.—March 9th.—Offers are invited for a Merryweather double-cylinder "Greenwich" steam fire engine complete with all fittings. Mr. G. Bruce Tomes, surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

BOURNE.—Accepted for the supply of granite, for the rural district council:—

Groby Granite Company, 2,500 tons; Ellis & Liverard, 2,500 tons; Whitwick, 500 tons; Holwell Co., 1,000 tons of slag.

DROXFORD. For the hire of steam rollers and scarifiers, for the rural district council.—Mr. A. V. Carter, surveyor:—

Baldwin Steam Rolling Company, Limited, Dorchester, 26s. 11d. per day; d. per yard scarifying.
E. W. Wright, Alton, Hants, 28s. per day; d. per yard scarifying.

FLINTSHIRE.—For building and other works, for the county council:—

For the Proposed Extensions to the Souington Council School.

R. Williams, Wrexham	£1,268
P. Williams, Wrexham	1,155
R. E. Price, Mold	1,101
A. B. Lloyd, Flint*	1,064

For the Proposed Tar-paving of the Playground at the Coed Talon Council School.

	Per sq. yd.
	s. d.
Bwlchgwyn Roadstone Company, Limited, Wrexham	2 0
Permanite, Limited, Merthyr Tydfil	1 10½
G. P. Trentham, Limited, Birmingham	1 9
J. Smart & Son, Matlock, Derbyshire	1 8
Val de Travers Paving Company, Limited, Birmingham*	1 7½

For Proposed New Special Subjects Rooms for Coed Talon Council School.

W. E. Samuel, Wrexham	£1,418
R. Williams, Wrexham	1,322
R. Roberts, Wrexham	1,286
B. H. Roberts, Wrexham	1,276
J. Roberts, Mold	1,249
P. Williams, Wrexham	1,159
Miles Brothers, Wrexham	1,152
T. L. Davies, Ruabon	1,135
R. Price, Mold	975

For Proposed New Council School, Sealand, to Accommodate 342 Scholars.

Parker Brothers, Chester	£6,024
R. Williams, Wrexham	5,700
Roberts & Sloss, Liverpool	5,556
Jones & Hough, Chester	5,430
J. Mayers & Sons, Chester	5,380
G. Cash & Sons, Chester	5,117
P. Williams, Bangor-on-Dee	4,930
T. L. Davies, Ruabon	4,902
Miles Brothers, Wrexham*	4,832

For Proposed Special Subjects Room at the Mold Junction Council School.

T. Lunt & Son, Chester	£275
Parker Brothers, Chester	266
J. Mayers & Sons, Chester	263
G. Wright & Sons, Hawarden*	232

GRIMSBY.—For the sale, by the corporation, of a steam road roller, with Morrison scarifier, made by Messrs. Aveling & Porter.—Mr. H. Gilbert Whyatt, borough engineer and surveyor:—

Pamplin Brothers, Cambridge, £250.

HAMPSTEAD.—The following tenders have been accepted by the borough council for terms varying from one to three years:—

Team Work.—W. & J. Drinkwater, Willesden.
Yorkshire Paving.—J. Brooke & Sons, Ripperholme, Yorks.
Aberdeen Adamant Paving.—Adamant Stone and Paving Company, Limited, Westminster.

Broken Guernsey Granite.—J. Mowlem & Co., Limited, Westminster.

Broken Cornish Basalt. Lavender & Bateman, Limited, Wisbech.

Sharp Pit Sand.—Leighton Buzzard Sand Company, Limited, Victoria-street, S.W.

Shingle.—W. Boyer & Sons, Paddington.

Dorking Lime.—Young & Son, Kingsland-road, N.E.

Portland Cement.—Hall & Co. (Croydon), Limited, East Croydon.

Tar-paving and Tar-macadam.—Constable, Hart & Co., Limited, Eastcheap, E.C.

Cresosoted Deal Paving Blocks.—Improved Wood Pavement Company, Limited, Queen Victoria-street, E.C.

Sectional Jarrah Paving Blocks.—Acme Flooring and Paving Company (1904), Limited, Victoria Park.

Lithofalt Paving Blocks.—Limmer Asphaltic Paving Company, Limited, Westminster.

Pitch, Tar, and Cresosote Oil.—J. Smart & Son, Poplar, E.

Drain Pipes, Traps, &c.—Doulton & Co., Limited, Lambeth.

Oilman's Goods.—Pryke & Palmer, Upper Thames-street, E.C.

Brooms.—W. & F. Archer, Upper Edmonton, N.

Privilege of Sorting House Refuse.—D. Blackwell & Sons, Shepherd's Bush, W.

NORTHAMPTON.—For the extension of the tramways, for the corporation.—Mr. Alfred Fidler, borough engineer:—

G. Wimpey & Co., Hammersmith	£26,208
R. Finegan, Northampton	25,407
A. A. Clarke, Northampton	24,835
W. Griffiths & Co., Limited, London	24,065
Clough, Smith & Co., London	23,409
Dick, Kerr & Co., Limited, London	22,571
J. Foster, Limited, Liverpool	22,490
G. P. Trentham, Birmingham	21,486
G. Law, Kidderminster	21,319
Pearce & Co., Limited, Morecambe	20,612
A. Stark & Co., Limited, Glasgow †	20,352

Borough engineer's estimate, £20,922.

MIRFIELD. Accepted for the extension of works for the disposal of sewage at the sewage farm, Northorpe, in two contracts, for the urban district council.—Mr. Edwin Gall, engineer and surveyor.

Contract No. 1.—S. Coop & Son, Anroyd, Newsbury, £3,001.
The lowest tender was £2,891, and the highest £3,618.

ROCHDALE.—For road work in certain streets, for the corporation.—Mr. S. S. Platt, borough surveyor:—

Contract No. 416.—Taylor & Turner, Rochdale.
Contract No. 417.—S. Kearsley, Leigh.

SOUTHALL-NORWOOD. For work of making up, for the urban district council.—Mr. R. Brown, engineer and surveyor:—

BALFOUR-ROAD.

Paterson	£530
Free & Sons, Maidenhead	515
H. Farrow	509
Clements, Knowling & Co., Brentford	482
Davy & Armitage	472
H. Morecroft	457
Mowlem & Co.	453
Toafe & Co., Harrow	450
A & B. Hanson, Southall	432

Engineer's estimate, £448.

LADY MARGARET-ROAD (PART OF)

Toafe & Co., Harrow	£205
Free & Sons, Maidenhead	93
Mowlem & Co.	89
— Paterson	83
Davy & Armitage	77
H. Farrow	76
H. Morecroft	71
A. & B. Hanson, Southall	69
Clements, Knowling & Co., Brentford*	68

Engineer's estimate, £68.

LEONARD-ROAD.

Paterson	£675
Free & Sons, Maidenhead	653
H. Farrow	647
Davy & Armitage	603
Clements, Knowling & Co., Brentford	600
H. Morecroft	583
Mowlem & Co.	581
A. & B. Hanson, Southall*	564

Engineer's estimate, £563.

QUEEN'S-ROAD (PART OF).

Toafe & Co., Harrow	£1,340
— Paterson	698
Free & Sons, Maidenhead	698
H. Farrow	638
Davy & Armitage	607
Mowlem & Co.	592
Clements, Knowling & Co., Brentford	589
H. Morecroft	582
A. & B. Hanson, Southall*	510

Engineer's estimate, £486.

LOXON-ROAD (PART OF).

Paterson	£856
Free & Sons, Maidenhead	832
H. Farrow	810
Davy & Armitage	775
Mowlem & Co.	759
Clements, Knowling & Co., Brentford	758
H. Morecroft	746
A. & B. Hanson, Southall*	714

Engineer's estimate, £727.

SHACKLETON-ROAD.

Toafe & Co., Harrow	£1,095
Free & Sons, Maidenhead	573
— Paterson	556
H. Farrow	541
Davy & Armitage	525
A. & B. Hanson, Southall	499
H. Morecroft	499
Mowlem & Co.	498
Clements, Knowling & Co., Brentford*	477

Engineer's estimate, £481.

TACHBROOK-ROAD.

Paterson	£477
Free & Sons, Maidenhead	462
H. Farrow	453
Clements, Knowling & Co., Brentford	427
Davy & Armitage	418
H. Morecroft	408
Mowlem & Co.	405
A. & B. Hanson, Southall	389
A. & H. Root*	308

Engineer's estimate, £388.

RANDOLF AND OTHER ROADS.

Paterson	£1,658
H. Farrow	1,503
Free & Sons, Maidenhead	1,441
H. Morecroft	1,421
Mowlem & Co.	1,412
Davy & Armitage	1,390
Wheeler & Co.	1,379
Clements, Knowling & Co., Brentford	1,377
A. & B. Hanson, Southall*	1,332

Engineer's estimate, £1,309.

Total of accepted tenders, £1,403; total of engineer's estimates, £4,168.

SOUTHAMPTON. For building four cottages at the Otterbourne waterworks, for the corporation:—

Stevens & Co.	£1,435
Jenkins & Sons	1,394
Franklin & Co.	1,337
Payne	1,334
Holly & Herbert	1,272
Fussell	1,264
Hales & Sons	1,230
Saunders	1,149
Pittfield Brothers, Eastleigh	881

SWANSEA.—For the execution of private street works, for the corporation.—Mr. G. Bell, borough surveyor:—

W. H. Owen, Seaforth	£1,348
W. Jones, Gorseinon	1,000
Hill Brothers, Sketty	389
Bennett Brothers, Swansea	919
C. Williams & Co., Swansea	904
Parkinson & Hodgens, Swansea	878

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

FEBRUARY.

- 6.—Institution of Civil Engineers (Students' Meeting): Mr. R. C. S. Walters on "Ancient Surveying." 8 p.m.
- 9.—Royal Institute of British Architects: President's Address to Students; Presentation of Prizes and Studentships
- 10.—Royal Sanitary Institute: Mr. Edwin T. Hall, F.R.I.B.A., on "The King Edward VII. Welsh National Memorial Sanatorium, Pont-y-Wal, South Wales." 7.30 p.m.
- 12.—Society of Architects: Mr. A. Ainsworth Hunt on "Buildings for Small Holdings." 8 p.m.
- 16.—Institute of Sanitary Engineers: Mr. F. R. O'Shaughnessy, F.I.C., on "The Significance of Colloidal Matter in the Problem of Sewage Disposal." Caxton Hall, Westminster. 8 p.m.
- 20-21.—Institution of Municipal and County Engineers: Meeting at Manchester.
- 21.—Institution of Municipal Engineers: Eastern District Meeting at Oundle.
- 23.—Surveyors' Institution: Annual Dinner, Whitehall Rooms. 7 p.m.

MARCH.

- 21.—Institution of Municipal and County Engineers: North-Eastern District Meeting at Wakefield.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

ORSETT RURAL DISTRICT COUNCIL.

A Clerk of works is required for an extension of the Little Thurrock Sewer, about 800 yds. of which is in tunnel. The candidates must have had previous experience in this work, and be thoroughly qualified to take levels and set up sight rails, &c.

Salary, £3 3s. per week: the work is estimated to last four to six months.

Applications, marked "Clerk of Works," with copies of testimonials, to be sent to the undersigned on or before Wednesday, the 11th inst.

(By order)

JAMES BECK,

Clerk to the Council.

Council Offices,
2 Orsett-road,
Grays, Essex.

(1,245)

WITNEY RURAL DISTRICT COUNCIL.
APPOINTMENT OF HIGHWAY SURVEYOR.

Applications are invited for the appointment of Highway Surveyor for the Eastern Division of the above District.

Applicants must not exceed the age of 40 years, have had previous experience in the repair and maintenance of roads, and a thorough knowledge of modern methods of construction.

Salary £140 per annum, and £35 per annum for the provision and upkeep of a motor bicycle.

Applications are to be made on printed Forms only, which will be sent on receipt of a stamped addressed foolscap envelope.

These must be returned to the undersigned not later than 12 noon on February 12th, 1914.

Canvassing in any form will be deemed a disqualification.

H. T. RAVENOR,
Solicitor,

Clerk to the Rural District Council.

Witney,
January 29, 1914.

(1,240)

WANTED, immediately, Temporary Assistant, qualified to prepare Plans, Specifications, Quantities, &c., for Housing Scheme. Applicants to state full particulars of qualifications and experience and salary required—Box 1,375, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,249)

COUNTY BOROUGH OF BOLTON.

BOROUGH ENGINEER AND SURVEYOR'S DEPARTMENT.

APPOINTMENT OF BUILDING INSPECTOR.

The Streets Committee invite applications for the appointment of Building Inspector at a salary of £110 per annum.

Applicants must have a thorough practical knowledge of all Building Trades, and have had experience as a Building Inspector of the Model By-laws and the Public Health Acts.

Applications, in candidate's own handwriting, stating age, experience and qualifications, together with copies of three testimonials of recent date (which will not be returned), and endorsed "Building Inspector," to be sent to the undersigned not later than 12 o'clock noon on Monday, the 16th day of February, 1914.

SAMUEL PARKER,
Town Clerk.

Town Hall, Bolton.

February 4, 1914.

(1,244)

TENDERS WANTED.

COUNTY BOROUGH OF READING.

SEWERAGE AND SURFACE-WATER DRAINAGE.

TO CONTRACTORS.

The Corporation invite Tenders for the execution of Works of Sewerage and Surface-water Drainage in and in the neighbourhood of the Tilehurst area of the Borough.

Persons desirous of tendering may inspect the Plans and Sections of the Works at the Offices of the Engineer, Mr. G. Midgley Taylor, of the firm of Messrs. John Taylor & Sons, Caxton House, Westminster, where copies of the Specification, General Conditions and Bill of Quantities, and Forms of Tender may be obtained on and after Monday, 2nd February, 1914, upon payment, by cheque, of the sum of £2, which will be returned upon receipt of a *bona-fide* Tender.

The person whose Tender is accepted will be required to enter into a Contract for the execution of the works, to give security for the due performance of the Contract by means of a bond of an approved guarantee society, and to observe and comply with the terms of the fair wages clauses set out in the general conditions.

Sealed Tenders, in printed addressed envelopes provided for the purpose, must be delivered to me, the undersigned, at my Office, situate at the Town Hall, Reading, on or before Saturday, 28th February, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender.

Dated this 26th day of January, 1914.

W. S. CLUTTERBUCK,

(1,235)

Town Clerk.

MATLOCK URBAN DISTRICT COUNCIL.

SEWAGE DISPOSAL.

STEEL BRIDGES, &c.

The Matlock Urban District Council invite Tenders for the supply, delivery and skilled labour in the erection of Steel Bridges over the River Derwent to carry Steel Tube Sewers.

Plans and General Conditions of Contract may be seen, and Form of Tender, Specification, and all other particulars obtained, on application to Messrs. James Diggle & Son, Civil Engineers, 14 Victoria-street, Westminster, S.W., and Hind Hill-street, Heywood, Lancashire, on payment of a deposit of £2, which will be returned on receipt of a *bona-fide* Tender fully priced out in accordance with the Conditions of the Specification, but not otherwise.

Sealed Tenders, endorsed "Matlock Sewerage: Tender for Bridges," must reach me not later than Saturday, February 28th, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

RICHARD TAYLOR,

Clerk to the Council.

Council Offices,
Matlock.

February 3, 1914.

(1,254)

(Continued on p. 310.)

LEGAL NOTICE.

1914 L. No. 64.

IN THE HIGH COURT OF JUSTICE.

CHANCERY DIVISION.

MR. JUSTICE ASTBURY
FOR MR. JUSTICE NEVILLE.

In the matter of

THE LIMMER ASPHALTE
PAVING CO., LTD.,

and

In the matter of

THE COMPANIES
(CONSOLIDATION) ACT, 1908.

NOTICE is hereby given that a Petition was on the 20th day of January, 1914, presented to the High Court of Justice by the above-named Company and amended the 29th day of January, 1914, to confirm an alteration of the said Company's objects proposed to be effected by special resolution of the Company unanimously passed at a General Meeting of the said Company held on the 10th day of October, 1913, and subsequently unanimously confirmed at a General Meeting of the said Company held on the 7th day of November, 1913, and which resolution is as follows:—

"That the Memorandum of Association contained in the printed document submitted to the Meeting and for the purpose of identification subscribed by the Chairman thereof, or such modified form thereof as may be approved by the court be and the same is hereby approved, and that such Memorandum of Association, with such modifications (if any) as aforesaid be and it is hereby adopted as the Memorandum of Association of the Company to the exclusion of and in substitution for the existing Memorandum of Association."

The following is a copy of the said proposed Memorandum of Association—that is to say:—

1. The Name of the Company is "THE LIMMER ASPHALTE PAVING COMPANY, LIMITED."

2. The Registered Office of the Company will be situate in England.

3. The Objects for which the Company is established are—

- (1) To purchase and work the contracts or concessions, rights, and interests held by MYLAUS COHEN for or relating to the importation into and sale and use within the United Kingdom of Great Britain and Ireland of the "Limmer" Asphalt, and also any other contracts or concessions, rights, estates, or interests relating to or in or over the same or any similar material or substance which the Company may at any time or times think fit to purchase or acquire, and which either already have been or hereafter may be made or granted either to the said MYLAUS COHEN or to any other person or persons whomsoever or which the Company may take directly in their own name.
- (2) To search for, inspect, examine, and explore, work, purchase, take on lease, or otherwise acquire any mines, mining rights, quarries, lands, and places in the Republic of France or the Empire of Germany or elsewhere which may seem to the Company capable or possibly capable of affording a supply of asphalt or other bituminous substances, stone, or materials for the preparation of artificial stone, cement, or concrete, and to develop, exercise, and turn to account the same.

(3) To crush, with g.t. quarry, smelt, calcine, refine, dress, amalgamate, manipulate and prepare for market asphalt and other bituminous substances, concrete, cement, stone, and artificial stone, and to carry on any other mining, mineralogical, or manufacturing operations which may seem conducive to any of the Company's objects.

(4) To purchase, acquire, import, export, manufacture, use, sublet, sell, exchange, deal in, and turn to account asphalt and other bituminous substances, concrete, cement, stone, artificial stone, wood, or other similar materials.

(5) To obtain or purchase and to undertake, work, execute, and carry out any contract for making asphalt, concrete, cement, stone, artificial stone, or other foundations for buildings and other works, or for paving or covering any places with asphalt or other bituminous substances, concrete, cement, stone, artificial stone, or wood or other similar materials, or any contracts for any other purpose for which asphalt or other bituminous substances, concrete, cement, stone, artificial stone, or wood may be found useful, and to carry out any ancillary or other works comprised in such contracts, and also to sublet any such contracts to any other person or company, and to contract with any person or company to supply him or them with asphalt or other bituminous substances, concrete, cement, stone, artificial stone, or wood.

(6) To carry on the businesses of Manufacturing and other Chemists, Importers, and Manufacturers of and Dealers in Chemical, Industrial, and other Preparations and Articles, Compounds, Cements, Oils, Paints, Pigments, and Varnishes, Makers of and Dealers in Electrical and Chemical Materials.

(7) Generally, to carry on the businesses of an Asphalt Company, Contractors, Engineers, Road Makers and Paviors; and to work and develop the same businesses, and to grant licences and concessions to other companies or persons for the same purposes or any of them.

(8) To carry on any other business (whether manufacturing or otherwise) which may seem to the Company capable of being conveniently carried on in connection with the above, or calculated directly or indirectly to enhance the value of or render more profitable any of the Company's property or rights.

(9) To purchase or by other means acquire, sell, exchange, deal in, and turn to account any freehold, leasehold, or other property for any estate or interest whatever, and any rights, privileges, or easements over or in respect of any property, and any buildings, factories, mills, works, wharves, roads, railways, tramways, machinery, engines, rolling stock, plant, live and dead stock, barges, vessels, or things, and any real or personal property or rights whatsoever which the Company may think necessary or convenient for the purposes of its business, or necessary for, or convenient to be used with, or likely to enhance the value of any other property of the Company.

(10) To build, construct, maintain, alter, enlarge, pull down, and remove or replace any buildings, factories, mills, offices, works, wharves, roads, railways, tramways, machinery, engines, walls, fences, banks, dams, sluices, or water-courses, and to clear sites for the same, or to join with any person, firm, or company in doing any of the things aforesaid, and to work, manage, and control the same, or join with others in so doing.

(11) To apply for, purchase, or by other means acquire and protect, prolong and renew, whether in the United Kingdom or elsewhere, any patents, patent rights, brevets d'invention, licences, protections, concessions, and the like conferring any exclusive or non-exclusive or limited right to use or any secret or other information as to any invention which may appear likely to be advantageous or useful to the Company, and to use and turn to account

and to manufacture under or grant licences or privileges in respect of the same, and to expend money in experimenting upon and testing and in improving or seeking to improve any patents, inventions, or rights which the Company may acquire or propose to acquire.

- (12) To acquire and undertake the whole or any part of the business, goodwill, and assets of any person, firm, or company carrying on or proposing to carry on any of the businesses which this Company is authorised to carry on, and, as part of the consideration for such acquisition, to undertake all or any of the liabilities of such person, firm, or company, or to acquire an interest in, amalgamate with, or enter into any arrangement for sharing profits, or for co-operation, or for limiting competition, or for mutual assistance with any such person, firm, or company, and to give or accept, by way of consideration for any of the acts or things aforesaid or property acquired, any Shares, Debentures, Debenture Stock, or securities that may be agreed upon, and to hold and retain, or sell, mortgage, and deal with any Shares, Debentures, Debenture Stock, or securities so received.
- (13) To improve, manage, cultivate, develop, exchange, let on lease or otherwise, mortgage, sell, dispose of, turn to account, grant rights and privileges in respect of, or otherwise deal with all or any part of the property and rights of the Company.
- (14) To invest and deal with the moneys of the Company not immediately required upon such securities and in such manner as may from time to time be determined.
- (15) To lend and advance money or give credit to such persons and on such terms as may seem expedient, and in particular to customers and others having dealings with the Company, and to give guarantees or become security for any such persons.
- (16) To borrow or raise money in such manner as the Company shall think fit, and in particular by the issue of Debentures or Debenture Stock (perpetual or otherwise), and to secure the repayment of any money borrowed, raised, or owing by mortgage, charge or lien upon the whole or any part of the Company's property or assets (whether present or future), including its uncalled capital, and also by a similar mortgage, charge or lien to secure and guarantee the performance by the company of any obligation or liability it may undertake.
- (17) To draw, make, accept, endorse, discount, execute and issue promissory notes, bills of exchange, bills of lading, warrants, debentures, and other negotiable or transferable instruments.
- (18) To enter into any arrangements with any Governments or authorities (supreme, municipal, local or otherwise), or any corporations, companies or persons that may seem conducive to the Company's objects or any of them, and to obtain from any such Government, authority, corporation, company or person any charters, contracts, decrees, rights, privileges and concessions which the Company may think desirable, and to carry out, exercise and comply with any such charters, contracts, decrees, rights, privileges and concessions.
- (19) To subscribe for, take, purchase, or otherwise acquire and hold shares or other interest in or securities of any other company having objects altogether or in part similar to those of this Company, or carrying on any business capable of being conducted so as directly or indirectly to benefit this Company.
- (20) To act as agents or brokers and as trustees for any person, firm or company, and to undertake and perform sub-contracts, and also to act in any of the businesses of the Company through or by means of agents, brokers, sub-contractors or others.
- (21) To remunerate any person, firm or company rendering services to this Company, and in particular any servant or employee of the Company, either by cash payment or by the allotment to him or them of Shares of the

Company credited as paid up in full or in part, or by giving to him or them a share or interest in the profits of the Company, or by a combination of two or more of these modes, or in such other manner as the Company shall think fit.

- (22) To pay all or any expenses incurred in connection with the formation, promotion and incorporation of the Company, or to contract with any person, firm or company to pay the same, and to pay commission to brokers and others for underwriting, placing, selling or guaranteeing the subscription of any Shares, Debentures, Debenture Stock or securities of this Company.
- (23) To support and subscribe to any charitable or public object, and any institution, society or club which may be for the benefit of the Company or its employees, or may be connected with any town or place where the Company carries on business; to give pensions, gratuities or charitable aid to any person or persons who may have served the Company, or to the wives, children or other relatives of such persons; to make payments towards insurance; and to form and contribute to provident and benefit funds for the benefit of any persons employed by the Company.
- (24) To procure the Company to be registered or recognised in any Colony or Dependency or in the Empire of India, and in any Foreign Country or Place.
- (25) To promote any other company for the purpose of acquiring all or any of the property or undertaking any of the liabilities of this Company, or of undertaking any business or operations which may appear likely to assist or benefit this Company, or to enhance the value of any property or business of this Company, and to place or guarantee the placing of, underwrite, subscribe for, or otherwise acquire all or any part of the shares or securities of any such company as aforesaid.
- (26) To sell or otherwise dispose of the whole or any part of the undertaking of the Company, either together or in portions, for such consideration as the Company may think fit, and in particular for shares, debentures, debenture stock, or securities of any company purchasing the same.
- (27) To distribute among the Members of the Company in kind any property of the Company, and in particular any shares, debentures, debenture stock, or securities of other companies belonging to this Company, or of which this Company may have the power of disposing.
- (28) To do all or any of the above things in any part of the world.
- (29) To do all such other things as may be deemed incidental or conducive to the attainment of the above objects or any of them.

And it is hereby declared that the intention is that the objects specified in each Sub-Clause of this Clause shall, except where otherwise expressed in such Sub-Clause, be in nowise limited or restricted by reference to or inference from the terms of any other Sub-Clause or the name of the Company.

4. The Liability of the Members is Limited.

5. The Capital of the Company is One Hundred Thousand Pounds, divided into One Hundred Thousand Shares of One Pound each.

And Notice is further given that the said Petition is directed to be heard before His Lordship Mr. Justice Astbury on Friday, the 20th day of February, 1914, and any person interested in the said Company, whether as creditor or otherwise desirous of opposing the making of an Order for the confirmation of the said alteration under the above Act, may appear at the time of hearing by himself or his Counsel for the purpose, and he is required to give two clear days' previous notice of his intention so to appear with the grounds of his objection to the undersigned, the Solicitors of the said Company. A copy of the said Petition will be furnished to any such person requiring the same by the undersigned on payment of the regulated charges for the same.

Dated the 3rd day of February, 1914.

WILLIAM STURGES & CO.,

Caxton House, Westminster.

Solicitors for the Company.

CORPORATION OF MADRAS.
SPECIAL WORKS DEPARTMENT. DRAINAGE
SECTION.

CONTRACT M. & M., No. 21.

The Corporation of Madras is prepared to receive Tenders from competent persons willing to enter into a Contract for the Supply and Delivery of 2,000 Cast-iron Manhole Covers and Frames.

Forms of Tender prepared by J. W. Madeley, Esq., M.A., M.INST.C.E., M.A.M.SOC.C.E., &c., Special Engineer to the Corporation of Madras, may be obtained from the undersigned, Agents to the Corporation, on payment of 4 (four) shillings per set, which will not be returned.

Tenders, accompanied by a deposit in currency notes or a draft on a Madras Bank for Rs.200, should be sent direct to the President, Corporation of Madras, so as to reach him at or before 12 noon on the 24th day of March, 1914.

The Corporation does not bind itself to accept the lowest or any Tender.

(Signed) JAMES MANSERGH & SONS,
Agents to the Corporation.

5 Victoria-street,
Westminster,
London, S.W.

February 4, 1914. (1,253)

DRUXFORD RURAL DISTRICT.
SUPPLY OF GRANITE OR HARD STONE.

The Rural District Council of Druxford invite Tenders for the supply and delivery of about 1,300 tons of Granite or Hard Stone.

Forms of Tender may be obtained of Mr. A. V. Carter, Surveyor, Druxford, Hants.

Tenders must be delivered to me in an envelope, sealed and endorsed "Tender for Granite," not later than Monday, the 16th March, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

H. GODFREY PEARSON,
Clerk.

Bishop's Waltham, Hants.
February 3, 1914. (1,256)

BOROUGH OF MANSFIELD.

The Corporation of Mansfield invite Tenders for the supply of the following Materials for a period of Twelve Months, ending 31st March, 1915 -

1. Granite, Slag and Tar-macadam.
2. Natural Flags, Kerbing, Channelling and Concrete Flags.
3. Portland Cement.
4. Stoneware Pipes, Junctions, Bends, &c.
5. Timber.
6. Sewer Ironwork and Castings.
7. Coal.
8. Ironmongery and General Stores.
9. Paints, Oils, Varnish, &c.
10. Brooms and Brushes.
11. Disinfectants.
12. Supply and Repair of Harness.
13. Supply of Groceries, Drysaltery, Soups and Sundries.
14. Butcher, Fishmonger, Baker, &c.

No Tender will be accepted from any person or firm paying to any workmen employed by him or them, whether on work for the Corporation or any other person, less than the standard rate of wages, or not complying with the recognised conditions of labour in the Borough.

Specifications, Schedules, and Forms of Tender may be obtained on application to Mr. Thos. P. Collinge, Assoc.M.INST.C.E., Borough Engineer and Surveyor, Exchange-row, Mansfield.

Sealed Tenders, endorsed "Tender for Stores," addressed to the undersigned, to be delivered on or before 12 o'clock noon on Monday, 23rd February, 1914.

J. HARROP WHITE,
Town Clerk.

Mansfield.
February 3, 1914. (1,252)

THE FINSBURY BOROUGH COUNCIL
invite Tenders for the underment oned Supplies,
&c., from 31st March next:

For Six Months
Fodder.*
For Twelve Months
Carbolic Acid.
Castings.
Chandlery, Oil, Brushes, &c.
Grants.
Horse and Cart Hire.
Pitch and Creosote Oil.
Portland Cement and Lime.
Sand Ballast, &c.
Stoneware Goods.
Timber.
Wood Paving Blocks.
Workmen's Clothing.
York Paving and Patent Stone.

Particulars and Forms of Tender may be had any day save Saturdays from 10 to 4, and on Saturdays from 10 to 12, on application to the Borough Surveyor at the Town Hall, except that in the case of items marked with an asterisk, similar application should instead be made to the Cleansing Superintendent, 24 Wharf-road, City-road, N. Postal requests must be accompanied by a stamped and addressed foolscap envelope.

Tenders, marked outside "Fodder," or as the case may require, must be delivered to me at this Town Hall not later than Saturday, 21st February inst.

Only those made upon the Official Form and properly filled up and signed, and confined to the articles specified therein, will be entertained.

GEORGE WHITEHEAD PRESTON,
Town Clerk.

Finsbury Town Hall,
Rosebery-avenue, E.C.
February 2, 1914. (1,250)

SHIPSTON-ON-STOUR RURAL DISTRICT COUNCIL.

SHIPSTON-ON-STOUR SEWERAGE AND SEWAGE
DISPOSAL WORKS.

CONTRACT No. 1.

The Shipston-on-Stour Rural District Council invite Tenders for the Provision, Laying and Jointing of about 3,632 yds. of 9-in. and 6-in. Stoneware Pipe Sewers, and about 300 yds. of 5-in. Cast-iron Rising Main; also the construction of Manholes, Lampholes and Flushing Chambers, Engine-house and Pump Well, Liquefying and Storm Tanks, Bacteria Beds, Sludge Beds, Approach Road and Footbridge, and other incidental works in accordance with the Drawings and Specification prepared by the Engineers.

Drawings and Specification may be seen, and Bills of Quantities and Form of Tender obtained, at the Offices of the Engineers, Messrs. Willeox & Raikes, 63 Temple-row, Birmingham, on or after the 9th day of February, 1914, on payment of a deposit of three Guineas, which will be refunded on receipt of a *bona-fide* Tender and the return of all documents to the Engineers.

Sealed Tenders, in envelopes supplied, endorsed "Sewerage and Sewage Disposal Works: Contract No. 1," to be delivered at my office not later than 12 o'clock noon on the 2nd day of March, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

WILLIAM ELLIS COE,
Clerk to the

Shipston-on-Stour Rural District Council.

Shipston-on-Stour.
February 2, 1914. (1,243)

BOROUGH OF OSSETT.

The Corporation of Ossett invite Tenders for the supply of Materials, Stores, Workmen's Tools, &c., required in the Highways, Gas, Lighting, Water, Sanitary and Educational Departments for one year from the 1st April, 1914, to 31st March, 1915.

Specification and Forms of Tender may be obtained at the Borough Surveyor's Office on application.

Sealed and endorsed Tenders to be delivered to me, the undersigned, at the Town Hall, Ossett, not later than 10 a.m., the 21st day of February, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender.

T. W. WILSON,
Town Clerk.

Town Hall,
Ossett.
February 2, 1914. (1,241)

WESTRUMITE ASPHALT.

(LAID COLD.)

The **Ideal Asphalt Road** and the only method by which Natural Asphalt can be applied **Cold** in exactly the same manner as cement concrete: a simplicity which enables Surveyors to carry out work by direct labour. An Expert to supervise the Mixing and Laying is provided. **No Heating Plants are Required.**

A **Westrumite Asphalt Wearing Surface** 2 in. thick can be laid on a Macadam or Concrete foundation. Miles of roads, thus constructed, are found after seven years' wear to be **equal to when laid.**

Westrumite Asphalt is proving a **Boon for Tar-macadam Roads**, as being the only form in which Natural Asphalt can be used as a complete void-filler, as it penetrates the surface to a depth of at least one inch. An Asphalt Surface is thus obtained which neither heat nor cold can affect, thereby adding years to its life

Water-bound Macadam Roads can be given a perfect asphalt surface by using **Westrumite Asphalt** in a matrix of limestone dust, and applying it after the interstices of the macadam have been thoroughly cleaned out. The method is second to none for all classes of roads in the country, the process being so simple that ordinary roadmen can operate it.

**THE BRITISH WESTRUMITE ASPHALT CO.,
LIMITED,**

25 Victoria St., WESTMINSTER, S.W.

Telegrams—"WESTRUMITE, VIC., LONDON."

Telephone—VICTORIA 5961.

Works and River Wharf—FULHAM, S.W.

District Office—13 HARRINGTON STREET, LIVERPOOL.

HAMPTON URBAN DISTRICT COUNCIL. SUPPLY OF MATERIALS, &c.

The above Council hereby invite Tenders for the Supply of:—

- (1) Hand-broken Granite.
- (2) Granite Chippings.
- (3) Broken Kentish Brown Flints.
- (4) Derbyshire Limestone Marble Tar-paving Material.
- (5) Forage.
- (6) House Coal and Coke.
- (7) Best Scavengers' Bass Brooms.

Forms of Tender, Conditions, and all particulars may be obtained at the Offices of the Council, Hampton, Middlesex, where Tenders must be delivered, sealed and endorsed "Tender for —," not later than 5 p.m. on Thursday, the 26th day of February, 1914.

Dated this 2nd day of February, 1914.

(By order)

SIDNEY H. CHAMBERS,
Surveyor to the Council.

Public Offices,
Hampton, Middlesex. (1,251)

BOROUGH OF RAWTENSTALL. TENDERS FOR MATERIALS, LABOUR, PRINTING, STATIONERY, NEWSPAPERS, AND MAGAZINES.

The Corporation of Rawten-stall invite Tenders for the Supply of the following:—

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(By order)

JAMES WHALLEY,
Town Clerk.

Town Hall, Rawten-stall.
February 3, 1914.

(1,255)

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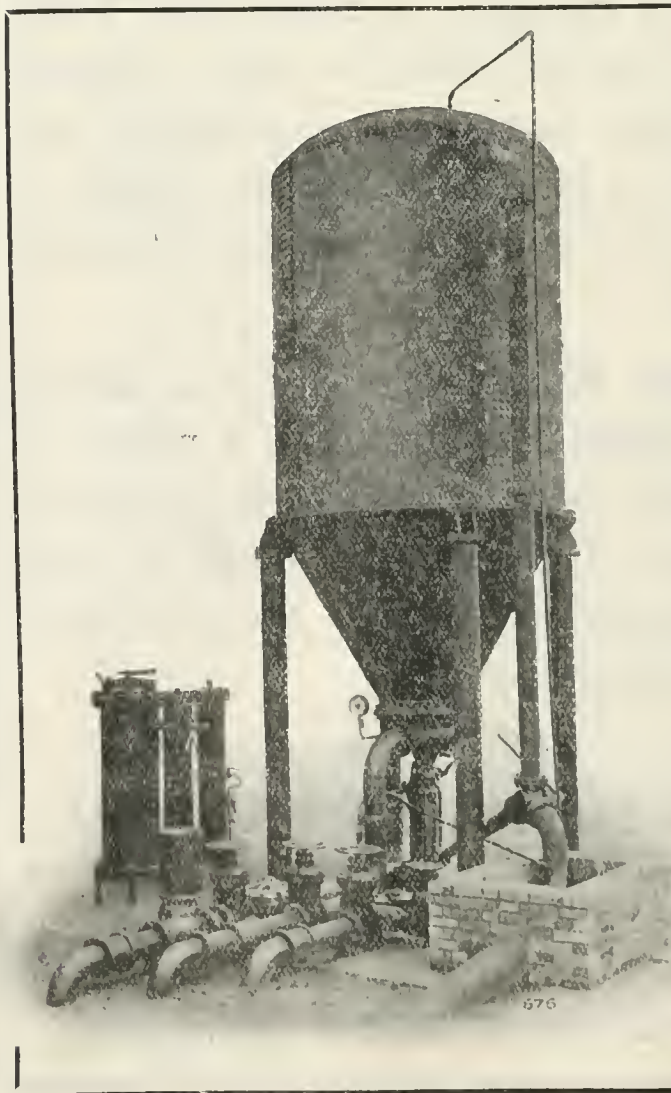
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The Surveyor

And Municipal and County Engineer.

Vol. XLV.

FEBRUARY 13, 1914.

No. 1,152.

Minutes of Proceedings.

Society of Engineers: Presidential Address.

Last week we discussed that portion of Mr. H. C. H. Shenton's address which dealt with professional matters, and we feel that no apology will be needed from us by those who have perused that address for devoting a further portion of our space to the technical section. Before doing that, however, we wish to draw attention to the arguments advanced by Mr. Shenton against the existing method of remunerating the consulting engineer. While the fee is based upon a percentage upon the cost of the work, the more personal attention he gives to a scheme in order to reduce the cost to the lowest point compatible with efficiency the less will be his rate of payment. "Thus the careless or incompetent person who designs works of an unnecessarily expensive character will receive a much larger fee than the better engineer who works out a thoroughly economical scheme." This is obviously an anomaly, but the arguments in favour of its abolition should be addressed to local authorities and others who employ engineers, and if the Society of Engineers can do anything in this direction it will be performing good work. Another important point in connection with engineering is the economy of scientific treatment. This was discussed in the address in connection with water supply works, but it is, in our opinion, equally applicable to works of sewerage and sewage disposal. It was pointed out, as we have ourselves stated on many occasions, that the engineer must work with the chemist and bacteriologist, and that it is absolutely essential that water supply problems should be placed in the hands of those who can deal with them scientifically, and utilise the latest knowledge and experience on the subject. Mr. Shenton cited several cases, notably that of the water supply of London, in which the application of the sciences of chemistry and bacteriology has been of great value in solving difficult problems. While the larger and more wealthy local authorities are frequently willing to incur the necessary expense involved in the employment of additional scientific advisers, the smaller authorities seldom possess sufficient knowledge to see that such expense is, in most cases, well advised and the best economy in the end. Here, again, the Society of Engineers might do good work in educating our local government bodies.

In his general review of matters pertaining to works of water supply, Mr. Shenton emphasised the urgency of several reforms which have been suggested in various quarters. Among these are a systematic hydrographical survey for the whole kingdom, and the establishment of rivers boards with a central authority, so that the national water supply shall be considered as a whole, and combination, rather than separate action, among local authorities shall be organised. He also referred to the value of water waste detection, and gave particulars of an instance where the adoption of this method of investigation would have been the means of preventing the expenditure of a considerable sum in duplicating existing works, including well,

reservoir and pumps. Reference was also made to a suggestion in a recent Memoir of the Geological Survey that the chalk water-bearing stratum under London, in which the water level has fallen 100 ft. or more within recent years, should be replenished artificially with water. So far as we are aware, with the exception of Mr. Bryan's experiment, nothing has been done to put this into practice on a large scale, and unless there are grave objections to the adoption of the idea, it occurs to us that it would be an excellent method of storing the flood waters of the Thames without necessitating the enormous expense involved in constructing additional reservoirs.

In dealing with sewage disposal, after giving a clear and concise description of the recommendations contained in the latest report of the Royal Commission, Mr. Shenton expressed the opinion that "it must not be thought that there is any probability of persons or authorities being allowed to discharge unscreened crude sewage into rivers which serve as sources of water supply, though it is quite conceivable that in some cases where the dilution is sufficient, filters may be omitted." To this we would add that, from the experience gained in other countries, it is improbable that the discharge of unscreened sewage will be permitted under any circumstances, and that the utmost relief we may expect, in special circumstances only, is the omission of filters in a few cases. It is also gratifying to us to note that Mr. Shenton, who has obtained excellent results with a large number of contact beds which he has constructed in various parts of the country, agrees with what we have stated on several occasions, to the effect that where this system has proved unsuccessful it has usually been due to bad construction and improper operation. He also added that in this way "bad results have been produced, and discredit has been thrown upon a system which should be of very great value to the engineer," an expression of opinion with which we thoroughly agree. On the importance of good management Mr. Shenton spoke very strongly, and we heartily endorse his testimony to the excellent work of sewage works managers in their difficult and frequently arduous duties. Bad management will render the best designed works ineffective, while good management can often produce excellent results from a poorly designed and badly constructed works. In conclusion, we congratulate the Society of Engineers in having elected a president who evidently does not intend to allow his office to become a sinecure, and we hope the members of the Society will rise to the occasion and support him in every possible way.

* * *

Sewage Disposal by Dilution.

Although the letter on another page from Mr. Hugh Howell, M. Inst. C.E., chief inspector of the Rivers Mersey and Irwell Joint Committee, reached us after the foregoing notes upon the technical portion of Mr. H. C. H. Shenton's presidential address to the Society of Engineers were written, we gladly take this opportunity of complying with his request to deal with the subject of the *quality*

of the water which may be used for the disposal of sewage or sewage effluents by dilution. As a matter of fact, the point is very clearly stated in Mr. Stowell's letter, and should not need any further emphasis. We had noticed the omission from the "Summary of Conclusions" at the end of the Eighth Report of the Royal Commission, of any reference to the quality of the diluting water or its contents of dissolved oxygen, but we had in mind not only section 25 in the body of the report (p. 7), but also sections 16 and 17 (p. 5), dealing with the "quality of water as a factor in a graduated scale of standards." In section 17 it is clearly stated that "for the purpose of arriving at a standard, or scale of standards, the quality of the diluting water should be assumed to be constant and represented by the figure 0," which is the average figure for a *clean* water. In addition to this, in our special issue of January 31, 1913, p. 181, we stated that "a system of treatment by dilution in a river already highly polluted would, of course, be unsatisfactory, even if the amount of dilution is high. . . ." It is true that the Royal Commission state (Eighth Report, p. 7) that there may be *extreme* cases where the relative volume of the stream is very small and its actual quality is very poor, and the most exacting standard which could be attained would be insufficient to prevent the occurrence of offensive conditions. In such cases the commissioners considered that regard should not be had to the quality of the water, but only to the dilution, reliance being placed on the enforcement of standards in the upper reaches to improve the quality of the water in question. It should be noted, however, that this refers to the question of the adoption in certain cases of *especially stringent standards*, and that there is no suggestion that anything less stringent than the general standard as set forth in paragraph (c) of the "Summary of Conclusions" would be permitted. On the other hand, in the following section, they think that a claim for a relaxed standard may be entertained under certain conditions, the first of which is that mentioned by Mr. Stowell in his letter - *i.e.*, "when it can be shown that the particular river water is of such *quality* and volume that, when mixed with a sewage or sewage liquor of known or calculated strength and volume it does not, or would not, take up more than 0.4 part per 100,000 of dissolved oxygen in five days," which presupposes that the river water is of the quality described above as "clean." Apart from all this it should be understood that the object in view in all these accommodations is the prevention of nuisance in our streams and rivers, and we believe that no relaxation of standards will be permitted which may in any way tend to obstruct the attainment of that object or to postpone an improvement in the condition of rivers which are at present polluted.

* * *

**A New Departure
in
Pile Construction.**

During the last few years there have been a number of important advances in the art of constructing pile foundations. There have been devised several methods by means of which a concrete pile can be formed in solid and even in soft ground, and devices enabling the engineer to spread out the concrete at the toe of the pile have been adopted with success. By the use of the water-jet the rate at which piles can be sunk has in many cases been greatly accelerated, and the cost of sinking much reduced. Of solid piles, not formed in the ground, but driven or sunk into it, there are now three principal classes - timber piles, screw piles, and ferro-concrete piles. In the employment of the last-named there has been steady progress in matters of detail - lengthening, connection with bracing, and so forth - and some advances have been made in the measures taken to protect timber piles from the attacks of

bore-worms, and to render the concrete of ferro-concrete piles as resistant as possible to sea-water. In recent years there has been, however, no radical departure in the actual methods of construction of preformed piles, and we have therefore given prominence, in another part of this issue, to an account of a method of combining, in one coupled piece, a ferro-concrete and a timber pile, and a description of a device by means of which timber piles can be coupled so as to provide, at moderate cost, a pile of any required length. Our readers will draw their own conclusions as to the merits of the invention - the coupling itself - and of the idea which suggested the construction of the compound pile - namely, the advantage of using ferro-concrete and timber together in such a manner that one or both of them may be immune from influences causing corrosion or decay.

This basic idea seems to be of considerable importance, and the coupling described promises to provide a sound engineering joint; but, although there is much sound argument in Prof. Schönhöfer's contentions, it is impossible wholly to accept his conclusions, or even to admit that his promises are without flaw. In the first place, Prof. Schönhöfer's idea as to the corrosive effects of certain soil and water contents on concrete seems to be exaggerated; in the second place, it is evident that the Heimbach joint would itself be specially liable to attack in some of the situations described; and, thirdly, the difficulty of designing the work so as to secure the desired immunity for the timber or the concrete, or both, would often be very great, and would considerably restrict the scope or diminish the advantages of the compound piling. In the case of a sea work, such as that described in the article, the joint could, as is suggested, be protected from rust; but so could a corresponding length of timber pile be protected from the attacks of bore-worms, or a ferro-concrete pile from the corrosive action of sea water. Even if this were not the case, the argument, as stated, would apply only to very shallow waters. It would seem, indeed, that the case for the compound pile would be stronger if less stress were laid upon the ill-effects of sea water and marsh waters upon concrete, a consideration which is favourable to the design, since these effects are probably exaggerated in the "brief." Since, however, the importance of such effects is insisted upon, it must be remarked that a difficulty arises in situations in which the concrete would be affected by the water, below the lowest level of which the timber portion of the pile must be driven. Practically, in most cases the exposure of the concrete between these levels would be the lesser evil; but we must not forget the coupling, the susceptibility of which to rusting would be a serious matter. It is evident that this coupling would often be inaccessible after the completion of the work, or could only be reached at considerable expense. Further, the lowest water level is often at a considerable depth below the surface of the ground, and there would in situations of this kind be much difficulty in making the joint, especially in wet ground, since the timber pile has to be driven to its proper depth before the reinforcement is placed in the upper part of the tube and the concrete filled in. It is to be presumed, though the point is not referred to in Prof. Schönhöfer's article, that the ferro-concrete portion of the pile would sometimes be made beforehand, and its projecting reinforcement carried into the tube, though, when not attended with any special difficulty, the method of construction by moulding in situ might be preferred. It may be remarked, in conclusion, that there is a considerable range of conditions under which the above criticisms would not apply, or would apply with less force, and there seems to be in Mr. Heimbach's methods quite enough merit to ensure a considerable application of them in small and large works.

Buildings for Small Holdings.

At the meeting of the Society of Architects held last night the members were privileged to hear an excellent paper by Mr. A. Ainsworth Hunt on the important subject of "Buildings for Small Holdings." Needless to say, Mr. Hunt, who is a member of the Departmental Committee of the Board of Agriculture on the subject, was able to speak with great authority; and his concluding hint that architects should pay particular attention to small holdings for the next few years, as large sums of money will inevitably be spent upon them, will doubtless be widely acted upon. Mr. Hunt pointed out that when the Small Holdings Act, 1909, was first introduced, there were no regulations as to what should be provided in the way of buildings, with the result that each county council was a law unto itself. The consequence is seen in the comparative costliness and unsuitability of many of the earlier buildings. The Departmental Committee was appointed mainly in order to insure an improvement in these respects. In the words of Mr. Hunt, the great problem in the proper equipment of a small holding is to provide, at the smallest cost, buildings which will be suitable and sufficient for the holdings concerned, but not in excess of their practical requirements. Insufficient or unsuitable equipment must lessen the productive capacity of the holding; while, on the other hand, excessive equipment must represent so much dead weight upon it, and involves the occupier in expenditure for which he can get no real return. Mr. Hunt's paper dealt separately with the construction of the house and of the necessary farm buildings, and was illustrated by several designs, all of which we reproduce elsewhere in this issue. We may perhaps draw attention, as of special interest, to the design for a pair of cottages erected at various places in West Suffolk at prices varying from £310 to £345, and to the designs for single cottages erected for £250 and £206 respectively. While making a special appeal to those more directly concerned with rural development, Mr. Hunt's paper will also be found of interest to all who are called upon to consider questions appertaining to inexpensive cottage design.

* * *

A Warning.

As long ago as November last we commented on a case which had then recently been heard in the Market Harborough County Court, and in which the Stellovite Company, of 60 Rue de la Victoire, Paris, unsuccessfully sued a local builder and others for various amounts alleged to be due for steel supplied. Following upon our reference to this case we heard in connection with the same firm of several other instances of a similar kind which seemed to show that the firm's operations were on an extensive scale. In one case, to which we alluded in our issue of December 5th last, there was a threat of legal proceedings against a local authority in respect of an "order" given by their surveyor, but, so far as we have heard, these proceedings have never matured. Complaints continue to reach us with such frequency as to demonstrate beyond doubt that certain foreign firms dealing in steel are still systematically obtaining orders—in many cases from the surveyors to local authorities—usually in a foreign system of weights, under such circumstances that the person giving the order does not realise the amount or price of the goods. The usual method adopted appears to be to coax an unwary and busy official into giving an apparently small order for a sample bar "just as a trial." Presently a bill is presented for several hundredweight of steel at an exorbitant price. It cannot be too clearly pointed out, therefore, that orders should not be given to these specious travellers for steel of special quality without the clearest understanding of what the transaction means in pounds, shillings and pence, and the exact value

being written upon the face of the order before it is given. Further, the full name and address of the firm should be definitely ascertained, and a sample of the steel to be supplied should be insisted upon, such sample to be retained by the person giving the order. We understand that a determined attitude in regard to the last-named condition often causes the canvasser to beat a retreat!

* * *

Consulting Engineers.

In another column will be found an account of the very successful inaugural dinner of the Association of Consulting Engineers held recently under the presidency of Mr. G. Midgley Taylor. At the time when the association was formed we pointed out the advantages which might be expected to follow advantages which were epigrammatically described by Mr. J. H. Balfour-Browne, K.C., as "keeping the profession of engineering on the heights." The speech made by Mr. Balfour-Browne will be of special interest to our readers, because he had something to say in regard to the profession of municipal engineering. We are in cordial agreement with the view to which he gave utterance that "municipal engineers should devote all their time and attention to the work of the municipality, and be adequately paid for doing this duty." We are unable, however, entirely to concur in the observations which followed in regard to municipal engineers engaging in private practice. With the grant of adequate remuneration by local authorities in every case, we think that it ought not to be necessary for engineers holding public appointments to look elsewhere for a livelihood. But where this course has to be followed we do not agree that a municipal engineer is in any way unfitted to do consulting work because "he is liable to have a narrow outlook." So long as he sticks to matters which are within his special province, and in regard to which he is a real "specialist," there is no reason why the municipal engineer should not be a thoroughly efficient consultant. We do not desire, however, to be unduly critical of a speech, the occasion of which was a highly enjoyable gathering to celebrate the successful launching of an association, the formation of which in our view must tend to the benefit of the engineering profession generally.

* * *

Highway Developments in California.

References to the State roads of California will be found in our issues of December 13, 1912, and June 27, 1913, and we hope to be able to place before our readers further notes as to the development of the highway system of that state, and engineering features of the roads constructed by the Highway Commission. Through the courtesy of responsible officials in different parts of the world, we are in a position to record, from time to time, the developments which take place in a considerable number of countries in which the highway work carried out is interesting in itself, and where the conditions are more or less typical of important areas in many different climates, and under various economic conditions. From the United States we received much interesting information relating to the small eastern states and New York State, and, finding that in the case of California we had an opportunity of recording developments from the date at which the Highway Commission was appointed, we are paying special attention to that state, which, by reason of its area and population, represents conditions quite distinct from those of European countries of about the same area, and distinct too, from those of provinces with about the same population but of much less extent. Some notes on recent developments will be found on another page of the present issue.

Buildings for Small Holdings.*

By A. AINSWORTH HUNT, Member of the Departmental Committee of the Board of Agriculture on Buildings for Small Holdings.

When the Small Holdings Act was first introduced there were no regulations as to what should be provided in the way of buildings, with the result that each county council or its adviser was a law unto itself. Some of the earlier buildings erected are not very suitable, some are too large and expensive, and planned without due regard to their requirements. To obviate this in future the Board of Agriculture appointed the Departmental Committee on Buildings for Small Holdings, of which I had the honour to be a member. The duties of the committee were generally to consider the most suitable houses and buildings to be erected on small farms of 50 acres and under. In the course of our investigations we visited small holdings in various parts of the country. Although we saw some buildings which certainly were very carefully thought out, the experience we gained from these visits was principally what to avoid. . . . The great problem in the proper equipment of a small holding is to provide, at the smallest cost, buildings which will be suitable and sufficient for the holdings concerned, but not in excess of their practical requirements. Insufficient or unsuitable equipment must lessen the productive capacity of the holding, while, on the other hand, excessive equipment must represent so much dead weight upon it, and involves the occupier in expenditure for which he can get no real return.

PROBLEMS IN PLANNING.

The first question to be considered in planning a set of buildings is: What is the land expected to produce? Speaking generally, I think the buildings should be divided into three groups—(1) market gardening, (2) general farming, (3) dairy farming. The houses for each of these classes of holdings can be much the same, but the farm buildings must be especially arranged for the special purpose for which they are required.

THE HOUSE.

The class of house to be erected must necessarily depend somewhat on the size and nature of the holding. For a holding of, say, 10 acres or under, which is not used as a market garden, a house of the nature of a labourer's cottage will be quite sufficient. This should contain living-room or kitchen, 15 ft. by 12 ft.; scullery, 8 ft. by 10 ft.; larder, 6 ft. by 4 ft.; three bedrooms, 12 ft. 6 in. by 12 ft., 11 ft. by 9 ft., 9 ft. by 8 ft.

This arrangement may be varied by providing a small parlour and a combined living-room and scullery. I will deal with this point again later. An earth-closet should be provided, situated away from the main building, and a good fuel store at least 7 ft. by 5 ft. As the holding increases in acreage, the size of the house must be increased also. A holding of 25 acres should have a sitting-room or parlour. This house would then contain: Parlour, 12 ft. by 10 ft.; kitchen, 13 ft. by 15 ft.; scullery, 10 ft. by 9 ft.; larder, 6 ft. by 4 ft.; fuel store, 7 ft. by 5 ft.; three, or perhaps four, bedrooms, No. 1 12 ft. by 13 ft., No. 2 12 ft. by 10 ft., No. 3 10 ft. by 10 ft., No. 4 9 ft. by 8 ft.

In addition to the above, on most holdings a dairy will be required, the minimum size of which should be 5 ft. by 8 ft. This would only be sufficient for two cows. If the holding is to be devoted principally to dairy farming, the size of the dairy must be increased proportionately.

In considering the planning of the house, the general conditions of house planning will apply, but I should like to draw particular attention to one or two points.

The Kitchen or Living-room.—This is the room in which the family will mainly live. It should, therefore, have the best aspect, which should be south or south-east, even if there is a parlour provided, for experience shows that the kitchen will be always in use, but the parlour only occasionally. Most careful attention should be given to the position of doors and windows. The cooking range should be in this room. It should also contain a good dresser and cupboard. In many districts it is usual to provide a tiled floor.

The Scullery.—In the scullery most of the dirty work of the house is done. This should contain the sink, copper and a small fireplace for occasional use in

summer. It is not necessary to put a proper stove in the fireplace opening; a few bars cross the front and a grating at the bottom are all that are necessary, as wood is generally burnt in the scullery. It is also advisable to put a brick oven, so as to encourage the baking of bread at home. A scullery should not be made too large, or it is likely to be used as a living-room. The door of the scullery must be so placed as to give easy access to the farmyard, and the kitchen or scullery window should command a view of the farmyard, so that the wife may see what is going on out there when the husband is away on the land. Care should be taken to see there is a suitable place for washtubs, mangle, &c. It is also very desirable that a bath should be provided.

The Larder and Fuel Store. These require to be made larger than those of the average small town house. In the larder a larger stock of provisions has to be kept, as shopping is not very convenient in the country. There should be storage room for all kinds of home-made provisions and a barrel of beer, also room for salting-pans for bacon, as these cannot be kept in the dairy. In the fuel store provision must be made for wood as well as coal; it should be borne in mind that in the country coal can seldom be obtained economically in very small quantities.

The Dairy.—On most small holdings a dairy will be required, as one or two cows are almost certain to be kept to provide milk and butter for the family. Under no circumstances should the dairy open into any room in the house, and it must always be quite separate from the larder. It must be well ventilated and lighted, have a north window if possible, and all means of ventilation should be fitted with flyproof wire gauze. The floor should be tiled or stone, with proper means for washing same. The shelves should be of slate, and not fixed quite close to the walls.

The Bedrooms.—In planning the bedrooms, it is important to see there is a suitable place for the beds, a point so often overlooked in cottage construction. In the large bedroom provision is required not only for a double bed, but frequently for one or two cots.

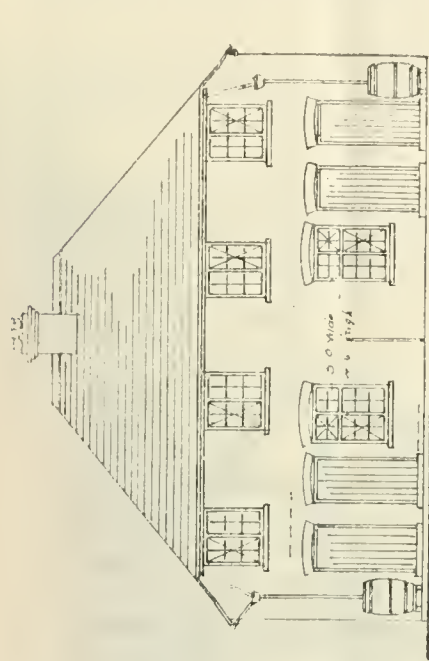
The Parlour.—The question of a parlour in very small houses is a point upon which there is a great difference of opinion. Some people assume that a parlour is not necessary. During the last few years I have erected several different sets of cottages, and provided a large living-room, and put a cooking range in it, and a small scullery containing the copper and sink. I have generally found, on inspecting these when occupied, that the living-room is furnished as a parlour, and the family lives in the scullery, no matter how small it may be. Personally, I am inclined to think that for country houses where only two rooms are provided, it will be much more appreciated by the smallest family if a small parlour is provided, and a large combined living-room and scullery, which would then contain the cooking stove, sink and copper. The sizes of the rooms would then be: Parlour, 12 ft. by 9 ft. 6 in.; living-room, 12 ft. by 13 ft. It is difficult to alter the habits of the labouring classes by providing rooms for them which they will not use as they should. Even the agricultural labourer generally has a few small articles of furniture which he specially values, and likes to display them in his "best parlour," as he generally terms it. A certain amount of house pride may be beneficial in keeping the home neat and tidy. I have several sets of cottages in the course of erection now, where I am providing a small parlour, and a large combined living-room and scullery. I am sorry they are not yet completed to enable me to give my experience of them. When three living-rooms are provided in the larger type of house, a room 12 ft. by 10 ft. 6 in. will be quite large enough for the parlour, and will give a fair-size second bedroom over it.

Wash-houses.—In some districts a wash-house is required away from the house, separated from the scullery. On a small farm a building of this description serves other useful purposes, such as a store for cycles, perambulators, &c. If a separate wash-house is erected, it is not a bad plan to provide two coppers—one for the family laundry, and the other for boiling food for cattle, it being obvious that one copper cannot serve the two purposes.

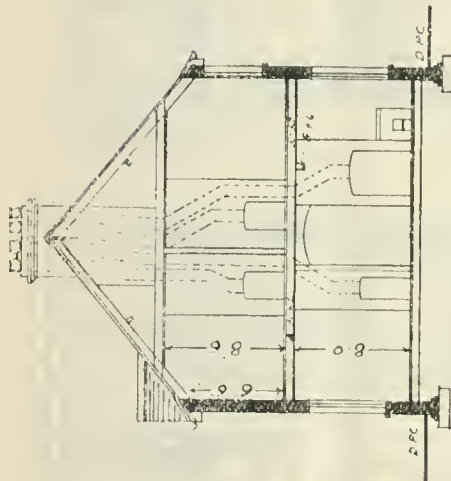
* Paper read last night at a meeting of the Society of Architects.

The Structure of the House.—In deciding on the structure of the house, much must depend upon the local materials at hand, but the building should be of such a nature as to ensure the minimum of expenditure in subsequent repairs and upkeep. Economy

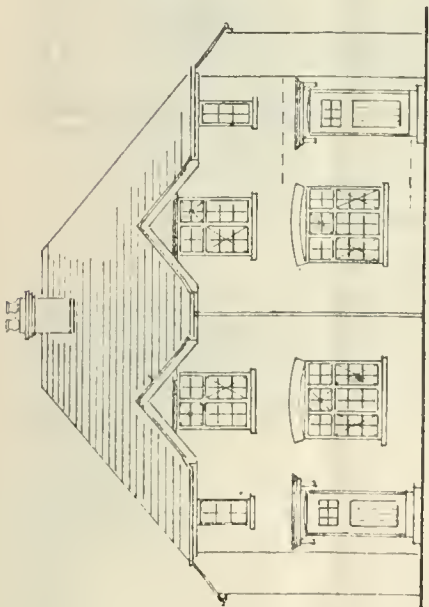
facing bricks of even colour are not required; good, sound, common bricks, of a texture that will weather well, are preferable in every way. In some cases it may be necessary to provide cavity walls, or use the cheaper kinds of bricks, and rough-cast them. The



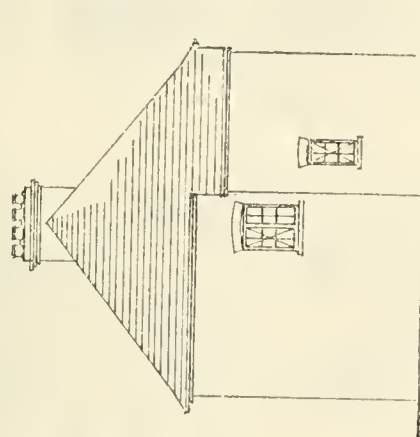
Back Elevation.



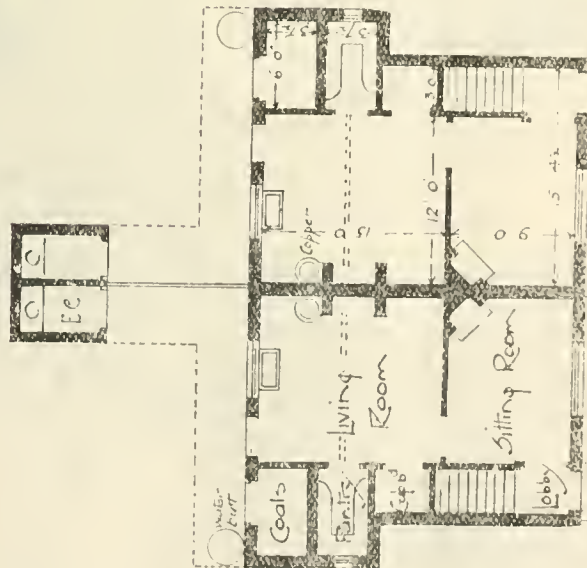
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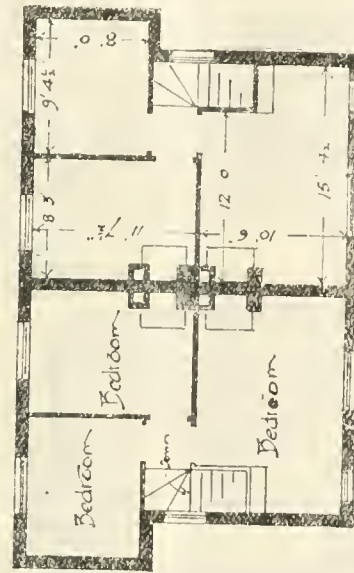
Front Elevation.



Side Elevation.



Ground Floor Plan.



First Floor Plan.

PLAN OF COTTAGES FOR SMALL HOLDINGS OF 5 TO 10 ACRES.

(Erected in various places in West Suffolk at prices from £310 to £345 per pair; Mr. A. Ainsworth Hunt, Architect.)

should therefore be sought by careful planning and construction, and not by undue cutting down of the size of the room, or the quality of the materials, workmanship and fittings. In selecting materials, preference should always be given to those which belong to the district. In cases where bricks are used, expensive

old-fashioned method of giving a wide projection to the eaves and gables will materially assist in keeping the walls dry, but the gables should not have an expensive barge board and timber work which is costly in upkeep in the way of painting. The height of the rooms on the ground floor should be 8 ft. from floor

to ceiling, and the bedrooms 6 ft. 6 in. to the springing of the roof and 8 ft. 6 in. to the collars of the ceiling.

The Floors.—The most economical floors are concrete, and will do very well for the scullery, pantry and dairy. The kitchen or living-room floor should be generally of good, red tiles on concrete, but in some districts there is a prejudice against this. A considerable amount of mud is brought into the house at times, and tiles are much easier to clean than boarded floors. If a boarded floor is used, it is likely to be covered with linoleum, and this has a tendency to encourage dry rot, especially on new floors.

Windows.—The simplest and most economical window is the Yorkshire slide, and if oak cills with oak pegs are used instead of the retaining fillet, they are very durable. Casement windows come next in the matter of simplicity, but care should be taken to

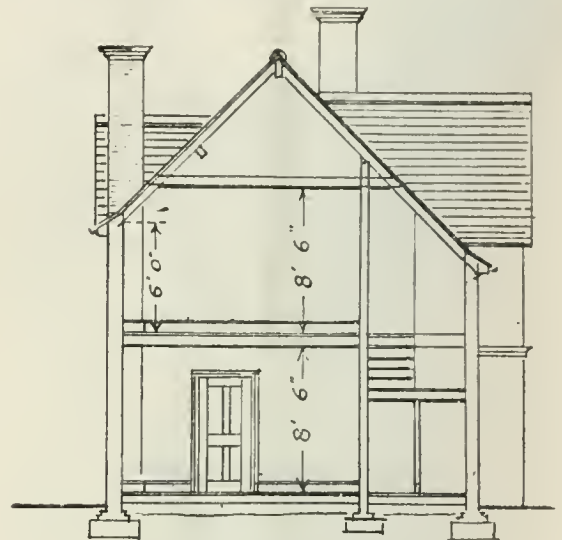
Another method is to sink the land immediately adjacent to the outlet, and provide a galvanised iron tank on wheels, the distribution of the water over the land can then be easily carried out. If the ordinary cesspool is provided, it is usually not watertight, with the result that it is liable to percolate into the sub-soil and pollute any well near. If it should be watertight it results in the slop water remaining in the cesspool until it becomes offensive, and then there is a large quantity to deal with at one time, upon the same area of ground.

WATER SUPPLY.

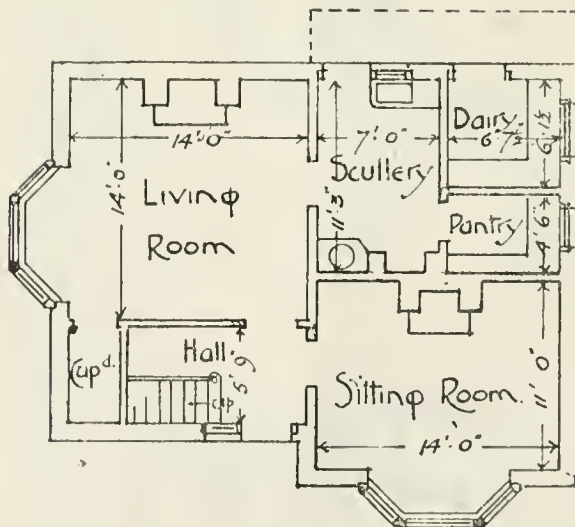
The provision of a good water supply is absolutely necessary for a small farm. The cost of a deep well is generally prohibitive, unless it is intended to supply a group of small holdings.



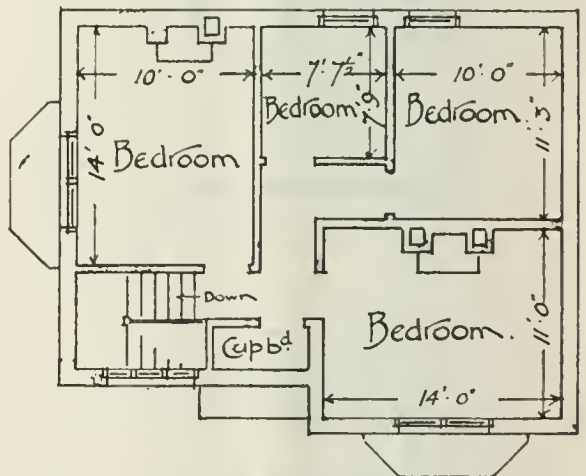
Front Elevation.



Section.



Ground Plan.



First Floor Plan.

COTTAGE ON SMALL HOLDING AT WEST ROW, MILDENHALL.

(Erected in 1911 at a cost of £250; Mr. A. Ainsworth Hunt, Architect.)

see that a sufficient amount is made to open, especially above the transom.

THE SITE AND DRAINAGE.

In choosing a site, the cost of the scheme will depend very much on the facilities for water supply and drainage. Where available, land should be chosen which will allow of the houses being placed so that the ground will fall away from them, particularly at the back, where slop water has to be dealt with.

In some districts it is not usual to provide drains or even a sink. The slop water is simply thrown on to the land, but this has a tendency to cause a nuisance near the house. The best means of dealing with the slop water from a small farm is to put the usual sink and gully, and a length of drain, say, 20 ft. to 30 ft. from the house, and from this point lay a few lines of field drains, if the soil is suitable, radiating from a point where the glazed drain stops. The liquid can then easily be distributed where required.

When water can be found at a reasonable depth a shallow well will generally be sunk into the water-bearing stratum, but it is essential to guard against any risk of contamination. The well should be lined with bricks or concrete, and made watertight to a sufficient depth to prevent the percolation of surface water into it.

In some districts where there is no water-bearing stratum at an available depth recourse must be had to the storage of rain water for domestic purposes. In that case a strong storage tank must be provided. This should be built of brickwork or concrete, and made thoroughly watertight, so as not only to retain the water, but exclude any surface water. The top should be domed over much the same as an ordinary well, an overflow pipe should be provided, and this as well as the outlet should be protected by grids to exclude vermin. Arrangements should be made to exclude the first flush of rain water from the tank, as this will not generally be very clean.

The maximum amount spent on the house should

never exceed £350, and on the buildings £400, as this with interest, sinking fund, repairs, management expenses, &c., on a fifty years' loan will be equal to a rent of 5½ per cent or £41 5s., which is as much as a small holder on the maximum of 50 acres can afford to pay.

THE FARM BUILDINGS.

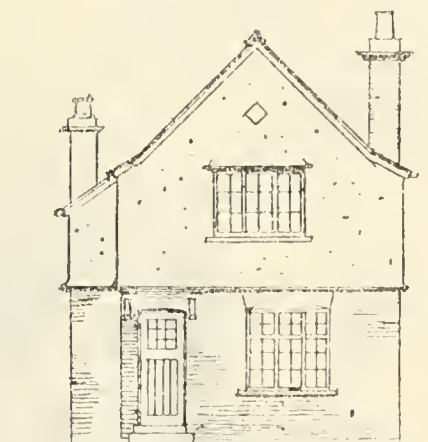
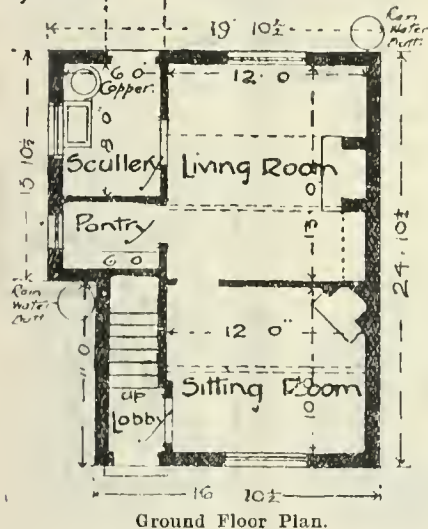
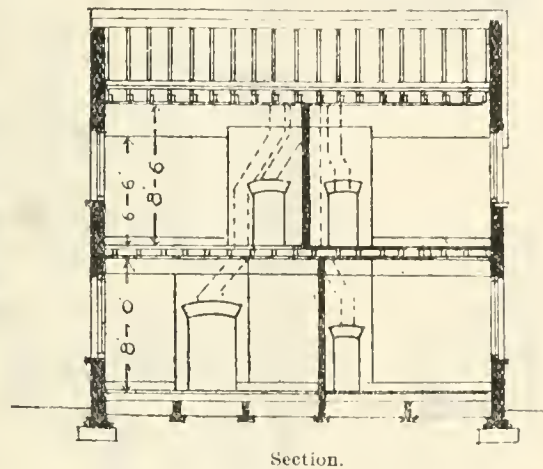
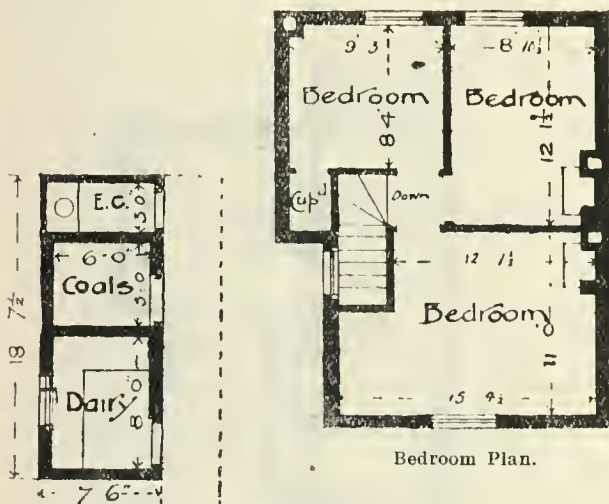
In considering the nature and character of farm buildings necessary to meet the convenience and requirements of small holders, it is obvious that the difficulty of laying down definite rules is even greater than in the case of houses. The house may be much the same, whatever the nature of the holding, but the farm building must be specially planned to meet the requirements of the particular holding concerned.

In planning the buildings allowance should be made for the possibility of future extension, and the type of buildings provided should be capable of being added to without much difficulty, only the minimum of accommodation should be provided at the outset.

An extra loose box is a great convenience. It can be used for so many purposes, for calves, pigs, or a sick animal. The general opinion among modern farmers is that the old-fashioned pig-sty should not be built. Pigs do much better in a loose box, and should have the run of the yard or a field. It is a good plan to provide a low platform of wood upon which the pigs can lie. This should be portable, so that it may be moved when the box is required for other purposes.

All stables should have floors of grooved concrete or grooved paving bricks, and laid with a good fall. Care should be taken to see there is proper ventilation without draught. Barn floors should be of concrete, or preferably of wood. Cart sheds should have backing rails and guard posts. The stables, cow-houses, cattle sheds, &c., should be readily accessible from the barn or mixing-house, so as to save labour in carting fodder.

It is most important that stock-yards should be



PROPOSED COTTAGE ON SMALL HOLDING AT BEYTON.

(Cost £206 18s.; Mr. A. Ainsworth Hunt, Architect.)

If the tenant is consulted beforehand, care must be taken not to provide equipment in excess of what the holding can produce, for he will generally take a rather extravagant view of his requirements, without realising the extra amount of rent or interest involved.

The smallest type of buildings are those required for market gardening or fruit growing. The requirements for this will be: A packing shed, fruit store, stable and cart shed; a rough shed for tools and artificial manure.

A very good timber building of this class could be erected for about £100.

ARABLE HOLDING OF 20 TO 30 ACRES.

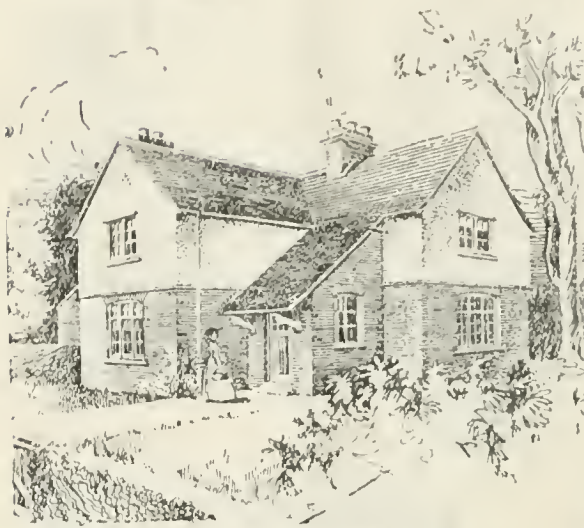
The equipment for a holding of this character can be very simple, and would contain the following: Fodder and chaff house, 14 ft. by 15 ft.; stable for two horses, 12 ft. by 15 ft.; cattle shed, 14 ft. by 18 ft.; cart shed, 14 ft. by 18 ft. For holdings of larger size the chief additions would be the provision of loose boxes, cow stalls, and possible stabling for an extra horse.

sheltered from the north and east winds, and at the same time open to the sun and air. The buildings are therefore best planned L-shape, and placed backing to the north and east. All the doors and windows should be on the south and west, and opening into the yard. The cattle will thus, when in the yard, get all the sun and be protected by the buildings from cold winds.

DAIRY FARMING.

The main object on a holding of this description is to provide sufficient cow-houses at the lowest possible cost. The cost will work out at about £10 per stall if built of brick and tile, and £6 or £8 if built of timber.

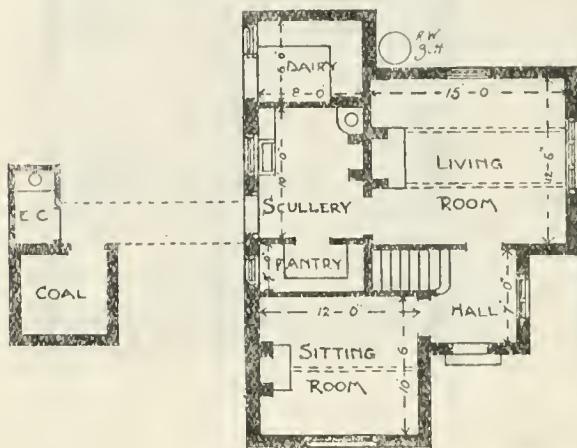
Cowsheds must comply with the requirements as to cubic space laid down by any regulations adopted by local authorities under the Dairies and Cowshed and Milk Shops Order. The usual minimum space prescribed is 800 cub. ft. per cow, in cases where they are habitually kept in the building, and 600 cub. ft. where they are turned out for part of the day. The



lower figure will be quite as much as is necessary on a farm. In calculating the cubic space, it is usual not to allow anything above 12 ft. in height above the ground line.

The lighting of cowsheds is a matter of great importance, as good lighting is one of the essentials for clean milking. The simplest method is by glass tiles in the roof, but windows should also be provided both for light and ventilation. The space admitting light should not be less than 2 sq. ft. per cow.

The cowshed should have a grooved concrete floor, but rammed clay or chalk for a width of 4 ft. from the manger will make a more comfortable surface for the cows to kneel on, and will help to prevent swollen knees. The gutter should be formed in the concrete with a roughened surface. It should be 2 ft. wide, and 6 in. deep, with a fall of 1 1/2 in. to the gangway, and a semi-circular channel for liquid formed at the back about 3 in. wide. The gutter should have a fall of 1/4 in. per yard, and discharge 6 in. beyond the wall with glazed pipes. A grid should be fixed at the end to prevent solids entering the drain. The drain from



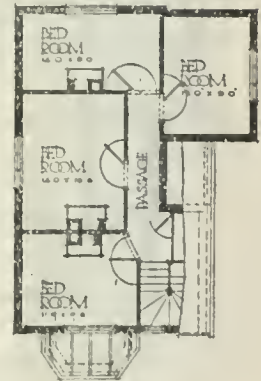
Ground Floor Plan.



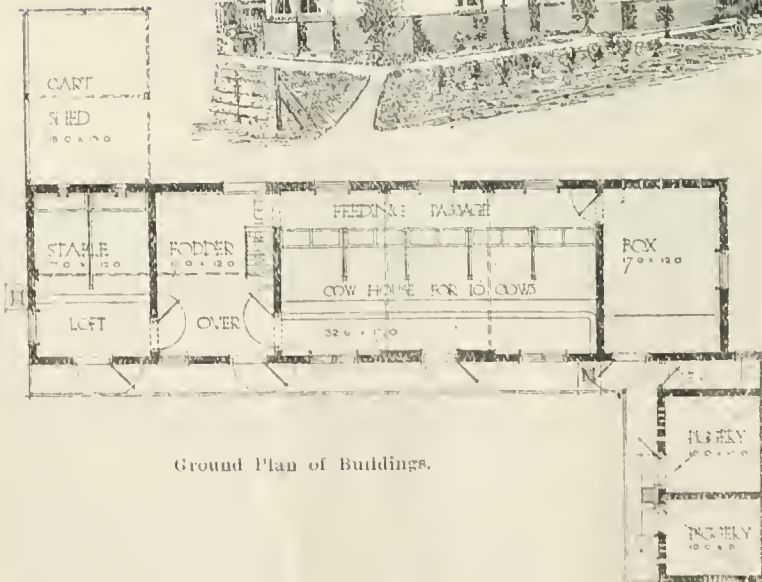
First Floor Plan.

COTTAGES FOR SMALL HOLDINGS, UNDLEY, WEST SUFFOLK.

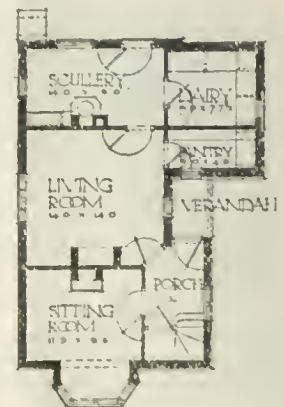
(Cost £250; Mr. A. Ainsworth Hunt, Architect.)



Bedroom Plan.



Ground Plan of Buildings.



Ground Plan.

HOMESTEAD ON A SMALL HOLDING AT BUSHBURY.

(Mr. J. M. Hotchkiss, County Land Agent, Stafford.)

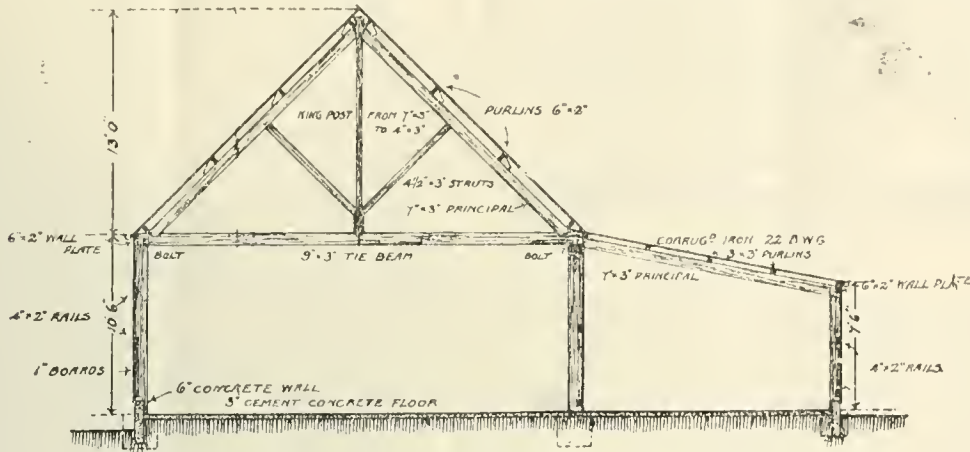
the gully should lead into a liquid manure tank, which should be watertight, and fitted with either a loose top or a pump.

The feeding trough should be a semi-circular trough formed of concrete or glazed stoneware, and should be continuous in length so that it can easily be cleaned out, and if supplied with tap or pump at one end and a waste at the other, it will make a good water trough as well. Arrangements for tying cows are required, but all other fittings, including stall divisions, are superfluous.

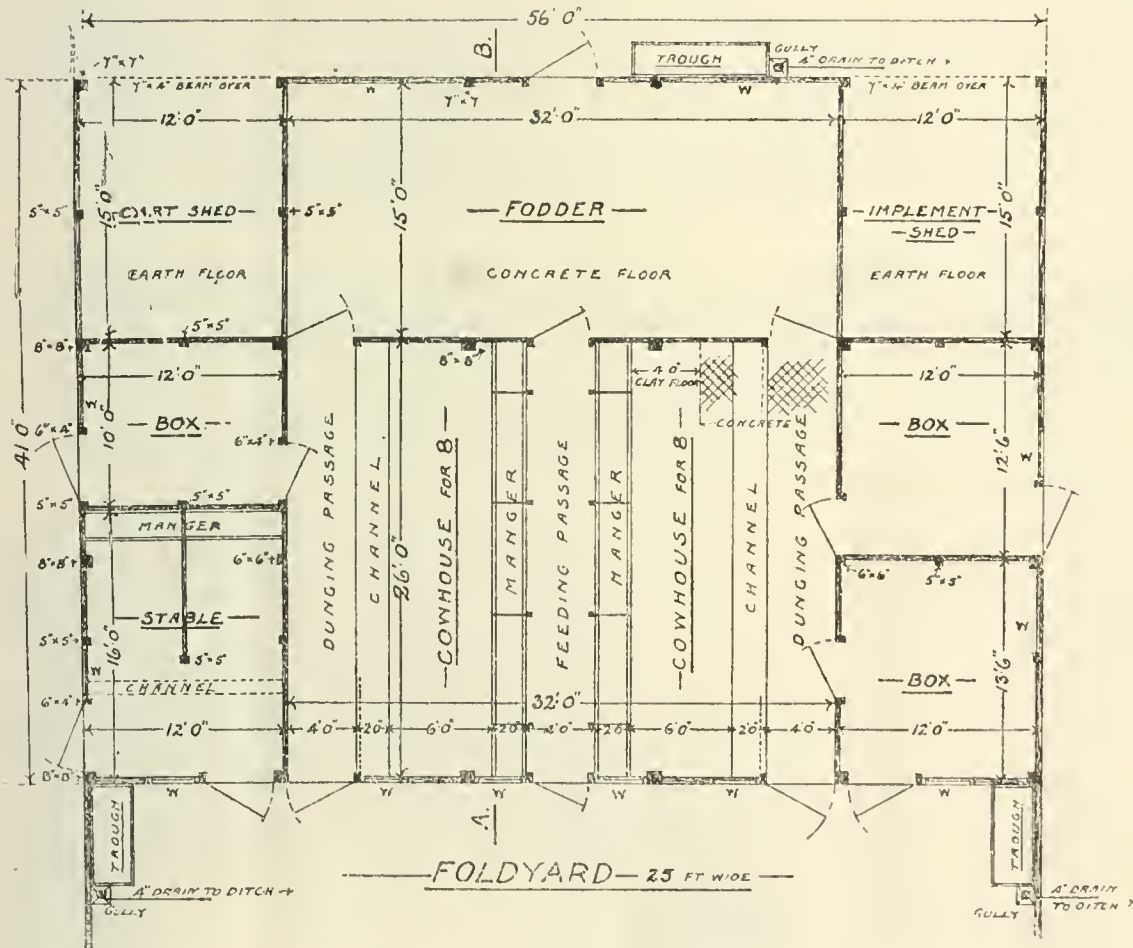
Allowing 3 ft. 6 in. per standing for cows will be

judice against drains of any sort for farm buildings, the liquid manure is run into the yard, which is littered down from time to time to soak up the moisture. If drains are provided, they should all be collected together and run into a manure tank. This should have a pump fixed at a good height from the ground (so that a cart may be backed under it), and the liquid manure pumped into it for carting to the land. If a small holding should be situated in any district which is sewered, the liquid manure should never be run into the drains, as by that means it would be wasted.

A class of farm buildings which is being largely



Section A B.



Ground Plan.

BUILDING FOR DAIRY HOLDING OF 50 ACRES.

(From Report of Departmental Committee.)

quite sufficient, so that twelve cows in a line will require a building 42 ft. long. The width will be 14 ft. to 15 ft., as follows: Feeding trough, 2 ft.; standing, 6 ft.; gutter, 2 ft.; gangway, 4 ft. or 5 ft., preferably the latter. Where there are less than twelve or fourteen cows, a feeding passage is not necessary. It is important in all farm buildings to keep the horses and cows well separated, as any odour arising from the stable is liable to put the cows off their feed, and consequently affect the milk.

In some parts of the country there is a great pre-

used now is provided with what is known as the open (or Yorkshire) boarded roof. These are generally wooden buildings on brick or concrete foundations, with stud walls, weather-boarded outside. The roof is covered with boarding laid at right angles to the purlins, each board being grooved on the top about 1 in. from the edge, and fixed with a space of about 1/4 in. between each board. A roof of this description looks as if rain will simply pour through it, but it does not.

In constructing the walls, three sides must be com-

pletely closed in, and a portion of one side left partly open. This causes a slight upward current of air, and prevents any rain coming through the joints between the boards. The bar and chaff house should be kept at one end of the building, and this portion should be tiled or slated. This class of building is most economical in construction and very healthy for cattle, being warm in winter and cool in summer. They are most suitable for large cow-houses.

In conclusion, I would point out that it is impossible to lay down any definite regulations to suit particular buildings, as agriculture and the method of living differ very considerably in various parts of the country. Architects and county land agents should pay particular attention to small holdings for the next few years, as large sums of money will inevitably be spent upon them, and it is only by care in planning every detail, with special reference to the need of the localities concerned and the industry in question, that the small capitalist can make a living upon his holding.

ASSOCIATION OF CONSULTING ENGINEERS.

INAUGURAL DINNER.

The inaugural dinner of the Association of Consulting Engineers was held at the Whitehall Club, Princes-street, Westminster, on Monday, February 2nd, under the presidency of Mr. G. Midgley Taylor, chairman of the Committee of the Association. The members and guests present numbered about ninety, and included Sir R. Antrobus, K.C., C.B., Sir A. B. W. Kennedy, LL.D., F.R.S., Sir H. Tanner, C.B., D.S.O., Prof. D. S. Capper, Messrs. A. Bruce Anderson, J. H. Balfour-Browne, K.C., H. Percy Boulnois, C. E. C. Browne, W. Duddell, F.R.S., F. Gore-Browne, K.C., Robert Hammond, W. M. Morley, G. Scott Ram, J. F. C. Snell, and James Swinburne, F.R.S.

After the toast of "The King" had been duly honoured, "The Association of Consulting Engineers" was proposed by Mr. J. H. BALFOUR-BROWNE, K.C., who said that he was in the happy position that evening of having a good client whom he need not defend, but only praise. There was a necessity for the new departure which had been made in the formation of that association. It was an attempt to keep the profession of engineering on the heights, that profession which was among the greatest, and whose monument, if it were sought, could not be better indicated than in the word "Circumspice." He could conceive no worse fate for engineers than that they should become an instrument of manufacturers or a slave of a municipal corporation. In order to maintain a profession at its highest level it was essential that it should have an external conscience in addition to the individual consciences of its members. Their society with its rules for moral guidance was a conscience of this kind. When a society was on the down grade its behaviour as a body was worse than the behaviour of its individual members, and the opposite equally applied when a society was on the up grade. Examples of the down grade were to be found in secret societies and of the up grade in the Christian Church. The spirit of a society, the *esprit de corps*, was therefore different from the spirit of the individuals forming it. With regard to trade and commerce the members of the Association of Consulting Engineers must stand in splendid isolation. The engineer was certainly serving God when he was working at his best, but the engineer commercialised was as certainly serving Mammon. The latter was the condition of the State and the municipal engineer when he competed with private enterprise. Continuing, Mr. Browne said he felt very strongly that new trades ought not to be handicapped by the competition of public departments which operated with funds provided by the very people with whom they were competing. Further, State and municipal engineers should not be allowed to compete with what he would call ordinary consulting engineers. They should devote all their time and attention to the work of the municipality, and be adequately paid for doing this duty. If they did devote their time and attention adequately to the work of the municipality they ought to have no time for engaging in private practice. Apart from this there was the danger in a municipal engineer acting in a consulting capacity that he was liable to have a narrow outlook. The variety of the work engaged in by the consulting engineer was his strength, and was apt to give a judicious breadth to his decisions which was invaluable to his client.

In future municipalities would tend more and more to demand whole-time engineers whose work would be subordinated to collectivist doctrines, inimical to the free opinions which should be held by every consulting engineer. The Association of Consulting Engineers was therefore doing good work, both for itself and for the public, in keeping up the standard of the profession.

This toast was replied to by the CHAIRMAN, who said he felt some diffidence in responding to the toast of a new association. It had, however, by this time successfully passed through most of its infantile diseases, and was growing up. He hoped it would have a numerous progeny, and many grandchildren. Mr. Balfour-Browne had described the aims of the association with great exactitude. Its members did not seek to elevate themselves among their brethren. The association was not a scientific society, and its members remained loyal to those societies to which they already belonged. The rules were very definite on this point, and it was not desired to usurp the functions of these high bodies. But no scientific association, having necessarily a very varied membership, could make rules which would be applicable merely to consulting engineers. So, proceeding on the idea that heaven helps those who help themselves, the association had been formed for the better protection both of consulting engineers and of the general public. The lives of the community were as much in the hands of the engineer as in those of the doctor, and that was another reason why this association had been formed as a body of professional men to work on professional lines, and to advise clients to the best of their ability irrespective of their own pockets.

The toast of "The Guests" was proposed by Mr. H. Percy Boulnois, who said that the number of distinguished guests present that evening was a good augury for the future of the association. He compared this inaugural dinner to a christening feast, and dwelt humorously on the infant troubles of "Dykes's Baby." The association had been changed with being a trade union and a purity party. He did not object to either. It was necessary that the consulting engineer and expert witness should be beyond suspicion. They had many precedents for what they had done. Both the legal and medical professions had their trade unions, and even the House of Commons was a society of the same kind.

This toast was responded to by Mr. C. E. C. Browne, president of the Society of Parliamentary Agents, and Mr. A. Bruce Anderson.

Mr. JAMES SWINBURNE proposed the toast of "The Hon. Secretary and Hon. Treasurer of the Association," and remarked that what might be thought to be a fortuitous concurrence of atoms had now become the Association of Consulting Engineers entirely owing to the initiative of Mr. Dykes. Mr. Dykes had done a tremendous amount of hard work in forming the society, and some of his numerous expeditions for this purpose were humorously described by the speaker. In connection with the formation of the association there had been a great deal of difficulty in discovering exactly what a consulting engineer was. He had been said by some to be a purveyor of zinc chimney-pots, by others a patent agent, by others an employee of an insurance company, and by others as a man who received a retaining fee from a railway company. The difficulty of exactly defining the consulting engineer seemed to be insuperable, but it had been overcome. The association were deeply indebted to Mr. Dykes and Mr. Lowcock for the work they had done on the part of the profession.

Mr. Dykes, in reply, pointed out that the success of such an association depended upon the co-operation of its members. Every member should therefore do his best to make the association known to both engineers and to the public, and to acquaint the secretary of ways in which the association might be useful to its members. To form such an association had meant a great deal of hard work, but the results were worth it, and he felt satisfaction in that he could truly say he had "lived and toiled with men."

Mr. Lowcock also briefly replied to this toast, and pointed out that this dinner was not really a christening, but a confirmation. He, as treasurer, had no difficulty in obtaining the subscriptions, and they would be pleased to hear that the association was financially sound.

Road Improvement in Sussex.—Costing £70,000, a scheme for the improvement of the Sussex part of the main road from London to Brighton has been approved, the Road Board contributing £28,000.

BRITISH AND AMERICAN ROAD TAR.

MAJOR W. W. CROSBY'S INVESTIGATIONS.

In order that he might obtain data bearing upon the apparent superiority of British tarred roads over American roads treated in a similar way, Major W. W. Crosby obtained a sample of typical British road tar and compared it with samples of American tars by

GARDEN CITIES AND TOWN PLANNING ASSOCIATION.

Owing to continued ill-health, the Hon. Mr. Justice Neville, president of the Garden Cities and Town Planning Association, will be unable to preside at the annual meeting of that body at Carpenters' Hall,

TABLE A.
ANALYSIS OF REPRESENTATIVE TAR.

Analysis.	British tar ("dehydrated").		American coke-oven tar (raw).	American coal-tar ("refined").		American water-gas (refined)
	(1)	(2)	(1)	(1)	(1)	(1)
Specific gravity	1.201	—	1.235	1.213	1.223	1.183
Free carbon (insol. in CS ₂)	29.22 per cent	—	18.29 per cent	15.7 per cent	20.11 per cent	0.41 per cent
Fixed carbon less free carbon	6.63 per cent	—	10.24 per cent	10.1 per cent	10.39 per cent	23.77 per cent
Viscosity—						
At 100 deg. C. (Engler) (50 c.c.)	34.3 sec.	—	30 sec.	40 sec.	4 sec.	155 sec.
At 25 deg. C. (Lunge) (to 1.40)	3.8 sec.	—	4 sec.	14 sec.	4 sec.	906 sec.
At 25 deg. C. (Hutchinson)	5.4 sec.	—	—	—	—	—
At 25 deg. C. (Crosby) (plunger 12, load 4 grams)	6.2 mm.	—	—	—	—	—
At 25 deg. C. (Crosby) (plunger 12, load, 0.5 grams)	0.6 mm.	—	—	—	—	—
Loss on evaporation at 105 deg. C., 3 1/2 in. dish, 21 hours	14.70 per cent	—	21.95 per cent	17.0 per cent	23.5 per cent	4.45 per cent
Penetration of this residue at 4 deg. C.	35	—	5	1	Too hard	12
Penetration of this residue at 25 deg. C.	Soft	—	42	65	15	110
Melting point of this residue	17 deg. C.	—	55 deg. C.	43 deg. C.	61 deg. C.	34 deg. C.
Loss on evaporation at 170 deg. C., 2 1/2 in. dish, 5 hours	15.15 per cent	—	22.65 per cent	24.51 per cent	24.2 per cent	21.55 per cent
Penetration of this residue at 4 deg. C.	29	—	Too hard	Too hard	Too hard	Too hard
Penetration of this residue at 25 deg. C.	Soft	—	10	Too hard	13	Too hard
Melting point of this residue	21 deg. C.	—	68 deg. C.	74 deg. C.	53 deg. C.	66 deg. C.
Distillation—						
Initial temperature of distillate	164 deg. C.	155 deg. C.	98 deg. C.	150 deg. C.	145 deg. C.	226 deg. C.
Room temperature to 105 deg. C.	0.0	0.0 per cent	0.5 per cent	0.0 per cent	None	0.0 per cent
105 deg. to 110 deg. C.	—	0.0 per cent	—	—	—	—
105 deg. to 170 deg. C.	0.4 per cent	Trace	1.5 per cent	1.4 per cent	1.3 per cent	0.0 per cent
170 deg. to 225 deg. C.	*3.4 per cent	6.0 per cent	8.3 per cent	1.5 per cent	5.7 per cent	0.0 per cent
170 deg. to 235 deg. C.	—	9.0 per cent	—	—	—	—
225 deg. to 270 deg. C.	*12.7 per cent	14.0 per cent	10.2 per cent	12.1 per cent	14.4 per cent	2.0 per cent
235 deg. to 270 deg. C.	—	11.0 per cent	—	—	—	—
270 deg. to 300 deg. C.	†6.7 per cent	6.0 per cent	3.6 per cent	15.0 per cent	8.5 per cent	5.5 per cent

(1) According to methods proposed by Special Committee, Am.Soc.C.E.
 (2) According to methods proposed by Sub-Committee of Committee D-4, A.S.T.M.
 * Practically all solid (naphthalene), at 25 deg. C.
 † 25 per cent solid at 25 deg. C.

means of a careful analysis of each, including tests of viscosity and penetration. The results were published in a recent issue of the *Engineering Record*, but the tables reproduced herewith have been care-

London-wall, on February 16th. Mr. Cecil Harmsworth, M.P. (chairman of the council), and Mrs. Harmsworth will hold a reception at Carpenters' Hall at 4 p.m. At the meeting following, Lord Robert Cecil,

TABLE B.
ANALYSIS ON A FREE CARBON BASIS.

Analysis.	British tar.		American tar.	American water-gas tar.
	(1)	(2)	(1)	(1)
Specific gravity	1.148	—	1.124	1.144
Free carbon (insol. in CS ₂)	None	—	None	0.43 per cent
Fixed carbon less free carbon	13.69 per cent	—	12.77 per cent	23.22 per cent
Viscosity—				
At 100 deg. C. (Engler) (50 c.c.)	15 sec.	—	15.7 sec.	113 sec.
At 25 deg. C. (Engler) (50 c.c.)	313 sec.	—	172.8 sec.	—
At 25 deg. C. (Lunge) (to 1.40)	—	—	—	550 sec.
At 25 deg. C. (Hutchinson)	—	—	—	—
At 25 deg. C. (Crosby) (plunger 12, load 0.5 grams)	13.0 mm.	—	—	—
Loss on evaporation at 105 deg. C., 3 1/2 in. dish, 21 hours	29.90 per cent	—	38.20 per cent	8.65 per cent
Penetration of this residue at 4 deg. C.	9	—	Hard	10
Penetration of this residue at 25 deg. C.	54	—	Hard	79
Melting point of this residue	30 deg. C.	—	54 deg. C.	33 deg. C.
Loss on evaporation at 170 deg. C., 2 1/2 in. dish, 5 hours	35.25 per cent	—	45.00 per cent	24.10 per cent
Penetration of this residue at 4 deg. C.	Hard	—	Hard	Hard
Penetration of this residue at 25 deg. C.	9	—	Hard	Hard
Melting point of this residue	12 deg. C.	—	81 deg. C.	70 deg. C.
Distillation—				
Initial temperature of distillate	—	130 deg. C.	123 deg. C.	248 deg. C.
Room temperature to 105 deg. C.	—	0.0 per cent	None	0.0 per cent
105 deg. to 110 deg. C.	—	0.0 per cent	—	—
105 deg. to 170 deg. C.	—	3.6 per cent	8.0 per cent	0.0 per cent
170 deg. to 225 deg. C.	—	4.5 per cent	6.0 per cent	0.0 per cent
170 deg. to 235 deg. C.	—	8.5 per cent	—	—
225 deg. to 270 deg. C.	—	17.5 per cent	14.0 per cent	2.3 per cent
235 deg. to 270 deg. C.	—	13.5 per cent	—	—
270 deg. to 300 deg. C.	—	7.5 per cent	8.0 per cent	8.1 per cent

(1) According to methods proposed by Special Committee, Am Soc.C.E.
 (2) According to methods proposed by Sub-Committee of Committee D-4, A.S.T.M.

fully revised by Major Crosby, and certain important corrections have been made.

Major Crosby considers that the analyses account for the superiority of the British tar for road work; it seems to become hard and brittle less quickly, and the residue from the evaporation tests is softer and changes less than do those from the American tars. He notes, however, that our ranges of temperature are less than those experienced in the United States.

M.P. will be the chief speaker. Cards of admission to the meetings can be obtained from Mr. Ewart G. Tulpin, 3 Gray's Inn-place, W.C.

New Refuse Destructor for Lincoln.—The foundation-stone of a new refuse destructor to be erected at Lincoln by Messrs. Heenan & Froude was laid last week.

Compound Piles of Timber and Ferro-Concrete.

By Professor R. SCHÖNHÖFER, DR. ING.

Specially translated for THE SURVEYOR from an article in the "Zeitschrift für Betonbau."

A great development in the domain of pile construction has taken place in the past ten years or so, in that, by the employment of concrete and ferro-concrete, it has seemed that timber, the material exclusively employed for hundreds of years, would be almost entirely superseded. To-day the number of methods of construction and of systems for concrete and ferro-concrete piles is legion. The chief reasons for the change are to be found, on the one hand, in the rising price of timber and the increasing cost of piles of considerable length, and in the fact that timber is soon destroyed by decay where the ground-water level is subject to rise and fall; while, on the

simple manner in the design of Mr. Michael Heimbach, engineer, of Bregenz, Austria; these designs being protected by patents at home and abroad.

It will not be without interest to remark here that the coupling of a timber pile with a ferro-concrete pile to form a compound pile, which naturally to a great extent combines the advantages of both, is a distinct step in advance, as can often be noticed in the history of technical matters concerning an old method of construction when it is developed so as to be united to a new and more advantageous method. Ferro-concrete as a compound material of construction composed of iron and concrete, is recognised as furnishing in this respect one of the most striking examples of the kind.

THE METHOD OF MAKING THE COUPLING.

The manner in which this compound pile is made is shown in Fig. 1. Before being driven, the timber pile H is made cylindrical at the top, so that a wide binding ring or band can be driven on to it. The timber pile is then driven down until its head is about a metre above the ground or water level. The band is then taken off and a steel tube S, conical in a downward direction, is driven on to the head of the pile by means of a tube head-piece. A ring-wedge,

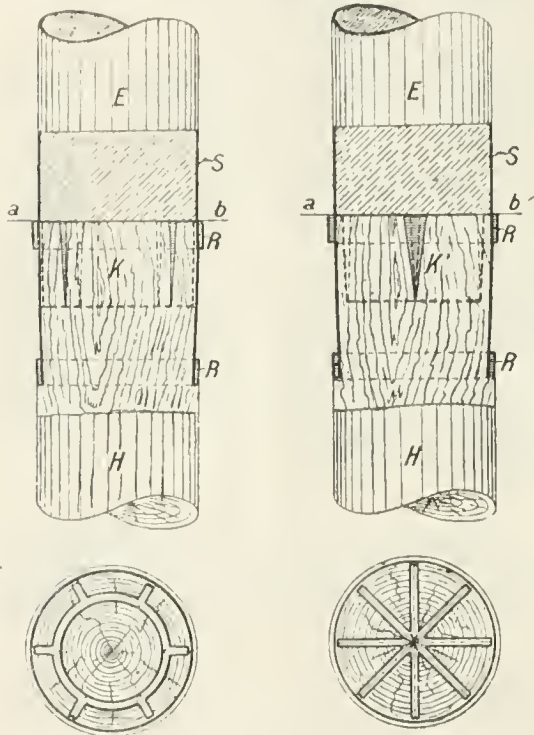


FIG. 1.

FIG. 3.

other hand, concrete and ferro-concrete piles, which are not affected by the level of the ground-water, can, almost without restriction as to length, be provided at a relatively low cost.

Many as are the advantages which attend the use of concrete and ferro-concrete piles, there is a limit to their scope, owing to the circumstance that concrete is attacked by certain kinds of soils and subsoil waters. This is specially the case in marshy or boggy soils, and in subsoil waters containing acids or acid salts, magnesium salts, sulphur compounds or carbonic acid.

Since, then, timber is not attacked in such soils, nor in subsoil waters of the kinds mentioned, and since, in this respect the only proviso is that a timber pile must be permanently under water, we are led to the idea that in such cases where the soil or the subsoil water attacks concrete, we might construct a compound pile with the lower part of timber and the upper part of ferro-concrete. Intimate as is the association of ideas, we are confronted with the practical difficulty as to how two structural materials so dissimilar as timber and ferro-concrete are to be coupled together in a satisfactory manner. The problem has been solved in an effective and yet



FIG. 2.

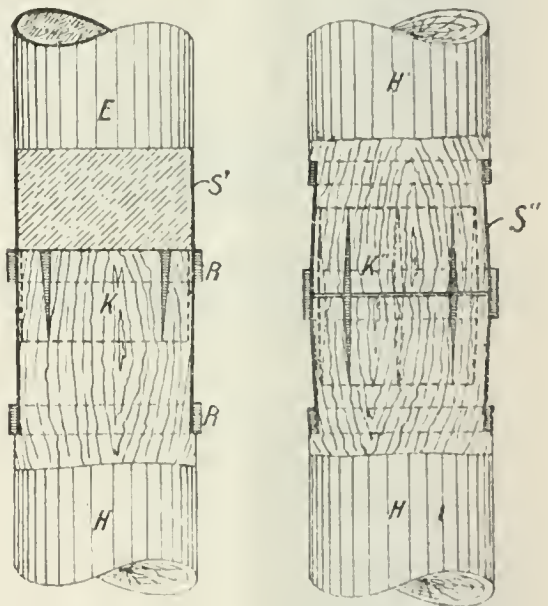


FIG. 4.

FIG. 5.

K, is then set upon the head of the pile and is driven into it by means of the ram with a suitable dolly. By the driving in of this ring-wedge the originally cylindrical pile-head is forced into the form of a cone, completely filling the conical part of the steel tube, and pressing the pile-head very tightly against the constraint of this shell. The ring-wedge shown in Fig. 2 has radial wedge-ribs, the use of which secures, not only a symmetrical radial expansion of the pile-head, but also the absence of random radial clefts. When the pile is very hard a conical wedge with radial wedge-ribs may be employed instead of the ring-wedge; and a compound pile constructed in this manner is shown in Fig. 3. To avoid the danger of the steel tube changing its shape during the driving in of the ring-wedge, an iron strengthening ring, R, is provided.

By this simple joining of the steel tube and the wooden pile both parts are wedged together, and a tight joint is obtained by the ample pressure between the tube and the wood. When the tube has been made fast on the pile in this manner the pile can be driven into the desired depth by means of a tube head-piece. Then the iron reinforcement is placed inside the tube, and the concrete filled in. The coning of the steel tube may sometimes be omitted, but in this case it must be taken into consideration that the re-

sistance of the cylindrical tube is much less than that of the conical tube, and that a change of shape of the tube at the joint is therefore much more to be feared. For this reason specially stout strengthening rings should be provided. Fig. 4 shows such a compound pile with a quite cylindrical tube. In a somewhat different, or double, form the wedge-ring can be adapted to the coupling of timber piles. For this purpose a double-coned steel tube, S, is rammed on to the cylindrically shaped pile-head. The double ring-wedge, K¹¹, is then placed on the top of the pile, and the lengthening pile, H¹¹, is rammed with its cylindrically formed end in the open end of the steel tube. By further ramming the double ring-wedge is driven into the ends of both piles, which are forced each into the form of a cone, and firmly wedged with considerable force against the steel tube.

THE ADVANTAGES OF THE COMPOUND PILE.

As will already have been perceived, it has become possible, by means of this compound pile, to employ ferro-concrete pile work in soils in which the destruction of concrete is to be feared—a possibility much sought after in the case of concrete and ferro-concrete piling. In this respect the Heimbach compound pile provides a welcome and perfectly satisfactory solution of the problem. The pressure on the pile-head, which is tightly held by the tube, makes a watertight joint against the concrete, so that a creep of ground water or of dampness from the soil into the concrete is fully guarded against.

These advantageous applications by no means exhaust, however, the scope of the employment of the Heimbach compound pile, for there are numerous cases for which it is specially suitable. This method of construction has, too, a number of valuable advan-

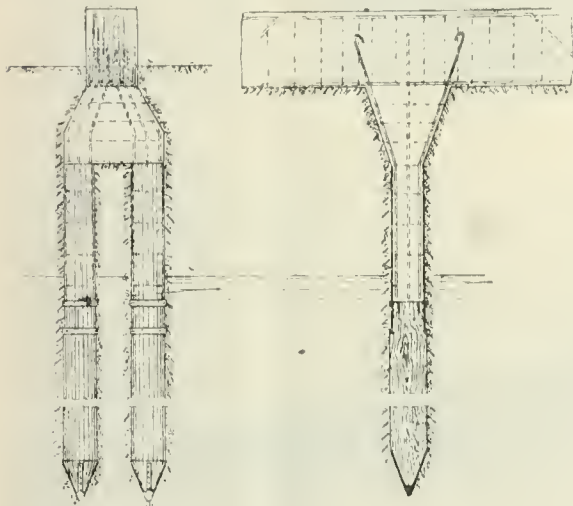


FIG. 6.

tages. An essential advantage consists in the fact that the pile can be driven with the pile-driver usually employed for timber piles. The costly special pile-drivers necessary for ferro-concrete piles, and the heavy staging necessary in the employment of such pile-drivers are not required. This advantage is specially welcome in the case of pile work in boggy and marshy soils, for in such places the erection of the heavy staging is not only very troublesome, but also involves considerable expense.

A valuable advantage of this compound pile is that it is a very simple matter to place it in position, and that no special precautions need be taken. In the employment of ferro-concrete piles it is necessary to make special arrangements for the assembling of the reinforcement, the setting up of the forms, and the moulding of the piles, for which reason the use of ferro-concrete piling is confined to the larger undertakings. These compound piles will be specially suitable for the carrying out of small works for which, though it is desired to obtain the advantages of ferro-concrete piles, the establishment of a special plant for their erection is avoided on account of the cost.

These compound piles share with those of timber a further advantage over ferro-concrete piles, in that timber piles in soft, loamy, boggy or marshy ground, develop, after a long period of rest, a notable increase of resistance, and a corresponding increase in load-carrying power—a fact which has often been proved by experience and research, and is due to the strong pressure and grip upon the soil, developed as a result of the swelling of the timber.

In comparison with timber piles the compound piles have the further advantage that they are not destroyed by rot, as the result of changes in water levels, or in the subsoil water levels, the timber portion being, of course, always below the water line. An unforeseen and lasting drop in ground-water levels, which, in the case of timber piles, is often followed by serious consequences, cannot affect the compound pile, provided that the timber portion be driven deep enough.

THE COMPOUND PILE IN SEA WORKS.

The compound pile has a special advantage in sea works. A timber pile standing in sea water will very soon be destroyed by boring shellfish and bore-worms, while, on the other hand, ferro-concrete piles are not seldom attacked by the sea water. By the employment of the Heimbach compound pile in such a manner that the timber portion is in the ground, and the part which is surrounded by sea water consists of ferro-concrete girt with the iron tube, a very durable pile is provided. The steel tube would, of course, be protected from rusting by a coating or metallic covering, and would be made of a suitable thickness and strength.

It may here be remarked that the Heimbach coupled timber piles likewise effect a very useful advance, since they can be used in any place where, for sufficient reasons, timber piles are necessary, but where, on account of the great length required, these cannot be made, or where the cost of piles of sufficient length is very great. This applies especially to fender piling required in navigable ways, for which only timber piles are used, since they possess the necessary resiliency. Since the inadequacy of the methods hitherto employed in coupling piles has precluded the use of coupled piles for such purposes, it has been necessary, for deep navigable ways, to make exceedingly long piles at very great cost. But now, by means of the Heimbach coupling, a coupling has been provided which is in every respect firm, elastic and waterproof, and therefore quite suitable, and by the employment of these lengthened piles large sums can be saved. The Heimbach coupled piles should, therefore, be generally adopted for such purposes.

As regards the cost of the compound piles of timber and ferro-concrete the following may be noted. In view of the simplicity of their erection—that is, on account of the avoidance of the use of special pile-drivers and heavy staging—the Heimbach compound piles are in general much cheaper than ferro-concrete piles; especially is this the case for the greater lengths, for which ferro-concrete piles, to stand being driven, must have a strength many times greater than that needed to carry the load. As has already been explained, ferro-concrete piles are very costly when used in small works. As regards timber piling, the compound or the coupled pile is much cheaper in the greater lengths; since the price of long timbers is out of all proportion to their length.

The invention of this new type of compound pile is not confined to paper, as are so many other inventions, but has already been carried into practice in a number of cases. The firm of Heimbach & Schneider, contractors for structural works, at Hard, in Bregentz (Austria), and at Lindau (Germany), has already employed the compound pile in various works, and is, in all respects, satisfied with the results. As a single instance there is shown in Fig. 6 an example of piling work carried out at Lindau.

Sunderland's Electrical Undertaking.—A record year's working of the Sunderland Corporation Electricity undertaking is anticipated, while, having regard to the increase of output, the whole of the items of working the system show decreases, or, in other words, the cost of production per unit during the year is lower. The total estimated working expenses for the year ending March 31st next amount to £35,132, and interest and redemption will absorb £28,196, a total of £63,328, as compared with actual working expenses for the year ending March 31st last of £34,070, and interest and redemption of capital charges of £27,038, a total of £61,108. The estimated revenue is £73,599, an increase of £4,055, as compared with the year ended March 31st. The estimated credit balance of £10,270 is placed to the Renewals Fund, an increase of £1,835 on the previous year. The Electricity Committee intend to ask the council to reduce the charge for the ordinary incandescent street lamp from 49s. to 46s. per lamp per annum, which will put them on equal terms with the charges of the gas company.

REINFORCED CONCRETE FENCE POSTS.

Among the many directions in which reinforced concrete is making headway at the present time, and one in which it seems to have a promising future, is in connection with fencing.

The advantages of a reinforced concrete fence post are that the cost of maintenance is practically *nil*, the posts cannot burn, and the more wet weather they are subjected to the harder they become for some considerable period, after which they remain impervious to moisture.

Of course, it is most essential that they should be



well made, for amateur attempts have in some cases produced bad results; but there is no doubt that a properly constructed concrete post is more economical than a wooden one as regards upkeep and renewal, and, generally speaking, it is cheaper in the first cost, while after five or six years its superiority over wood becomes evident.

The Reinforced Concrete Fence Posts Company, Limited, Broadway-court, Westminster, are exclusively engaged in the manufacture of these posts at several places in England, and have recently supplied their fencing to the Metropolitan Water Board, the Pembrokeshire and East Suffolk County Councils, and the Lichfield and Portland Urban District Councils. In some cases they have also carried out the work of erection.

These posts are now in use upon seven English railways, and the Port of London Authority are also testing them with a view to their further adoption.

Institute of Sanitary Engineers.—On Monday evening next, at Caxton Hall, Westminster, Mr. John D. Watson, M.INST.C.E., the president, will occupy the chair at a meeting of the Institute of Sanitary Engineers, at which Mr. F. R. O'Shaughnessy, F.I.C., A.R.C.S., will read a paper entitled "The Significance of Colloidal Matter in the Problem of Sewage Disposal."

LONDON AND THE ROAD BOARD GRANTS.

THE PROPOSED INQUIRY.

At Tuesday's meeting of the London County Council the refusal of the Road Board to contribute to the carrying out of a number of street improvements suggested by the council was criticised by a number of members.

Mr. H. H. Gordon pointed out that London was providing money for the Road Improvement Fund, and it was being used for extra-London purposes. There was no evidence that, as contended by the Road Board, the cost of London improvements would not increase in time. The evidence pointed in the contrary direction. In twenty years the traffic, north and south, had increased by 5,000,000 vehicles a year. The needs of central London were great, and the same state of things existed all over the administrative county.

It was pointed out by various speakers that, in all, London had contributed £500,000 to the fund, and only £115,000 had been given back or promised to it, this money going entirely to the borough councils for the improvement of road crusts damaged by motor vehicles.

Viscount Peel, chairman of the Improvements Committee, emphasised the statement that the



REINFORCED-CONCRETE FENCE POSTS AT CHINGFORD (METROPOLITAN WATER BOARD) AND ON THE L. & N.W. RAILWAY.

money of the board was to be devoted to road-crust purposes, and pointed out that that meant neglecting some of the main duties for which the board was set up. He thought it very hard that the London County Council should be penalised because they did not wish to have the Great Western Road scheme.

Sir John Benn said the board was being regarded as a sort of relieving officer for a local authority which neglected to do its duty in the matter of street improvements in London. The board had endeavoured, with both hands, to meet the council.

The council finally resolved to ask the Road Board whether it adhered to its suggestion of a public inquiry on the subject of the distribution of the Board's available funds, and, if so, on what lines it was proposed that the inquiry should be conducted

SOME RECENT PUBLICATIONS.*

PRACTICAL SANITATION. By George Reid, M.D., D.P.H. Seventeenth edition. Price 6s. London: Charles Griffin & Co., Limited.

The popularity of this well-known work is such that, although it is only eighteen months since the last edition appeared, a new edition has again become necessary. As a compendium for the use of sanitary inspectors, students, and all who are interested in matters of sanitation, this book would be difficult to improve upon. The various chapters deal with water supply, ventilation and warming, sewerage and drainage, sanitary appliances, plumbers' work, sewage and refuse disposal, house construction, disinfection and food. There is an appendix of sanitary law, but the author does not claim that it is more than a guide to a student's more extended reading, and a carefully selected list of the essentials with which they must be familiar in official positions. So rapid is the progress in sanitary practice at the present time that it has been found necessary to introduce many alterations and additions into this edition. A thorough revision has accordingly been made, and the work in its present form is an excellent up-to-date textbook of sanitation.

APPLIED MECHANICS. Vol. I.: Statics and Kinetics. By C. E. Fuller and W. A. Johnston. Price 10s. 6d. nett. London: Chapman & Hall, Limited.

The authors of this book are Professors of Theoretical and Applied Mechanics at the Massachusetts Institute of Technology, and the work is intended primarily for students. The subjects dealt with in the present volume are treated in five chapters devoted respectively to introductory matters, statics, centre of gravity, moment of inertia, and kinetics. Throughout the work a thorough discussion of the underlying theory is given, so far as it is required to elucidate the principles which are required in the solution of practical engineering problems. Many problems are included to be worked by the student, and full solutions are given, where necessary, to indicate the methods of applying the theoretical principles. The more elementary operations of the differential and integral calculus are freely used. The authors have treated their subject clearly, logically and scientifically, and have succeeded in producing a book which should admirably fulfil the requirements of the college student of applied mechanics.

TARRED ROADS IN NORTHUMBERLAND.

COUNTY SURVEYOR'S RECOMMENDATIONS.

Northumberland County Council have approved a report of the county surveyor, Mr. J. A. Bean, to the Bridges and Roads Committee on the subject of the tar-surface treatment of roads. The report, after reviewing what had been done in the past, stated:—

"In order to meet the complaints raised against the slippery state of tarred roads, I have one suggestion following on that made at the last council meeting—viz., that it is desirable to construct the surface in two kinds of material, one suitable for horses and the other for self-propelled vehicles. This may be carried out as follows: (1) Where the road is hilly and the gradient steep to lay two tracks for horses in ordinary water-bound macadam, 3 ft. wide, one on either side of the road; (2) the channels and centre of the road to be laid in tar-macadam (not pitch), but without the finer material on the surface; (3) where the road is fairly level, tar-macadam (not pitch) to be laid the full width. The committee must remember that the dust nuisance and economy are important factors in road construction. The above is the cheapest way out of the difficulty, although the dust nuisance will prevail to a certain extent. Difficulties will present themselves in laying the material, also widening the macadam will be involved on some sections. There are other ways of preventing the dust nuisance, but the limit to which rates may be increased is soon reached, and I cannot suggest a more economical method."

It is notified that the Road Board are prepared to make grants amounting to £10,000 for work of tarring and improvements of roads, and the widening and reconstruction of bridges in the county, the cost being estimated at £17,070.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii, 2.

MR. BOULNOIS' "GLOSSARY OF ROAD TERMS."

To the Editor of THE SURVEYOR.

SIR,—Although I am anxious to reply to your criticism of my letter of the 7th ult., I am afraid that it is not possible to do so fully by correspondence, and, in my opinion, a conference of all interested parties is necessary so that an early settlement of the whole question could be arrived at.

I am opposed, as you say, to the interference with the present usage of the words "bitumen" and "asphalt" as understood by all leading analysts and other authorities, but I cannot agree that "there is no class of persons who, as a class, consistently use these terms in the same way."

I have been interested in these materials for some considerable time, and have always found analytical chemists, manufacturers and users of asphalt, bitumen, pitch, asphaltum, &c., in various trades, to use these terms in the same way, and it is only in connection with road work that the words are being so loosely used, and I repeat that it is evidently being done for the purpose of gain.

There has never before been any misunderstanding, and I am confident that the absurdity of the proposal of those who have only recently become connected with the use of bitumen, &c., to draw up and publish definitions for engineers owing, presumably, to themselves being strange to the subject, and not acquainted with the regular usage of the terms, will be apparent to you and all your readers.

It has therefore been asked what objection there is to the term which has all along been applied to the residuum obtained from petroleum oil—viz., petroleum pitch—and what object is there in endeavouring to have it altered? No answer has been given, nor, perhaps, under the circumstances is one necessary. There are many in this country who, to my knowledge, have made a study of, and are well acquainted with, the various bitumens and asphalts, and if the opinions of these and authorities on the Continent were taken—openly and not in private—there is not the slightest doubt that the efforts of those who are endeavouring to get petroleum pitch—i.e., the residuum obtained from the distillation of petroleum oil classified as bitumen would be defeated, and this and all other artificial products relegated to their proper position.

The loose way of using these words commenced in America some time back, and apparently spread to this country with the introduction of petroleum residuum for road work under the title of bitumen. This same material has been imported largely from the Continent for many years past under its proper title—viz., petroleum pitch. The residuum from coal tar is coal-tar pitch, and the residuum from petroleum is very rightly termed petroleum pitch. This, then, is partly why I am opposed to interference with the present and proper usage of these words.

Asphalt, bitumen, asphaltum, manjak, &c., are being imported into this country continually, and if it is desired to publish definitions for the use of engineers I consider advice should be sought from the city markets, London Chamber of Commerce, analytical chemists and others, and not from those who have undertaken the duties to say "we will ourselves draw up these definitions in private."

I am glad you consider there is some force in my contention that the term "bitumen" has all along been understood to apply to a natural product. That is practically my sole point, and if that is agreed it is only necessary, as I have before said, to consider the three classes:—

(1) Rock Asphalt.—Limestone and sandstone found naturally impregnated with a small percentage of bitumen in France (Seyssel), Germany (Limmer), Switzerland (Val de Travers), Sicily, &c.

(2) Natural Bitumens or Asphalts.—Venezuelan, Cuban, Trinidad, Nigeria, Barbadoes, Dead Sea, &c.

(3) Pitches.—Coal, petroleum, Swedish, wood, bone, &c.

Any material that does not come under the classification of rock asphalt, and is not a natural asphalt or bitumen always described with a prefix denoting country of origin, such as Cuba, Trinidad, &c.—or is not an asphaltum or manjak, is a pitch of some kind.

likewise always described with a prefix, such as coal tar pitch, petroleum pitch, &c.

All the sources and deposits of rock asphalt, natural bitumen or asphalt, and all the different kinds of pitches are known, and these materials are all being dealt with daily on the markets. There is then no necessity to make the matter more complicated by inventing different definitions for surveyors and engineers only. Have we been wrong all these years, and are the bitumens, &c., which have been known since the days of Noah, now to have fresh description, at the bidding of a certain few?

You say there has been no restriction in the use of the term "bituminous." I quite agree, and in my opinion there never can be, as anyone has the right to describe a substance of any kind as "bituminous" if it is of this nature. "Bituminous," "asphaltic," &c., are good sounding terms for probably tar and pitch compositions sold under fancy names, and pitch may be said to be "bituminous," although it does not follow that it contains any percentage of bitumen.

I am interested in Dr. S. Judd Lewis's letter appearing in your issue of the 23rd ult., and no better definition of bitumen has yet been published than the one he gives. I suggest that Dr. Judd Lewis's definition be adopted without the alteration of one single word and that all engineers and surveyors keep Dr. Lewis's letter before them for future reference. Dr. Lewis very rightly says that the word "bitumen" signifies a natural substance, and is therefore not one produced by artificial distillation, but I would point out that all other materials "employed for purposes for which true bitumen is especially available" have already their proper terms, and these are, without exception, pitches of some kind. The prefix applied to each, such as coal-tar pitch, petroleum pitch, &c., describes each of these materials perfectly. It is then not necessary to seek for some new term to give to any of these pitches that may be so specially favoured and singled out, and "artificial bitumen" and other misleading terms can only help to confuse engineers; and, strictly speaking, bitumen being a natural product, cannot be produced artificially, and this description is both absurd and incorrect.

I note from your remarks that "the sub-committee on bituminous materials appointed by the Engineering Standards Committee" is conducting its proceedings in private, and it is, I presume, correct that, as Mr. Bastian writes: "Colonel Crompton states that it is his intention and that of those associated with him to confer with certain American engineers, and as a result of their united action, and, presumably, the co-operation of the Engineering Standards Committee, to obtain the classification of petroleum pitch as "bitumen."

A great deal more, of course, has yet to be said on the subject, and it may be advisable for some other committee, composed of European authorities, to be formed to refute any incorrect definitions that may be published.

In the meantime may I ask who are the members of the sub-committee on bituminous materials appointed by the Engineering Standards Committee? I do not wish to be personal, but in the interests of all concerned it is necessary to know what is being done.—Yours, &c.,

ENGINEER.

February 4, 1914

SEWAGE DISPOSAL BY DILUTION.

To the Editor of THE SURVEYOR.

SIR, In your issue of yesterday I see that you propose, in your next issue, to deal with the technical portion of Mr. Shenton's address to the Society of Engineers. I hope you will excuse me if I make a suggestion that you would be doing good service if in your comments you called attention to the omission in Mr. Shenton's remarks on the relaxation of the General Standard for Sewage Effluents (when dilution of certain proportions is afforded by the river flow) of any reference to the fact that such dilution can only be urged as a reason for relaxation when the diluting water is of a certain quality as regards purity, or, rather, has a certain power of oxidation. I find there is much misunderstanding on this point due to the fact that in the "Summary of Conclusions," on p. 17 of the Eighth Report of the Royal Commission on Sewage Disposal only quantity of dilution is mentioned, and not quality. A large proportion of readers take these conclusions without reading the body of the report in which, on p. 7, section 25, the quality

of water on which a claim for a relaxed standard by dilution may be entertained is described.

I may say that on several occasions I have had the "conclusions" quoted to me by local authorities as a reason why they should not be compelled to purify small sewage flows in isolated parts of their districts, where the river flow is far greater than the sewage flow, basing their appeal on quantity only in spite of the fact that the rivers in question are purely industrial ones which can probably never reach the purity figure on which the Royal Commission base their "conclusions."

I am sure that if you could see your way to include a reference to this matter in your leading columns you would be correcting a fairly widespread misunderstanding, and owing to your large circulation among professional men such correction would be of great service. Yours, &c.,

HUGH STOWELL.

41 Mosley-street,

Manchester.

February 7, 1914.

P.S.—May I express my hearty appreciation and thanks for your issue of January 30th?

[A note on the matter to which Mr. Stowell refers will be found under "Minutes of Proceedings."—Ed. SURVEYOR.]

NORWICH ROAD SIGNS.

To the Editor of THE SURVEYOR.

SIR,—In my article on road signs published on pp. 187 to 189 of your issue of the 30th ult. I find I made a mistake in the diagram at the bottom right-hand corner of p. 188. This indicates that route 77 turns to the left and again to the left. It really is first to the left and then to the right—that is to say, the point of the arrow should point upwards instead of downwards. Yours, &c.,

ARTHUR E. COLLINS.

City Engineer.

City Engineer's Office,

Norwich.

February 9, 1914

Cost of Birkenhead Water Scheme.—The increased quantity of peat required to be removed from the reservoir bed, an increase of 40 per cent in the cost of cast-iron pipes, an increase of 50 per cent in the cost of Portland cement, and an increase of 20 per cent in navvies' labour, were reported at Wednesday's meeting of the Birkenhead Council to be primarily responsible for the Parliamentary estimate of £800,000 for the Alwen water scheme being exceeded by £197,765. The council gave authority for the Parliamentary Committee to apply for power to exceed the original estimate.

Official Tests with Fire Extinguishers. The British Fire Prevention Committee devoted considerable time last year to an exhaustive investigation into the reliability of existing portable chemical fire extinguishers, in which inquiry they had the co-operation of a number of Government departments, corporations and institutions, who lent the committee extinguishers which had been in their possession for periods varying from a few months to as long as thirty-five years. The reports on these investigations have been issued by the British Fire Prevention Committee as Red Books Nos. 185 and 186, of which the latter may be deemed the more important, and contains a comparative table as to the results of tests with about 100 appliances in all. It is interesting to observe that the great majority of the appliances under test were of British make, and that all existent types of extinguishers (although not every individual make) were under investigation. Regarding the strength of the appliances and their aptitude to burst, which has caused fatalities, it is interesting to observe that out of a series of fifty-seven extinguishers tested hydraulically ten failed at under 300 lb. pressure, and eight failed to withstand the committee's official 350-lb. pressure test, while thirty-three passed the latter-named test. Again, on looking through the table it will be found that the working pressure generated by one of the extinguishers when the nozzle was closed was 319 lb., and in another case it was 340 lb., which plainly shows the wisdom of the committee insisting on a margin of safety for the future. The Fire Prevention Committee's reports deal with many aspects of the extinguisher question, and Memorandum III, (signed on behalf of the Extinguisher Research Sub-committee by Mr. D. W. Wood) is a particularly valuable contribution.

STATE HIGHWAYS IN CALIFORNIA.

A NOTE ON THE WORK OF THE HIGHWAY COMMISSION.

By REGINALD RYVES, M.CONS.E., ASSOC.M.INST.C.E.

The 2,300 miles of State roads which had been planned by the Californian Highway Commission some two years ago will be extended to not less than 2,700 miles and, according to information furnished in a recent issue of the *Times*, some 900 miles will be in the mountains. The principal characteristics of the type of main road to be adopted are set forth as follows:—

(1) A right of way not less than 60 ft. in width where it is reasonably possible and as direct between objective points as is consistently possible.

(2) Gradients not exceeding 7 per cent, even in the mountainous parts of the State.

(3) Curves as open as possible, and in no case of less than 50 ft. in radius.

(4) As many culverts of sufficient capacity as are needed to take care of surface and underground water.

(5) A travelled way under ordinary conditions not less than 21 ft. in width, with the centre paved or surfaced so as to be hard and smooth under all climatic conditions at all times of the year, the width of surfacing to be in general 15 ft.

(6) Smoothly-graded roadsides, reserved for future tree-planting.

As regards the first of these points, it is, of course, evident that, although control of the land to a width of 60 ft. may be an important advantage on mountain roads, the practicable right of way will be hardly wider than the wheelway in the more rugged parts of the mountain country. On the plains, it may be assumed, the expression "not less than 60 ft." will cover cases in which control is obtained over considerably greater widths, but whether it is desirable in such cases to declare the whole of such width to be a right of way width is a matter that may demand consideration. As regards the second and third points, it may be suggested that they are hardly compatible, and that even when much steeper gradients than 1 in 14 are allowed it is difficult to avoid sharp bends unless the work includes some tunnelling and the building of costly viaducts. It is, in a rugged country with deep valleys of considerable size, almost impossible to avoid hairpin turnings and sharp bends, unless, by building large viaducts, both sides of the valley be utilised.

It is interesting to note that, out of six leading points, one refers to a sufficiency of culverts. In many districts the culvert is one of the chief, if not the most important, of the elements which go to make a successful road, and this applies both to roads in the plains and to mountain roads of a certain character. As regards the fifth point, it is not unlikely that the commission will revise this. Under most traffic conditions, and certainly with the through traffic that may be expected to be developed in California, it is bad engineering to make a 15-ft. road crust on a travelled way of 21 ft. Sooner or later, American highway engineers will see this, and will adopt the method of making a strong road crust for the full width of the carriageway, though the middle 12 or 15 ft. may be surfaced with a harder metalling than that of the rest of the crust. It is significant that one of the six main points is the reservation of roadsides for future tree-planting. It may be pointed out, however, that it takes a considerable time for trees to grow to a height at which they exert nearly their most beneficial effect. In our latitudes, where screening of radiation in frosts and shade in spring and autumn sunshine prevents too rapid surface thawing, young trees are relatively efficient; but to keep a road cool under the conditions of a Californian summer, in the South at any rate, tall trees which give shade without shutting out the breeze are much more useful. Very tall trees which will provide a thick canopy at a considerable height above the road, and spread sufficiently to shade the whole road, are found to be better in tropical or semi-tropical climates than are trees of smaller and lower growth. The Californian Highway Commission might do well to put tree-planting in hand at once wherever the levels allow of this being done before the road is made. The point is of special importance on account of the probability that bituminous materials will be largely employed for the road crusts.

The oiling of earth roads has, we learn, been aban-

doned to a large extent. It has no doubt served a useful purpose, and will probably be employed for some time for roads which are awaiting developments which will justify the putting down of solid crusts. In Los Angeles county a considerable mileage of oil-macadam roads has been constructed, and reference has already been made in *THE SURVEYOR* to the main road which has an asphaltic carpet on a concrete crust. Apart from the work of the Highway Commission, there is much activity in road construction in California, and the development of motor transport in that State will be watched with much interest by road engineers in America and elsewhere.

THE ROAD BOARD.

APPOINTMENT OF ENGINEERING INSPECTOR.

Mr. C. Curtis Gray, engineer and surveyor to the Urban District Council of Scunthorpe, has been appointed to the recently-advertised position of engineering inspector to the Road Board.

Mr. Curtis Gray served his articles with the late Mr. Albert Latham, M.INST.C.E., then borough engineer of Margate. Upon the completion of his articles he became an assistant, and later chief assistant, in Mr. Latham's office. In 1898 he was appointed assistant



MR. C. CURTIS GRAY.

surveyor to the Malvern Urban District Council under Mr. H. P. Maybury, and served in that capacity for six years. Early in 1904 he resigned, and took up an engagement with Mr. Maybury under the Kent County Council. In the autumn of the same year, however, he was appointed engineer and surveyor to the Hayes, Middlesex, Urban District Council, a position which he occupied for four and a-half years, and in 1909 was appointed engineer to the Scunthorpe, Lines, Urban District Council. Scunthorpe is a rapidly growing town in the midst of the ironstone district, and its development has entailed a large amount of hard work in private and other street works and improvements, sewerage and waterworks extensions.

Junior Institution of Engineers.—The annual dinner of this body will take place on Saturday, the 28th inst., at the Holborn Restaurant.

Lower Thames Valley District Surveyors' Association.—The usual monthly meeting of this association was held in the Town Hall, Twickenham, on Saturday, the 7th instant, when a fair number of members attended. The Superannuation Bill promoted by the National Association of Local Government Officers was further discussed. A most interesting and instructive discussion on "Town Planning" was opened by Mr. F. W. Pearce, engineer and surveyor to the Twickenham Urban District Council. Mr. Pearce fully outlined the whole of the procedure from the time of the decision of the local authority to apply to the Local Government Board for permission to prepare a scheme, through the various subsequent stages to the period of the actual preparation of the scheme. A very hearty vote of thanks was accorded to Mr. Pearce at the close of the meeting.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. M. INST. C. E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left hand corner. Correspondents are invited to submit questions for consideration and answers

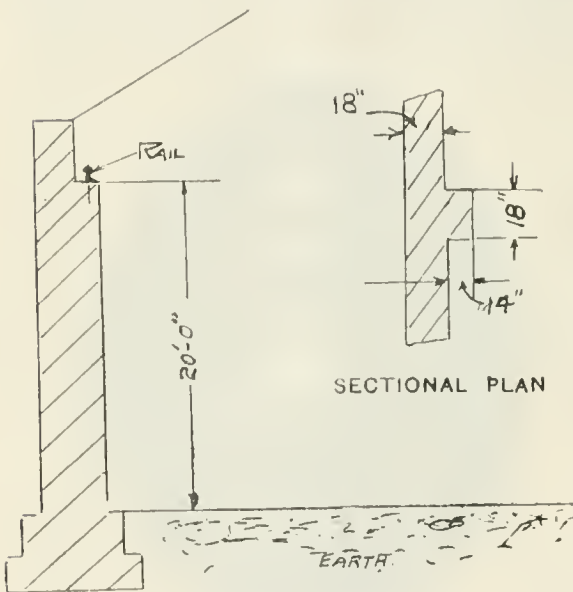
to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:

370. Temporary Building Design.—A temporary building is required, 50 ft. long, 30 ft. wide, and 10 ft. to eaves. Design a suitable structure, with steel trusses and stanchions, to be covered with corrugated iron on boards and felt, the bays to be filled in with 4-in. reinforced brickwork. (J. M. N., *Hitchin*.)

377. Machine Shop.—An electric crane is to be fitted in a machine shop on existing piers, as shown in sketch. The piers are bonded into the wall, and about



VERTICAL SECTION THROUGH WALL AND PIER

12 ft. centres. Assuming the foundations are good, and the work is in Staffordshire brick set in cement and sand, what is the safe load these piers will withstand? (B. W., *Cradley Heath*.)

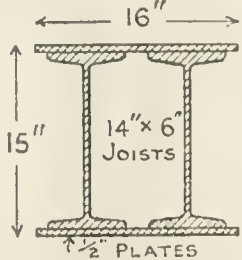
378. Cost of Running Steam Engine. Compare the cost of running a steam engine with that of an electric motor in the following circumstances: The horsepower required is 30; electricity costs 1d. per unit, coal (best steam) costs 18s. per ton delivered; the engine is required to drive a stone crusher working an average of eight hours per day for five days per week. (Crusher.)

379. Testing Pipes. What tests should stoneware pipes be subjected to before they are accepted for use? What defects are often thereby disclosed? (B. W., *Tadcaster*.)

380. Belt Gearing. A belt running at 1,500 ft. per minute transmits 80-horse power. Find the difference of tension of the two sides of the belt. (T. R.)

REPLIES TO QUESTIONS.

376. Foundation for Stanchion.—A built-up steel stanchion, as shown in the diagram, transmits a load (including its own weight) of 250 tons. Design a suitable steel base and concrete and steel joist grillage foundation for the stanchion. The safe load on the earth may be taken as 2 tons per square foot. (L. W. S., *Clapham Junction*.)



Base.—The number of rivets connecting the gusset plate and stanchion must be sufficient to carry the

total load. The gusset plate will be $\frac{1}{2}$ in. thick, according to general practice, and the rivets $\frac{3}{4}$ in. in diameter.

Let $f_s = 5$ tons per sq. in.; $f_b = 8$ tons per sq. in. for rivets in shear and boring.

Value of 1 $\frac{3}{4}$ " rivet in single shear = $\frac{\pi}{4} (\frac{3}{4})^2 \times 5$ tons = 3 tons.

" " in bearing in $\frac{1}{2}$ " plate = $\frac{3}{4} \times \frac{1}{2} \times 8$ tons = 1.4 tons.

Total load 250 tons.

\therefore Number of rivets required = $\frac{250}{3} = 83$ rivets.

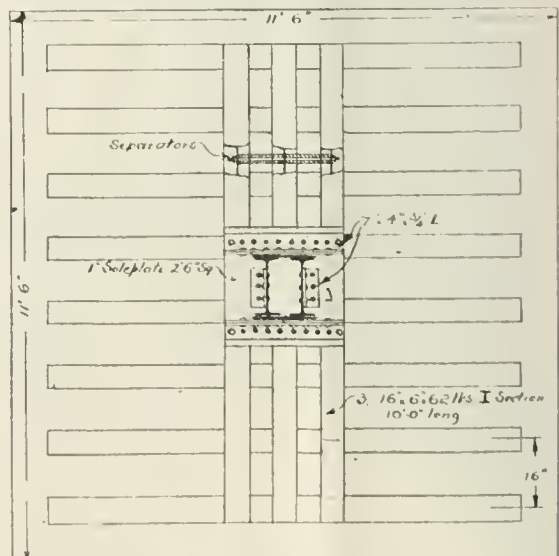
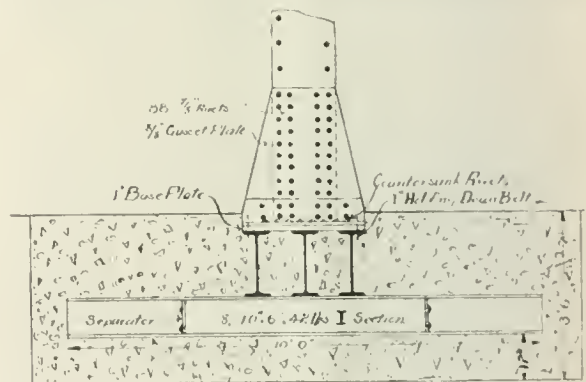
As the rivets will be arranged in four rows in the flanges of the stanchion, as shown in the sketch, 68 rivets will be used.

The pitch of rivets will be 3 in.

\therefore The height of the gusset plate will be $\frac{88}{4} \times 3$ in. = 2 ft. 9 in.

The gusset plates will be fixed to the base plate by means of 7-in. x 4-in. x $\frac{3}{8}$ -in. angles running the full width of the base plate. The rivets through these angles and the solepiece must be countersunk on the lower side, so that a true bearing on the joists below can be made.

Assume a thickness of 1 in. for the soleplate; then, according to the general practice, this plate must



GRILLAGE FOUNDATION.

not overhang the sides of the stanchion by more than eight times the thickness of the plate.

$8 \times t = 8$ in.

Then, adding 16 in. to the least width of the stanchion (15 in.), we have 31 in. for the width of plate.

\therefore Let the base plate be 30 in. square.

The Surveyor

And Municipal and County Engineer.

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It will be necessary to check these dimensions of the soleplate, to ensure that it is safe against shearing stresses. The worst case of shear is covered by supposing the maximum shear on the base to be one half the total load—i.e. maximum shear on base = $\frac{250}{2}$ tons = 125 tons. Treating the overhanging portion of the base as a cantilever, the maximum shear will occur under the sides of the stanchion.

Section of plate at this line is 30 in. x 1 in. = 30 sq. in. \therefore shearing strength = 30 in. x 5 tons = 150 tons. \therefore The base plate is strong enough in shear.

The bending action on the base plate is resisted mainly by the gusset plates and angles riveted to it.

Foundation.—In designing a concrete and steel joist grillage, the area of the foundation is fixed according to the bearing power of the ground. In this case the earth will stand 2 tons per square foot, and the total load is 250 tons.

$$\therefore \text{Area of foundation} = \frac{250}{2} \text{ sq. ft.} = 125 \text{ sq. ft.}$$

If the foundation be square, the side will be 11.1 ft., say, 11 ft. 6 in.

The placing of the joists is governed by the fact that concrete must be rammed between them. In practice a minimum of 3 in. between the flanges is allowed, and a maximum spacing of 18-in. centres. In this case, if the joists in the bottom layer be placed at 16-in. centres, and there are eight of them 10 ft. long, sufficient concrete will be left round the sides and ends to protect the steel from corrosion. In the top layer three joists will be required, 10 ft. long; this number is limited owing to the width of the baseplate. Having decided upon the number and length of the joists, it is necessary to ascertain their dimensions. The overhanging portions of the joists are treated as cantilevers under a uniform load equal to the upward pressure. Overhang of all joists = 5 ft. - 1 ft. 3 in. (see sketch).

$$= 45 \text{ in.}$$

Bottom Layer.—The intensity of upward pressure per inch run on one joist—

$$p = \frac{P}{n.L}$$

where P = total load, n = number of joists, L = length in inches.

$$\therefore p = \frac{250}{8 \times 120} \text{ tons} = 262 \text{ tons per in. run.}$$

Let y be the overhang of joists.

Then maximum bending moment =

$$\frac{p.y^2}{2} = \frac{262 \times 45^2}{2} = 265 \text{ tons in.}$$

Allowing $f_t = 7.5$ tons per square inch for tensile strength.

$$\text{The section modulus required, } Z = \frac{M}{f_t} = \frac{265}{7.5} = 35.3 \text{ in.}^3$$

From a table of British Standard Sections, the section 10 in. x 6 in. x 42 lb. I-beam, will be found suitable, as its $Z = 42.3 \text{ in.}^3$

Testing for Shearing Strength.—The web of this section is .40 in. thick.

$$\therefore \text{Area of web} = .4 \text{ in.} \times 10 \text{ in.} = 4 \text{ sq. in.}$$

\therefore Shearing strength of 8 joists = $8 \times 4 \times 5 = 160$ tons.

Taking $f_s = 5$ tons per square inch shearing strength, this section is quite strong as regards shear.

$$\text{Top Layer.}—p = \frac{250}{3 \times 120} = 694 \text{ tons per in. run}$$

$$\text{Maximum bending moment} = \frac{p.y^2}{2} = \frac{694 \times 45^2}{2} = 700 \text{ in. tons.}$$

$$Z = \frac{M}{f_t} = \frac{700}{7.5} = 93.3 \text{ in.}^3$$

Referring to the table of Standard Sections,

The 16 in. x 6 in. x 62 lb. I section is most suitable with a modulus $Z = 90.7 \text{ in.}^3$

Thickness of web of this section = .55 in.

$$\therefore \text{Area of web} = .55 \text{ in.} \times 16 \text{ in.} = 8.8 \text{ sq. in.}$$

\therefore Shearing strength of 3 joists = $3 \times 8.8 \times 5 = 132$ tons.

This section is amply strong in shear, but a little deficient in bending strength; however, as no allowance has been made for the concrete, this section may be safely adopted.

It is the general practice to fit cast-iron or steel tube separators between grillage joists at intervals not greater than 5 ft. The concrete must be well rammed between the joists, and the latter should be well surrounded with at least 12 in. of concrete below the bottom layer. The concrete may be proportioned 1:2:3 for good work. The stanchion is attached to the foundation by four 1-in. holding-down bolts passing through the corners of the baseplate and the flanges of the top joists. (H. V. O., West Bromwich.)

Portland's New Waterworks.—A new water supply scheme for Portland was formally opened last week by the chairman of the urban district council, Mr. W. Edwards. The cost of the new works, together with purchase of the land, is approximately £15,785. The pumping station is situated right in the valley, and the most modern machinery for lifting water has been installed. Side by side are two boreholes, one 24 in., capable of supplying 696,000 gallons of water per diem, and the other 10 in., giving 240,000 gallons per day. The depth of each borehole is 355 ft. The engineer to the Portland authority is Mr. R. Stephenson Henshaw, who was responsible for the construction of the works.

Paving Renewals in North London.—In a report submitted lately by Islington Finance Committee, it was stated that the renewal of the surfaces of such roads as Upper-street, Holloway-road and Seven Sisters-road—not to mention many smaller roads—was a matter which would have to be faced before very long. The committees held the opinion that such renewals should properly be made the subject of a loan, and that the London County Council should not object to sanction such loan. That body, however, in pursuance of a financial policy which, however desirable from their point of view, pressed very hardly upon the present ratepayers, had refused sanction to a certain loan recently applied for, and the council, thinking it a matter of importance both to Islington and other boroughs, are appealing from that refusal to the Local Government Board.

Institution of Civil Engineers: Students' Meetings.—At the students' meeting held at the Institution on Friday last, Mr. R. C. S. Walters, STUD. INST. C. E., read a paper entitled, "Ancient Surveying." The chair was taken by Prof. S. M. Dixon, M.A., B.A.L., M. INST. C. E. The paper, an extremely interesting one, dealt with the various instruments used and methods employed in surveying by the Greeks and Romans, so far as can be gathered from existing records. The author quoted various authorities, more especially Schöne, who has reconstructed a number of instruments. The paper was accompanied by lantern slides of the various instruments reconstructed, and of ancient engineering works probably set out by their aid. In the course of his remarks, the chairman referred to the similarity between ancient and modern surveying instruments and to the knowledge and proficiency of the ancient Chinese. The author replied briefly to various questions raised, and the meeting adjourned with the customary vote of thanks to the chairman.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Barnes U.D.C. (January 20th. Major J. Stewart).—£800 for the laying out of tennis courts and a bowling green, and the provision of a shelter with lavatory accommodation, on Sheen Common. The surveyor (Mr. G. B. Tomes) explained the position of the proposed tennis courts and bowling green, which would, he said, cover an area of four-fifths of an acre exactly. The pavilion would be constructed of timber and rustic work. There would be no fences whatever except stop netting of wire mesh round the tennis courts.

Christchurch R.D.C. (January 27th. Dr. F. St. George Mivart).—£700 for the provision of an administration block at their isolation hospital in Fairmile.—The proposal is that the administration block shall contain suitable accommodation for caretaker and wife, three nurses and a store for food. The plans were prepared by Mr. L. Raine, the surveyor, who explained what was proposed to be done. He said he estimated the cost of erection at £550, and the rest of the £700 was to be for water supply and drainage.

Felling U.D.C. (February 3rd. Mr. R. H. Bicknell).—£1,000 for street improvement works. Plans were produced by the surveyor, Mr. C. W. Hall, of the proposed work, which included the laying of whinstone chip paving in several streets. The inspector said he had been trying for many years to persuade surveyors and councils to discontinue whinstone chip paving, and had, he thought, been successful in every instance. Besides being the most insanitary paving they could put down, and impossible to cleanse, it was noisy. Water stood on it, too, and it was no cheaper than good tar-macadam. Properly attended to, tarred, and sprinkled over with chipping, tar-macadam lasted practically for all time. The surveyor stated that the gradients varied from 1 in 12 to 1 in 30. He should not use tar-macadam on a gradient of more than 1 in 20. Mr. Bicknell suggested that the council should take into consideration what streets they would be disposed to pave with tar-macadam in place of the chips. The cost per yard would probably be 5s. 2d., instead of 5s. in the case of the chip paving.

Newcastle-on-Tyne T.C. (February 3rd. Mr. R. H. Bicknell).—£7,968 for a recreation ground.—One item of expenditure was £930 for a bowling green, which led the inspector to ask if the greens were paved with gold. It was explained by the borough engineer, Mr. W. J. Steele, that a large part of the cost was due to excavation in the side of a hill, and to the use of Silloth turf at 1s. 6d. per yard. The city engineer added that the average cost of a bowling green was about £600.

Oxfordshire C.C. (January 29th. Mr. W. O. E. Meade-King).—£2,888 for the purposes of main road improvement. The county surveyor, Mr. S. Stallard, stated that the work of reconstruction of certain sections of main roads, for which application is made to borrow, are on the following roads: Oxford and Banbury, from Oxford city boundary to Banbury borough boundary; Oxford and Cheltenham road, from Swinford Bridge to the Gloucestershire county boundary; Oxford and Chipping Norton road, from Oxford city boundary as far as the Chipping Norton borough boundary at Southcombe; Oxford and London road *via* Henley-on-Thames, from Oxford city boundary to Henley borough boundary; Oxford and London road, from Oxford city boundary to the Bucks county boundary at Stokenchurch. The total length of these roads is, approximately, 90 miles. Of this mileage, after omitting the sections already reconstructed with bituminous material, the hills on which it is too steep to put tar-macadam, and the sections that have no foundations and are waterlogged, there remain about 60 miles on which it is proposed to lay tar-macadam. It is proposed to commence the work in March, and it is hoped that it will be finally completed within a period of three years.

Penybont R.D.C. (February 5th. Mr. A. G. Drury).—£10,759 for the construction of a system of sewerage for Pen-coed.—The clerk, Mr. R. H. Cox, stated that the council hoped the repayment of the loan would be extended over sixty years. The in-

pector, I can hold out no hope of your getting that nor fifty. It is the settled practice of the board to sanction loans for works of this kind for thirty years only. Mr. J. E. Moss-Flower, Bristol, who had prepared the scheme, explained the engineering details, and said he thought there was an ample water supply for flushing purposes. It could be further improved by increased storage at the source. Mr. W. A. Howell said the parish council were negotiating for additional springs.

Rhyl U.D.C. (February 10th. Mr. T. C. Ekin).—£3,900 for the purposes of the electricity undertaking, £1,150 for the purposes of the gas undertaking, and £892 for works of water supply. It is proposed to enlarge the electricity generating station, and install a second Diesel engine set. The original steam generating plant is maintained as a stand-by. The Diesel engine put down a few years ago has been very successful both in efficiency and reduced cost of the current generated. The loan for the gasworks is for a new station meter and other improvements, that for water supply is to cover the cost of laying a new main for a distance of practically a mile from Boddywyddan in the direction of Abergele, to increase the pressure of water at Abergele, and to enable the council to supply water in bulk at the boundary of the district to the parish of Llanddulas.

Stoke Newington B.C. (January 21st. Mr. R. H. Bicknell).—This was an application for consent to the appropriation of the site of 42 and 44 Milton-road, and for sanction to borrow £1,300 for the erection of wash-houses. The borough surveyor, Mr. W. F. Loveday, produced the plans he had prepared, and stated that in the scheme wash-houses were provided on the ground floor with an entrance in the centre, payments being taken in an inner room. There would be two hydro-extractors, twenty-four drying closets, two mangles and ironing tables, and a stove for the heating of the irons. At Islington it was found that the stove was only used for a couple of hours one day per week. At Stoke Newington they could have either a gas or electric stove. The cost of the wash-houses, exclusive of the first floor, would be £1,900, including equipment, and the first floor would necessitate an expenditure of £300, making a total of £2,200. The inspector said the council had better pass a resolution for the extra sum, and he advised them to get in provisional tenders.

Tynemouth T.C. (February 4th. Mr. R. H. Bicknell).—This was an application for permission to issue a Provisional Order empowering the council to put in force the Land Clauses Acts with respect to the purchase and taking of land for the widening of Bell-street and Liddell-street, North Shields.—The town clerk (Mr. Stanley Wilson) said the streets in question were situated in what was known as the Low Town, and they were practically the only approaches to the Fish Quay for the great volume of vehicular traffic coming across the river. Following this a further inquiry was held with reference to an application for sanction to borrow £1,575 for the purchase of an area known as the Rosella Horse Field, Spring-terrace, North Shields, for the purpose of laying it out as a recreation ground. The area was stated to be 10,800 sq. yds.—The borough surveyor, Mr. J. F. Smillie, gave evidence.

Wallasey T.C. (February 3rd. Major J. Stewart).—£95 for the provision of public gardens between Breck-road and Hilary-drive, Wallasey; £5,860 for the erection of a fire station in Manor-road, Liscard, and the purchase of No. 8 Anglesea-road as a residence for the superintendent; £1,950 for the purchase of two motor fire engines; and £8,725 for the widening and improvement of Claremount-road, Breck-road and St. Hilary-brow, Wallasey, and Wallasey-road, Liscard.—Evidence was given by the town clerk, Mr. W. H. Cook, and the chairmen of the committees concerned with the several schemes. The borough surveyor, Mr. W. H. Travers, stated that a scheme for the provision of about sixty workmen's dwellings had been prepared, and would probably be the subject of a Local Government Board inquiry in about two months' time. There was reason to believe that by the summer there would be abundant accommodation provided for the working classes in Wallasey Village.

Whitworth U.D.C. (January 30th. Mr. F. H. Tulloch).—£5,000 for paving in Market-street.—It was stated that the main road where the paving was required was the connecting link between Rochdale and Bacup, and between many of the large towns in North Lancashire. The scheme for granite paving

had the approval of the Lancashire County Council, who had agreed to enter into an agreement with them to contribute 90 per cent of the annual repayments in respect of principal and interest on account of the loan of £5,000.

APPLICATIONS FOR LOANS.

- Accrington T.C.**—£9,500 for extensions to the car shed.
- Axminster R.D.C.**—£1,815 for the erection of ten workmen's dwellings at Colyton.
- Banbury T.C.**—£5,400, supplemental loan for bacteria beds at the sewage farm.
- Bootle T.C.**—£1,554 for hospital extension, and £800 for the purchase of land for an electricity station.
- Bournemouth T.C.**—£1,600 for the purchase of a site for a dispensary, and £7,000 for sewage outfall works.
- Chippenham T.C.**—£2,460 for the erection of twelve workmen's dwellings, and £2,460 for the Blind-lane improvement.
- East Grinstead U.D.C.**—£2,900 for a refuse destructor, and £800 for the site.
- Epsom U.D.C.**—£9,500 for new pumps and a rising main at the waterworks.
- Horwich U.D.C.**—£400 for the provision of an open space.
- Leeds T.C.**—£1,200 for tennis courts at the training college; £4,000 in connection with the electricity undertaking.
- Lincoln T.C.**—£9,000 for the purchase of land for a housing scheme.
- Monmouthshire C.C.**—£1,450 for school extensions, and £175 for an art centre.
- Newton Abbot R.D.C.**—£4,500 for a water supply scheme.
- Oswestry R.D.C.**—£900 for new water mains.
- Poole T.C.**—£3,360 for alterations to the Alderney Hospital, and £260 for school extension.
- Radcliffe U.D.C.**—£15,000 for the provision of sixty-four workmen's dwellings.
- Staffs C.C.**—£6,350 for the purchase of land for a county farm institute.
- Sunderland R.D.C.**—£1,750 for sewerage works.
- Sunderland T.C.**—£1,029 for alterations at a school.
- Westhoughton U.D.C.**—£3,070 for sewerage works extensions.
- Wigan T.C.**—£1,862 for the construction of manholes.
- Winchcombe R.D.C.**—£2,300 for the erection of twelve cottages.
- Worcester T.C.**—£1,150 for a site for a new school.

LOANS SANCTIONED.

- Arklow U.D.C.**—£150 for gas extensions.
- Ballymoney U.D.C.**—£400 for the extension of the technical school.
- Bentley U.D.C.**—£265 for street improvements.
- Burton T.C.**—£13,000 for the purchase of gas undertakings and gasworks extensions.
- Garnarvon T.C.**—£1,081 for laying out the cemetery and walling.
- Chapel-en-le-Frith R.D.C.**—£1,287 for the extension of the water mains in Chinley, Hope, and Wormhill. The engineers are Messrs. Brady & Partington, Chapel-en-le-Frith.
- East Grinstead U.D.C.**—£470 for a public convenience.
- Grantham T.C.**—£1,108 for a new school (repayable in fifty years).
- Kirkburton U.D.C.**—£1,250 for the erection of six dwellings.
- Lutterworth R.D.C.**—£5,110 for a housing scheme.
- Mexborough U.D.C.**—£5,960 for the provision of public baths.
- Rochdale T.C.**—£65,000 for extensions of the gas and electricity works.
- Tilbury U.D.C.**—£2,000 for road construction.
- Tredegar T.C.**—£9,900 for gas supply extensions.
- Ulverston U.D.C.**—£3,000 for the erection of a public hall.
- Upton-on-Severn R.D.C.**—£876 for the erection of four cottages.
- Wanstead U.D.C.**—£2,808 for road improvements.
- Whitefield U.D.C.**—£450 for road works.

FORTHCOMING INQUIRIES.

FEBRUARY.	£
16.— Surbiton. For the provision of a burial ground (Mr. R. H. Bicknell)	6,900
16.— Walthamstow. For public convenience and street purposes (Mr. F. H. Tulloch)	1,889
17.— Exeter. For the provision of a public convenience (Mr. W. M. Cross)	1,110
17.— Haywards Heath. For the provision of a cemetery (Mr. R. H. Bicknell)	1,700
17.— Whitefield. For the purpose of municipal offices (Mr. Edgar Dudley)	840
18.— Blofield. For the purposes of sewerage (Major J. Stewart)	8,250
18.— Glastonbury. For sewage disposal purposes (Mr. W. M. Cross)	4,400
18.— Hemel Hempstead. For street improvement purposes (Mr. R. H. Bicknell)	6,275
18.— Manchester. For street and open space purposes (Mr. Edgar Dudley)	29,766
18.— Orsett. For works of water supply (Mr. F. H. Tulloch)	428
19.— Chatham. For the formation of a joint sewerage board (Mr. A. G. Drury)	—
19.— Lowestoft. For lavatory extension (Major J. Stewart)	517
19.— Shepley. For the provision of a recreation ground (Mr. Edgar Dudley)	—
19.— Watford. For road widening purposes (Mr. M. K. North)	500
20.— Poole. For road improvement and drainage works (Mr. W. M. Cross)	4,069
20.— Samford. For works of water supply (Major J. Stewart)	1,271

TOWN PLANNING SCHEME.

- 17.—**Manchester.** (Mr. Thomas Adams)

West Ham Tramways.—A report states that the West Ham Corporation tramways are threatened this year with a deficit of £8,000.

Louth Surveyorship.—A sub-committee of Louth Town Council reported in favour of combining the offices of surveyor and sanitary inspector, at a joint yearly salary of £225, the person appointed to reside in the borough, and give his whole time to the duties.

South Shields and Water-carriage System.—South Shields Town Improvement and Health Committee on Wednesday decided to recommend the town council without delay to adopt the water-carriage system in existing properties as well as in all new properties. The cost is estimated at £30,000.

Aberdeen Fish Market Extension.—An extension of the Aberdeen Fish Market, which has been completed at a cost of £11,000, has just been opened. The existing wharf has been lengthened by 500 ft., and new market buildings have been erected. The extension has been carried out by the Harbour Commissioners jointly, and the Aberdeen Fish Market will now rank as one of the largest fishing wharves in the world.

Stirling Tramways Question.—The Stirling Town Council on Monday had before them a report on the subjects of the electricity and tramway schemes. An offer to purchase for £32,000 the electricity undertaking was declined. With regard to the tramway project, it was estimated that a complete system could be constructed at a cost of £74,000, with a reasonable certainty of financial success, but it was agreed that the draft report should be supplemented by a further statement on certain aspects of the question.

Housing Question at Penrith.—The Local Government Board, as a result of the recent inquiry into the alleged lack of housing accommodation at Penrith, have intimated to the urban district council that the case is not one in which the board could declare the council in default, but that there are cases of overcrowding and some insanitary houses in the town. The board recommend the council to build with the least possible delay a few new houses with three bedrooms each. A suggestion that six such houses be built under the Working Classes Housing Act has been referred to the Sanitary Committee of the council for consideration.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Birmingham £19,261, Margate £6,000, Torquay; housing and town planning—Cardiff, Walsall; roads and materials—East Lothian, West Sussex, Whitby £11,000; sewerage and sewage disposal—Aberystwyth £25,000, Kilkenny £22,000; water, gas and electricity—Edinburgh, Newport. Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Belfast T.C.—Councillor Shaw, at last week's council meeting stated that in 1904 a sum of £5,250 was required for the public baths, £100 for the lodging-house, and a rate of 1½d. For the present year they only required £3,790 for the baths, they had £10 to the credit of the lodging-house, and they only needed a rate of ½d., so that he thought the committee had been doing very good work.

Birmingham T.C.—The Baths Committee have been authorised to obtain tenders and proceed with the erection of baths in George Arthur-road, Saltley, at an estimated cost of £19,261.

Bodmin T.C.—The borough surveyor, Mr. R. T. Buscombe, has received instructions to prepare plans for a new fire station.

Coalville U.D.C.—The surveyor, Mr. L. L. Baldwin, has received instructions to prepare a rough plan of the proposed additional wards for the isolation hospital.

Darlington T.C.—A scheme for the erection of spray baths is to be carried out at an estimated cost of £300.

East Molesey U.D.C.—The tender, at £72, of Mr. W. J. Cooper, of East Molesey, has been accepted for the erection of a coal and apple store at the isolation hospital.

Hampton U.D.C.—The surveyor, Mr. S. H. Chambers, having reported the estimated cost of the proposed open-air swimming bath at £1,146, it was on Tuesday decided to apply to the Local Government Board to sanction the borrowing of £1,150.

Hove T.C.—The Works and Improvement Committee recommend the acceptance of the tender of Messrs. McKellar & Westerman, Hove, at £2,097, for enlarging the police station, and constructing underground lavatories in Norton-road.

Littlehampton U.D.C.—It has been resolved to seek powers at the Sessions to close the southern portion of Fitzalan-road to permit of an enclosure being made around the bandstand, thus enabling the council to make a charge for admissions when bands are playing.

Margate T.C.—The success of the municipal bathing scheme has led the corporation to undertake the erection, at a cost of £6,000, on the Westbrook side of the town, of a pavilion with accommodation for 100 bathers. The building will include tea-rooms and an assembly hall.

Mold U.D.C.—It is proposed to erect a new fire station at a cost of £500.

Seaham Harbour U.D.C.—Lord Londonderry has made over to the council as a free gift his interest in the Literary Institute and of the freehold on which it stands for the purposes of municipal offices.

Stockton T.C.—The borough engineer, Mr. M. H. Sykes, has prepared a report on the proposed new accommodation for the corporation offices on the site of the borough hall and adjoining land. Mr. Ivan C. Barling, M.INST.C.E., has been appointed to inspect a site with a river frontage of 1,000 ft., for the purposes of a new wharf, and report to the council.

Torquay T.C.—Plans have been approved of the proposed medical baths and large swimming bath at the Bath Saloons.—A scheme for a technical school has been adopted, the estimated cost being £11,000, one half of which will be contributed by the county council.

West Sussex C.C.—It has been agreed thoroughly to overhaul and repair Norfolk Bridge, at a cost not exceeding £1,000.

HOUSING AND TOWN PLANNING.

Altrincham U.D.C.—The council have authorised the Housing Committee to prepare a scheme for the erection of artisans' dwellings on a plot of land which was formerly occupied by the fever hospital in Lloyd-street. The council have already built about fifty houses on Hale Moor, which are let at low rentals to working men, and the chairman of the committee informed the council that the scheme had been so successful that many other authorities had determined to adopt similar plans in their own districts.

Buckfastleigh U.D.C.—The surveyor, Mr. A. Warren, last week presented plans and specifications for new workmen's dwellings, and it was decided that they should be submitted to the Local Government Board, who will be asked to make an appointment to see the clerk in London.

Cardiff T.C.—The city engineer, Mr. W. Harpur, has prepared for the Housing Committee a scheme for thirty-seven houses on the site of the old cattle market, Canton, costing £150 each, with four rooms, two upstairs and two downstairs, to let at about 6s. 6d. Bath-rooms would not be included. This the engineer estimated would cost an additional £10 per house. Regarding the Portmanmoor-road site, the city engineer has submitted a scheme for the provision of fifty-one 4-roomed houses, costing £155 and £165, forty-five with five rooms, costing £175, and forty-three 5-roomed houses of a larger type, costing £230 and £240. Each house would have a bath-room. Both schemes are still under the consideration of the committee.

Kingstown U.D.C.—Steps are to be taken for the promotion of additional housing schemes.

Lurgan U.D.C.—The housing scheme approved by the council, and sanctioned by the Local Government Board, is to be carried out at a cost of £135 per cottage.

Narberth (Pembooke) R.D.C.—The council have approved plans for building a dozen workmen's cottages at Ridgeway, Saundersfoot.

Renfrew T.C.—A special committee has been appointed to deal with the provision of municipal dwellings, to report within three months.

Walsall T.C.—A scheme is to be prepared forthwith under the Housing Acts for the provision by the council of 125 dwelling-houses, of which twenty-five at least shall be reserved for the purpose of rehousing families removed from insanitary dwellings.

Winchcombe R.D.C.—It has been agreed to erect twelve cottages on Great-road. Each cottage will have attached ¼ acre of land, and it is proposed to charge a rental of 4s. 6d. per week.

Wolverhampton T.C.—A scheme is to be prepared for the provision of houses at rentals not exceeding 1s. per week.

PARKS AND OPEN SPACES.

Birmingham T.C.—It is proposed to purchase 14 acres of land, at the price of £5,000, for the extension of King's Heath Park.

Fulham B.C.—A bowling green and two tennis courts are to be laid out in the recreation ground at a total estimated cost of £525.

Hove T.C.—In connection with proposed alterations to the Palmeira Lawn, the Works and Improvements Committee have decided to invite tenders. The alterations involve the shortening of the lawn by 40 ft. at the western end, and by 50 ft. at the eastern end, the parts so cut off being thrown into the roadway, and used for reconstructing the present underground lavatory; while at the west end of the lawn it is proposed to form a footway pavement 5 ft. wide, and one at the east end 10 ft. wide, the extra width of the latter being required to roof over the new lavatory. The estimated cost of the work is £1,280.

Seaford U.D.C.—The council have adopted a report by the surveyor, Mr. B. A. Miller, with respect to laying out 10 acres on the Salts as a recreation ground. Invitations have been issued for competitive schemes for laying out the grounds, and the council offer a first prize of £75 and a second prize of £25, the plans securing prizes to become the property of the council.

The schemes sent in are not to exceed £3,000 in cost, and are to include the laying-out of the ground, draining, yacht pond, tennis and bowling green, the making of roads and paths, retaining walls, seats, planting trees, and shrubs; sites to be reserved for swimming bath, shelters, handstand, tea rooms, public conveniences, sand pit, children's playground, and kursaals.

REFUSE COLLECTION AND DISPOSAL.

Hackney B.C.—Tenders have been accepted for the collection and removal of house refuse at 4s. 2d. per ton for the northern division, and 4s. 3d. per ton for the southern division, representing a total saving of £1,759 upon the tenders of the previous year.

ROADS AND MATERIALS.

Bath T.C.—An important improvement is foreshadowed in the minutes of the Corporate Property Committee when the Castle Hotel property falls into the hands of the corporation. This proposal will involve the further rounding of the corner of New Bond-street (Post Office Chambers) and the widening of Green-street.

Bristol T.C.—The Sanitary Committee have adopted the plan of the city engineer, Mr. L. S. McKenzie, for the widening of Sea Mills-lane to 40 ft.

Cumberland C.C.—The county surveyor, Mr. William Finch, it was reported at the council meeting held recently, had visited various places and works for the purpose of inspecting and testing road rollers. After careful consideration of the tenders submitted, a sub-committee recommend that two 10-ton road rollers, including scarifiers, sprinklers and water carts, be purchased at a cost of £1,250—one from Messrs. Aveling & Porter, Rochester, and the other from Messrs. Marshall, Sons & Co., Gainsborough. The county surveyor has also inspected various types of tractors for road haulage, and submitted tenders. The sub-committee recommend that the sum of £1,550 be provided in next year's estimates for the purchase of power haulage, and that at the present time one steam tractor, fitted so as to be available for alteration to a light road roller if required, with two trailer wagons, be purchased from Messrs. Marshall, Sons & Co. at a cost not exceeding £650, and that the purchase of a second tractor, out of the balance of the sum of £1,550, be delayed for the present pending a report from the county surveyor as to the relative methods of propulsion adopted by the various makers of vehicles used for this purpose.

Darwen T.C.—The borough surveyor, Mr. R. W. S. Saville, has prepared plans and estimates for making good a number of streets.

Dublin T.C.—The council have sanctioned the preparation of a scheme for widening Wexford-street and Redmond's-hill.

East Lothian C.C.—The council have authorised capital expenditure by the Eastern District Committee of £11,783, by the Western District Committee of £17,771, for road roller, stonebreaker, and other expenditure in improving roads, to be borrowed from time to time from the Road Development Commissioners, repayable in five years. This is expenditure in connection with the new county roads improvement scheme.

Exeter T.C.—It has been agreed to carry out the widening of Haven-road and Water-lane, at a cost of £800, plus the cost of fencing, not to exceed £300.

Gateshead T.C.—It has been agreed to add £830 to the estimates for the purpose of coating three streets with tar-macadam.

Guildford T.C.—The borough surveyor, Mr. C. G. Mason, has submitted an estimate, amounting to £2,850, for the London road widening scheme, and, subject to satisfactory contributions being received from the county council and the Road Board, it has been agreed to proceed with the improvement.

Harrogate T.C.—The corporation are advised by the Highways Committee to borrow £2,096 for private street works.

Hucknall U.D.C.—Plans of an improvement in Bulwell-lane, estimated to cost £1,715, have been forwarded to the county council.

Hull T.C.—A discussion arose at a recent committee meeting as to whether street paving was best done by corporation employees or by contract, and the chairman (Alderman Larard) said he had wondered whether they got as much for their money as the outside contractor. One reason was they were very chary about dismissing a man on account of age. The assist-

ant city engineer said that, taken all round, he had nothing to say against the men employed by the corporation.

Melton Mowbray U.D.C.—The council are considering the adoption of the full paving scheme prepared by the surveyor, Mr. Edmund Jeeves, providing for an expenditure of £3,060, to be met by loan.

Monaghan C.C.—From a report of the county surveyor, Mr. J. J. Hannigan, B.E., presented at a recent meeting, it appeared that in districts where work had to be done by direct labour under his supervision all the money set apart for the roads had been expended, whereas under the contract system there was a balance of £600 for money struck off or deferred. The chairman, Mr. T. Toal, J.P., said that in that county they had not a scheme of direct labour, and he did not consider it would be advisable for them to adopt a scheme, as in some other counties it had not proved successful; but while they had no scheme, there were few counties of its area giving as much employment under direct labour. The sum of £12,000 was to be expended under direct labour this year. That was giving encouragement to the labouring man who wished to remain in his country, and if the direct-labour gangs employed in the county gave satisfaction, it would encourage the council to go further in this direction.

Newton Abbot R.D.C.—The tender of Mr. Edwin Harris, Clysthydon, at £948, has been accepted for re-making Haccombe-road, Chudleigh.

Nottingham T.C.—The Improvement Committee have prepared a modified scheme for the widening of Main-street, Bulwell, and instead of a sum of £8,500 being involved, an estimate of £1,600 has been agreed to.

Stewartry C.C.—A scheme of improvement has been approved of the main road from Creetown Quarries to the station, and on the Dromore road from Gatehouse to the station, the estimated cost being £7,400, and application is to be made to the Road Board for a grant.

Swansea T.C.—It has been agreed to proceed with a widening scheme on the Mumbles road.

Torquay T.C.—The tender of Messrs. Yeo & Sons, at £1,490, has been accepted for the widening of Torbay-road, by the gasworks.

West Riding C.C.—Experiments are being made with glutrin macadam in the repair of roads. Hopes are entertained that the product, which contains no tar, will prove to have the same dust-resisting qualities and durability as tar-macadam. Experiments in Hull have shown, it is claimed, that the new material makes roads which are "non-slip," and safe for equestrian traffic.

West Sussex C.C.—With respect to the proposed road reconstruction scheme, the Road Board have made a grant of £16,000, and a further loan of £25,000, to be repaid in seven years, the first instalment only to be repaid next year. The total estimated cost of the scheme is £41,000. It was recently explained by Lord Leconfield, chairman of the Roads and Bridges Committee, that the committee had taken out all the roads which had heavy gradients, where tarred macadam would be dangerous, and they recommended tarred macadam to be used entirely on the Lancing and Worthing road, some parts of the Horsham and Cowfold road, the Crawley and Horsham road, and the Broadbridge Heath and Rudgwick road. The rest of the work under this scheme of £41,000 would be done with a water-bound road tar-painted.

Whitby R.D.C.—Consideration is being given to a proposed new road between Whitby and Sandsend, estimated to cost £14,000, of which the Road Board would pay one half, the county council one quarter, and the Whitby rural and urban councils one eighth each.

SEWERAGE AND SEWAGE DISPOSAL.

Aberystwyth T.C.—A sewage disposal scheme, prepared by Messrs. J. Diggle & Son, has been submitted to the Local Government Board. The probable cost will exceed £25,000.

Cambridge T.C.—The borough surveyor, Mr. Julian Julian, has prepared a report on the borough drainage, in which he recommends the carrying out certain alterations and surface-water drainage, at an estimated cost of £1,135.

Downham U.D.C.—The tender of Mr. Reuben Shanks, Chatteris and Hunstanton, has been provisionally accepted for the sewerage scheme, the plans of which have been prepared by Messrs. Elliott & Brown.

Kilkenny T.C.—The Local Government Board have sanctioned the issue of a Provisional Order in connection with the scheme of main drainage proposed for the city, the estimated cost of which is £22,000. The engineer is Mr. James F. Reade, Assoc.M.I.N.S.T.C.E., of Waterford.

Matlock U.D.C.—The tender of Ames-Crosta & Co., at £211, has been accepted for sprinklers for the sewage works.

Perth T.C.—The question of sewage disposal is being investigated by a special committee.

Teddington U.D.C.—With regard to the sewage contract No. 1, abandoned by Messrs. Cunliffe & Son, there has been accepted an offer from the Fidelity and Deposit Company to guarantee the due completion of the work by Mr. T. J. Moran, trading as the Standard Construction Company, of Prince's-street, Ipswich, whose amended tender was £10,926 and £250 allowed for plant and material on the works. The other tenders were from Messrs. Dick, Kerr & Co., £13,131 and £401 for materials, and Messrs. Hughes & Stirling, £14,335 and £395.

Uttoxeter R.D.C.—A plot of land at Abbots Bromley is to be leased for the purposes of sewage disposal.

WATER, GAS, AND ELECTRICITY.

Ballinrobe U.D.C.—Application has been made to the Local Government Board for a loan to cover the cost of a water supply scheme.

Edinburgh T.C.—The corporation's consulting engineer has advised that an additional power station will be required within the next few years for the electricity undertaking. The capital expenditure will be approximately £125,000.

Kensington B.C.—The Works Committee have had under consideration the question as to the advisability of further improving the street lighting in the borough, so far as regards those streets and places where garden enclosures exist. The estimated cost of the scheme will be £1,254, and the cost of the necessary extra gas supply will be £320. It is proposed to provide 116 new lamps and to move 163.

Kingstown U.D.C.—A report is to be prepared on the subject of installing a system of electric lighting.

Kirkby-in-Ashfield U.D.C.—The water engineer has reported upon the advisability of additional water storage, and a sub-committee has been appointed to go into the matter.

Lurgan U.D.C.—Steps are to be taken to purchase the local gasworks on behalf of the ratepayers.

Malton R.D.C.—The pumping tests at the Anotherby boring have yielded very satisfactory results, the water being pumped at the rate of 140,000 gallons per twenty-four hours.

Newport (Mon.) T.C.—It has been agreed to carry out water main extensions in the Maesglas district.

Perth T.C.—Messrs. Crouch, Hogg & Eastern, Glasgow, have been appointed to advise the special committee that is investigating the condition of the city water supply.

Riccall R.D.C.—A £3,000 scheme has been adopted for a water supply for Barlby. The supply will be drawn from the Selby waterworks, and the main will be laid across the bed of the river Ouse to the Barlby side.

Sleaford R.D.C.—The tender of Mr. John Hudson, of North Hykeham, at £2,514, has been accepted for the Heckington water supply extension scheme.

Swansea T.C.—At a recent meeting of the Electricity Committee, during the consideration of proposals for the erection of sub-stations, Colonel Sinclair (the chairman) said they had to bear in mind the large development in contemplation in connection with the corporation's housing scheme. Although that only provided for the immediate erection of 500 houses, there would altogether be erected on the town hill site quite 2,000 houses, and not only would the streets require electric light, but a large proportion of the houses would be customers as well.

MISCELLANEOUS.

Beverley R.D.C.—A decision has been reached for the joint provision with other local authorities of a fire engine and appliances.

Coleraine U.D.C.—Tenders are to be obtained for a motor suitable for attachment to the existing fire brigade apparatus.

Hove T.C.—The Watch Committee recommend the purchase of a motor fire engine from Messrs. Merryweather, for £950.

Molesley U.D.C.—A resolution has been passed that no man in the employment of any cartage contractor doing business with them is to be paid a rate less than 2s. a week.

Stepney B.C.—It has been reported to the Finance Committee that it will be necessary at an early date to take up loans amounting to £75,148. Of the total £60,000 is for electricity purposes, £3,600 for the construction of underground conveniences, £10,000 for the erection of buildings for the electricity supply undertakings, and £1,548 for street improvements.

PERSONAL.

Mr. H. W. Bowen, county surveyor of West Sussex, has had his salary increased from £400 to £500 a year.

Mr. H. E. Stilgoe, M.I.N.S.T.C.E., city engineer of Birmingham, had his salary increased on Tuesday from £1,250 to £1,400 per annum.

Mr. Harley Heckford, M.I.N.S.T.C.E., borough engineer of Poplar, is making a favourable recovery from the effects of a motor-car accident.

Mr. A. E. Darby, Assoc.M.I.N.S.T.C.E., borough surveyor of Bethnal Green, has been voted an increased salary at the rate of £500 a year.

Messrs. G. E. Gregson, Coard Squarey Pain, and J. Marcus Rea will represent the Surveyors' Institution at the Royal Sanitary Congress at Blackpool in July next.

Mr. Joshua Priestman, of London, member of the Hull firm of engineers, Priestman Brothers, Limited, passed away, we regret to have to report, on the 27th ult., after a short illness.

Mr. Geo. Heaton, of Birmingham, has been appointed manager of the streets and sanitary department of the Scarborough Town Council, at a salary of £150, rising to £200, per annum.

Mr. W. Louis Carr, surveyor to the Ruislip-Northwood Urban District Council, who has been ill since before Christmas through overwork, is now, we are pleased to state, convalescent, and has resumed duty.

Mr. John W. Cangley, on the occasion of his retirement on superannuation from the sanitary staff of the Liverpool public health department, where he had held a responsible position for nearly forty years, was on Tuesday presented with a silver tea and coffee service. The presentation was made by Mr. D. B. Cowden, chief sanitary inspector, who spoke in very high terms of the way in which Mr. Cangley had always discharged his duties during his long connection with the department, and of the esteem in which Mr. Cangley was regarded by his colleagues and all with whom he had been in contact.

Improved Roads for Manitoba.—A Bill providing for the expenditure by the Province of Manitoba of £500,000 in improving the main highways of the Province has been introduced in the Legislature by Dr. Montague, the Minister of Public Works.

Limerick County Surveyors.—The Limerick County Council are inviting applications for two county surveyors at a salary of £300 per annum each, inclusive of all expenses. Applications should be made not later than February 28th to Mr. John J. Quaid, county secretary, Limerick.

FOR OTHER ADVERTISEMENTS

See End of Paper.

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

APPOINTMENT OF ASSISTANT SURVEYOR.

The Sutton-in-Ashfield Urban District Council invite applications for the appointment of Assistant to their Surveyor, at a salary of £80, rising to £110 per annum. Applications, stating age and previous experience, and accompanied by copies of three recent testimonials, must be sent in to me, the undersigned, not later than Wednesday, the 25th day of February, 1914, endorsed, "Assistant Surveyor." Canvassing will disqualify.

WALTER BURN, A.M.I.C.E.,
Surveyor.

Surveyor's Office,
Outram-street,
Sutton-in-Ashfield.

(1,300)

ASSISTANT ENGINEERS and DRAUGHTSMEN required by Sierra Leone Government for Public Works Department for two tours of twelve months, with possible extension.

Engineers £300—£15—£400. Draughtsmen £300—£10—£350.

Furnished quarters or allowance.

Free first-class passages. Liberal leave. Age 25—40.

Candidates for Engineer vacancies should have served Articles with an Associate Member of the Institute of Civil Engineers, possess a diploma from some recognised Engineering College, or have been engaged for at least three years from the completion of Articles on Public Works in British Colony. Must be neat and expeditious draughtsmen, capable of designing and carrying out building, bridges and other structures, and of taking out bills of quantities and preparing detailed estimates; should have some knowledge of book-keeping and accounting and office routine, and be competent to execute surveys, take sections, and lay out and construct roads. Should have some knowledge of sanitary and water engineering.

Candidates for Draughtsmen vacancies should have had considerable experience in architectural and engineering draughting, and should have held a responsible position in the drawing office of an architect and surveyor, or civil engineer in good general practice. Neat and expeditious draughtsmen. They should also have had experience in control of a drawing office staff, and be capable of getting out designs and details of buildings, including steel frame work, bridges, &c., with some experience in architectural design. Should be well up in building construction, the preparation of specifications, bills of quantities and estimates, and preference given to those who have served articles with an architect, surveyor, or civil engineer.

Candidates should apply at once to the Crown Agents for the Colonies, Whitehall-gardens, London, S.W. (1,308)

COUNTY PALATINE OF CHESTER.
APPOINTMENT OF ASSISTANT COUNTY SURVEYOR AND BRIDGEMASTER.

The Cheshire County Council invite applications for the appointment of Assistant County Surveyor and Bridgemaster for Cheshire from persons not exceeding 40 years of age, to assist the County Surveyor and Bridgemaster in the performance of his duties, and to perform such other duties as the County Council may from time to time prescribe.

The Salary will be a commencing one of £350 per annum, with office accommodation, &c., and such reasonable travelling and other allowances as prescribed by the County Council.

Applications to be made on forms which will be supplied on receipt of an addressed foolscap envelope, on application to the undersigned, and endorsed "Assistant County Surveyor and Bridgemaster," and which, accompanied by not more than three recent testimonials, must be posted to the undersigned on or before the 28th day of February, 1914.

Canvassing, either directly or indirectly, is prohibited.

REGINALD POTTS,
Clerk of the Council.

County Offices, Northgate-street, Chester.
February 12, 1914. (1,299)

COUNTY BOROUGH OF WIGAN.

The Corporation of Wigan invite applications for the appointment of an Engineering Assistant in the Borough Surveyor's Office, at a salary of £110 per annum.

Applicants must be neat and expeditious Draughtsmen, accurate Surveyors and Levellers.

Form of Application may be obtained from Mr. A. T. Gooseman, Borough Engineer and Surveyor, King-street West, Wigan.

Applications, stating age and experience, accompanied by copies of not more than three recent testimonials, and endorsed "Engineering Assistant," must be sent to me not later than Thursday, the 26th instant.

WILLIAM HENRY TYRER,
Town Clerk.

Town Clerk's Office,
Wigan.
February 11, 1914. (1,303)

SUTTON (SURREY) URBAN DISTRICT COUNCIL.

CEMETERY SUPERINTENDENT.

The Council invite applications for the appointment of Cemetery Superintendent.

Applicants must be experienced practical gardeners between 30 and 45 years of age.

Wages £1 10s. per week, with house and gas.

Conditions of appointment and list of duties may be had on application to the undersigned on receipt of stamped addressed envelope.

Applications in Candidates' own handwriting, stating age, qualifications, and experience, and accompanied by copies of two recent testimonials, endorsed "Cemetery Superintendent," must be delivered to me not later than Wednesday, the 25th February, 1914.

Canvassing in any form will positively disqualify.
(By order)

H. BOLTON,
Clerk and Solicitor to the Council.

Municipal Offices,
Sutton, Surrey.
February 11, 1914. (1,297)

CHESHIRE COUNTY COUNCIL.

The Main Roads and Bridges Committee require temporarily a Clerk of Works used to the Widening and Reconstruction of Macadam Roads (Waterbound). Salary £3 3s. per week.

Applications, enclosing three recent testimonials, to be sent in to the undersigned.

W. HOLLAND,
Acting County Surveyor.

The Castle,
Chester.
February 10, 1914. (1,302)

TILBURY URBAN DISTRICT COUNCIL.
SUPPLY OF MATERIALS.

Tenders are invited for the Supply of the following Materials:—

- Broken Granite.
- Kentish Ragstone.
- Hoggin.
- Coal.

Particulars and Forms of Tender may be obtained from Mr. S. A. Hill-Willis, Engineer and Surveyor to the Council, 47 Dock-road, Tilbury.

Sealed Tenders, in the envelope and on the Forms supplied, must be delivered to the undersigned not later than 12 noon on Monday, the 2nd of March, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

THO. A. CAPRON,
Clerk to the Council.

47 Dock-road,
Tilbury.
February 12, 1914. (1,310)

TILBURY URBAN DISTRICT COUNCIL.
PRIVATE STREET WORKS.

- Christchurch-road,
- Northern End of Toronto-road, and } Tilbury.
- Northern End of Quebec-road, }

The above-named Council invite Tenders for the Making Up of the above-named Roads.

Plans may be seen, and the Specification, Quantities and Form of Tender may be obtained, on application to Mr. S. A. Hill-Willis, Engineer and Surveyor to the Council, 47 Dock-road, Tilbury, on payment of £2 2s., which sum will be refunded on receipt of a *bona-fide* Tender.

The Contractor will be required to enter into the Council's usual Form of Contract, and also a Bond with two approved securities in the sum of £200 for the due performance of the Contract.

Sealed Tenders, in the envelopes and on the Forms supplied, to be delivered to me on or before 12 noon on Monday, the 2nd day of March, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

THO. A. CAPRON,
Clerk to the Council.

47 Dock-road,
Tilbury.
February 12, 1914. (1,309)

DESBOROUGH URBAN DISTRICT COUNCIL.**TENDERS FOR ROAD MATERIALS.**

The above Council invite Tenders for a supply of Granite and Slag during the year ending March 31, 1915.

Tenders to be sent in to the undersigned not later than February 27, 1914, from whom Forms of Tender and other particulars can be obtained.

G. E. MARLOW,
Surveyor.

Council Offices,
Desborough. (1,298)

**EAST HAM CORPORATION.
TO MOTOR FIRE ENGINE MAKERS.**

The East Ham Corporation invite Tenders for the supply and delivery of a Petrol-driven Motor Fire Engine and Motor Fire Escape.

Particulars and Form of Tender may be obtained on application to Mr. J. Birch, Borough Engineer, Town Hall, East Ham, E.

Tenders to be sent in, addressed to "The Worshipful the Mayor, Town Hall, East Ham, E.," endorsed "Tender for Motor Fire Engine," not later than 12 o'clock noon of Monday, the 23rd February, 1914.

The Firm whose Tender is accepted will be required to observe and fulfil the obligations upon contractors specified in the Fair Wages Resolution adopted by the House of Commons on the 10th March, 1909, which is fully set forth in the specification and particulars of Tender, and to enter into a contract with a bond for the due performance thereof.

The Corporation does not bind itself to accept the lowest or any Tender.

(By order)
C. EUSTACE WILSON,
Town Clerk.

Town Hall,
East Ham, E.
February 11, 1914. (1,307)

**MILTON RURAL DISTRICT COUNCIL.
CONTRACTS FOR MATERIALS, &c.**

The Council invite Tenders for Supplying the following Materials, &c.:—

- Surface-picked Flints.
- Pit Flints.
- Pine Gravel.
- Broken Granite.
- Kentish Rag.
- Horse Labour.
- Limby Hard Steam Coal.

Particulars and Forms of Tender may be obtained on application to the District Surveyor, Mr. E. C. Percy, 45 High-street, Sittingbourne.

Sealed Tenders to be delivered at my Office not later than four o'clock p.m. on Tuesday, 24th February, 1914.

The Council do not bind themselves to accept the lowest or any Tender, and reserve the right to accept any part of a Tender.

(By order)
E. CECIL HARRIS,
Clerk.

Sittingbourne.
February 11, 1914. (1,296)

**LICHFIELD RURAL DISTRICT COUNCIL.
TENDERS FOR MATERIALS AND CARTING.**

Tenders are invited for the following for the year ending 31st March, 1915—viz.:—

Granite, Slag, Chippings, Carting, Tools, Oil, &c.

Tenders, endorsed "Tender for —," must be sent to the undersigned on or before Monday, the 2nd March, 1914, and Samples must be delivered on or before that date (free of charge) at the Surveyor's Office, Union Workhouse, Lichfield.

Further particulars and Forms of Tender may be obtained upon application to Mr. C. O. Rawstron, District Surveyor, Union Workhouse, Lichfield.

The Council do not bind themselves to accept the lowest or any Tender.

THOMAS MOSELEY,
Clerk to the Council.

Union Offices,
Breadmarket-street,
Lichfield.
February 11, 1914. (1,295)

TWICKENHAM URBAN DISTRICT COUNCIL.**CONTRACTS.**

The above Council hereby invite Tenders for the undermentioned Goods or Materials for a period of one, two, or three years, from the 1st April next:—

- (1) Ballast, Shingle, Flints, and Gravel.
- (2) Granite Cubes and Setts.
- (3) Portland Cement.
- (4) Coal and Coke.
- (5) Fodder and Forage.
- (6) Oil and Colourman's Goods.
- (7) Iron Castings.
- (8) Street Gullies and Drain Pipes.

Forms of Tender and Specifications for the whole of the above may be obtained on application to Mr. Fred. W. Pearce, F.S.S., Surveyor to the Council, Town Hall, Twickenham.

Sealed Tenders, endorsed "Tender for . . .," are to be delivered to me by hand, or by registered post, on or before noon of Wednesday, the 25th day of February, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
H. JASON SAUNDERS,
Clerk to the Council.

Town Hall,
Twickenham.
February 10, 1914. (1,306)

**PORTLAND URBAN DISTRICT COUNCIL.
BROKEN GRANITE OR BASALT.**

Tenders are invited by the Highways Committee of the above Council for the Supply of about 2,750 tons of 1½-in. and 2-in. Broken Granite or Basalt, for the year ending March 31st, 1915.

Contractors need not trouble to send in Tenders for Broken Limestone, as they will not be accepted.

Copies of Specification and Form of Tender may be obtained at the Office of the undersigned.

Sealed Tenders, on the Form supplied, endorsed "Broken Granite," must be delivered at these Offices not later than 12 noon on Tuesday, March 3rd, 1914.

The Council does not pledge itself to accept the lowest, the whole of, or any part of any Tender.

R. STEVENSON HENSHAW,
Engineer and Surveyor.

Council Offices,
Portland.
February 11, 1914. (1,301)

BOROUGH OF EALING.

The Town Council of the Borough of Ealing hereby invites Tenders for the Supply and Delivery of Goods and the execution of the Works as follows, for the twelve months ending 31st March, 1915—viz.:

- (1) Limes, Pipes, &c.; (2) Cement; (3) Ironmongery;
- (4) Iron Castings; (5) Paints, Oils, &c.; (6) Granite;
- (7) Disinfectants; (8) Refined Tar; (9) Official Books and Stationery; (10) Printing; (11) Timber; (12) Uniforms; (13) Tarred Macadam; (14) Tar Paving Material and Work in situ; (15) Harness Repairs, &c.;
- (16) Wood Paving Repairs; (17) Slab-laying, &c.

Printed Forms of Tender, Conditions of Contract, and full particulars may be obtained on application to the Borough Surveyor, Mr. W. R. Hicks, Assoc.M. INST.C.E., at his Office, Town Hall, Ealing, W., on or after Monday, the 16th February, 1914.

Tenders (in the envelopes provided) to be delivered at the office of the undersigned not later than 9.30 a.m. on Monday, the 2nd day of March, 1914.

The Council does not bind itself to accept the lowest or any Tender, and any person whose Tender may be accepted must enter into a proper Contract, with, if required, two sureties to be approved by the Council.

The Tenderer whose offer is accepted shall be held to have bound himself to an agreement, and may be compelled to carry out the obligations arising from his Tender, even though he may not have signed a formal Contract.

(By order)
GEO. E. BRYDGES,
Town Clerk.

Town Hall, Ealing, W.
February 13, 1914. (1,304)

GOOD second-hand light Steamer wanted. State make, age, capacity, and price.—Chief Officer J. C. Southcombe, Fire Brigado, Barnstaple. (1,305)

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

MANCHESTER MEETING.

A meeting of the institution will be held in the North-Western District at the Town Hall, Manchester, on Friday and Saturday, February 20th and 21st.

PROGRAMME.

Friday, February 20, 1914.

12.30 p.m.—Meeting of District Executive Committee.
1 p.m.—Members of District Executive and members of council attending the meeting will lunch with the Lord Mayor and the chairman of the Improvement Committee and of the Town Planning Committee.

2.15 p.m.—The members will assemble in the Manchester Town Hall, where they will be received by the Lord Mayor (Alderman McCabe) and Alderman Frowde (chairman of the Rivers Committee).

2.30 p.m.—North-Western District meeting in the Town Hall, Manchester.

Minutes of the previous meeting.

Any other district business.

3 p.m.—Description of some of the municipal works of the city of Manchester (illustrated by lantern slides) by Mr. T. de Courey Meade, M.INST.C.E., city surveyor of Manchester.

Drawings and photographs will be exhibited in the Lord Mayor's Parlour showing the works described and intended to be inspected.

A short paper on "The Future Government of Great Cities" (illustrated by lantern slides), by Councillor Joseph Swarbrick, M.INST.C.E.

6.30 p.m.—Dinner will be provided in the town hall at the invitation of the Lord Mayor and the Rivers Committee.

Saturday, February 21, 1914.

9 a.m.—Meet at Town Hall. Special trams (provided by the Tramways Committee) will leave Albert-square at 9.15 a.m. to convey members to any or all of the following works they may desire to inspect—viz.:—

Tramway car repairing works and permanent way depot, Hyde-road.

Intercepting sewers at Withington and Didsbury.

Outfall sewers in Stretford and Davyhulme.

Stuart-street subway and Coal Railway.

Lakes in Platt Fields and Heaton Park.

1 p.m.—Luncheon, at the invitation of the Tramways and Improvement Committees, at the Grand Hotel, where members will be received by the respective chairmen: Alderman Bowes, J.P. (chairman of the Tramways Committee), and Alderman Wilson, J.P. (chairman of the Improvement Committee).

A. W. BRADLEY, M.INST.C.E.,

Hon. District Secretary

St. Helens, Lanes.

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District will be held at Wakefield on Saturday, March 21, 1914.

EASTERN DISTRICT.

A meeting of the Eastern District is to be held at Chelmsford on April 18th.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on June 13th.

THE ANNUAL MEETING.

The date for the annual meeting of the Institution of Municipal and County Engineers at Cheltenham has been fixed definitely for June 24th, 25th, 26th and 27th next. It has been decided to make a special feature of town planning and of roads, and, if possible, to arrange for an exhibition of town plans.

THOMAS COLE,

Secretary.

92 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

NORTHERN DISTRICT.

A meeting will be held in the Town Hall, Newcastle-on-Tyne, to-morrow (Saturday) at 3.15 p.m.

BUSINESS.

Discussion on three papers read in London.

To receive report of sub-committee re arrangements for summer meetings.

Approve and pass accounts for payment.

Any other business.

JOHN ROBINSON,

Hon. District Secretary.

EASTERN DISTRICT.

A meeting of the Eastern District of the institution will be held at Oundle on Saturday, February 21st.

PROGRAMME.

2.10 p.m.—Assemble at Oundle Railway Station and proceed to inspect the widening of the North Bridge (adjoining the station), under the direction of Mr. J. H. Dyson, clerk of works to the Northants County Council, who will give a brief description of the works.

3 p.m.—Visit of inspection to the schools of the Grocers' Company, by kind permission of the head master, Mr. F. W. Anderson, M.A.; also the new science and engineering block in course of erection by Messrs. Thompson & Sons, of Peterborough.

Time permitting, visits will also be paid to the Oundle Urban District Council's sewage disposal works, waterworks, cemetery, &c., under the direction of Mr. G. Belson Chilvers, surveyor and water engineer to the council.

4.45 p.m.—Meeting at the council offices.

Election of chairman and hon. district secretary.

Forthcoming meetings.

Paper, "The Municipal Undertakings of the Oundle Urban District Council," by Mr. G. Belson Chilvers.

5.30 p.m.—Tea at the Talbot Hotel.

P. S. BENNETT,

Hon. District Secretary.

Ramsey, Hunts.

FORTHCOMING MEETINGS.

Arrangements have been made for the following meetings: February 25th, council meeting, London; June 13th, Tisbury. Meetings are being arranged also for Leeds and Birmingham during March.

NEXT COUNCIL MEETING.—The next meeting of the council will be held on Wednesday, February 25th.

B. WYAND,

Secretary.

39 Victoria-street, S.W.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

CLERK OF WORKS.—February 14th.—Torquay Town Council. £2 10s. per week.—Mr. H. A. Garratt, borough engineer.

GAS MANAGER.—February 14th.—Margam Urban District Council. £250 per annum.—Mr. D. E. Jones, clerk, Port Talbot.

BOROUGH SURVEYOR AND INSPECTOR.—February 16th.—Dunstable Town Council. £225 per annum.—Mr. C. C. S. Benning, town clerk.

BUILDING INSPECTOR.—February 16th.—Corporation of Bolton. £110 per annum.—Mr. Samuel Parker, town clerk.

INSPECTOR OF NUISANCES.—February 16th.—Wortley Rural District Council. £120 per annum.—Mr. J. Morton, clerk, Grenoside, near Sheffield.

CLERK OF WORKS.—February 16th.—Hemel Hempstead Town Council. £3 per week.—Mr. A. E. Usher, town clerk.

CLERK OF WORKS.—February 17th.—Aldershot Urban District Council. £3 3s. per week.—Mr. W. E. Foster, clerk.

CLERK OF WORKS.—February 18th.—Ossett Corporation. £3 per week.—Mr. Arnold E. Mottram, gasworks engineer and manager.

SURVEYORS.—February 18th.—Commissioner for the Port of Calcutta, river survey department. 125—201 Rs. per month. Mr. J. Angus, London agent, 17 Victoria-street, Westminster, S.W.

ASSISTANT SURVEYOR.—February 20th.—Alnwick Urban District Council.—Mr. J. Balmbra, clerk.

ASSISTANT INSPECTOR OF NUISANCES.—February 21st.—Wadebridge Urban District Council. £110—£120 per annum.—Mr. W. O. Wellington, clerk.

INSPECTOR OF NUISANCES.—February 21st.—Wadebridge Urban District Council. £110—£120 per annum.—Mr. Walter O. Wellington, clerk, Wadebridge, Cornwall.

INSPECTOR OF ROADS.—February 21st.—Islington Borough Council. £2 10s.—£3 per week.—Mr. J. Patten Barber, borough engineer.

TEMPORARY ASSISTANT.—February 21st.—Corporation of Bedford. £2 10s.—£3 per week.—Mr. N. Greenshields, borough engineer and surveyor.

PAVING AND BUILDING INSPECTOR.—February 23rd.—Corporation of Leigh. £2 10s. per week.—Mr. Tom Hunter, borough engineer.

ARCHITECT.—February 23rd.—Exeter City Council. £220—£250 per annum.—Mr. H. Lloyd Parry, town clerk.

SUPERINTENDENT OF FIRE BRIGADE.—February 28th.—Municipality of Karachi. 200 rupees per month, with free quarters.—Mr. Measham Lea, chief officer and chief engineer.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

ASSISTANT ENGINEER.—For Government Waterworks in the Gold Coast. £600—£650.—Messrs. Hunter, Duff & Middleton, 17 Victoria-street, Westminster, S.W.

TEMPORARY ASSISTANT.—Kiveton Park Rural District Council.—Mr. Frank Hewitt, engineer and surveyor.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

HENDON.—March 2nd.—Designs for public baths, for the urban district council. Premiums £100, £75, and £50.—The Clerk.

TWRCELYN.—March 9th.—Plans and specifications for a water supply and drainage scheme for Cemaes.—Mr. T. H. Hughes, clerk, Fir-grove, Menai Bridge.

BELFAST.—March 20th.—Designs for an art gallery and museum, for the corporation.—Mr. R. Meyer, town clerk.

BURTON-UPON-TRENT.—March 24th.—For children's cottage homes, for the Board of Guardians.—Mr. C. F. Chamberlin, clerk.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

OUNDLE.—February 11th—March 2nd.—For the extension of hospital buildings, for the rural and urban district council.—Messrs. Traylem & Son, 16 Broad-street, Stamford.

DENBIGH.—February 16th.—For the erection of a school and school houses, for the Education Committee.—Mr. W. D. Wyles, county architect, 42A High-street, Wrexham.

MERTHYR.—February 16th.—For laying a 10-m. water main, for the corporation.—Waterworks Engineer.

THURNSCOE.—February 18th.—For the erection of stables, outbuildings, and temporary offices, for the urban district council.—Mr. T. Bull, surveyor.

ROCHDALE.—February 18th.—For the erection of a filter house, and making an approach road, for the corporation.—Mr. F. H. Brunt, waterworks engineer and manager.

RICHMOND (Surrey).—February 19th.—For the construction of a movable floor to swimming bath, for the corporation.—Borough Surveyor.

HULL.—February 19th.—For the erection of a secondary school, for the Education Committee.—Mr. J. H. Hirst, city architect.

WARMINSTER.—February 20th.—For the erection of an isolation hospital, for the Joint Isolation Hospital Committee. Mr. C. H. Lawson, architect, 32 High-street, Warminster.

SHEFFIELD.—February 20th.—For alterations to offices at the Corn Exchange, for the corporation.—City Architect.

WEST RIDING.—February 20th.—For the erection of a school, for the county council.—Education Architect, County Hall, Wakefield.

TAMWORTH.—February 21st.—For hospital extensions, for the Joint Hospital Board.—Mr. C. L. Clarson, architect and surveyor, 21 Church-street, Tamworth.

MIDDLESEX.—February 21st.—For the erection of three pairs of semi-detached residences for asylum attendants, and six cottages for garden labourers, for the county council.—Mr. H. T. Wakelam, county architect, Guildhall, Westminster, S.W.

LANCASHIRE.—February 21st.—For the erection of a tuberculosis sanatorium at High Carley, for the county council.—Mr. Dean J. Brundritt, architect, County-square, Ulverston.

BEDWELLY.—February 23rd.—For the erection of a public convenience, for the urban district council.—Mr. D. H. Price, surveyor.

WEMBLEY.—February 24th.—For the erection of caretaker's lodge, tool house, and conveniences, for the urban district council.—Mr. C. R. W. Chapman, engineer and surveyor.

BISHOP'S STORTFORD.—February 24th.—For supplying and erecting 44-h.p. gas engine and suction gas plant, making repairs to existing machinery, erecting an engine-house at the waterworks, for the urban district council.—Mr. Robert S. Scott, engineer.

CLONMEL.—February 25th.—For the erection of a retort house and coal store, for the council.—Mr. Henry O'Connor, engineer, 1 Drummond-place, Edinburgh.

GOOLE.—February 25th.—For the erection of slipper baths, for the urban district council.—The Surveyor.

FEATHERSTONE.—February 28th.—For the erection of 149 working-class dwellings, for the urban district council.—Mr. S. Chesney, architect.

LEICESTER.—February 28th.—For the erection of a brick chimney shaft, 212 ft. high, for the corporation.—Mr. E. George Mawbey, borough engineer and surveyor.

WELLINGTON.—March 3rd.—For the provision of and laying about 5,750 yds. of 3-in. and 2-in. cast-iron water mains, with valves, meters, hydrants, stand-posts, air valves, and other incidental works, for the rural district council.—Messrs. Willcox & Raikes, 63 Temple-row, Birmingham.

ANTWERP.—March 6th.—For the construction of two metal sheds, for the municipality.—Secrétariat, Hotel de Ville.

KEIGHLEY.—April 11th.—For the construction of a storage reservoir, filter beds, clear water basin, and other appurtenances, for the corporation.—Mr. Ratcliffe Barnett, engineer.

Iron and Steel.

MYNYDDISLWYN.—February 17th.—For laying 6-in., 4-in., and 3 in. cast-iron spigot and socket pipes, for the gas department.—Mr. E. Watkin Edwards, Council Offices, Pontllanfraith.

SHIPLEY.—February 21th.—For the supply of steel girder tram rails and fish plates, for the urban district council.—Mr. H. W. Dawson, engineer.

MADRAS.—March 24th.—For the supply of 2,000 cast-iron manhole covers and frames, for the corporation.—Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster.

MATLOCK.—February 28th.—For the erection of steel bridges over the river Derwent to carry steel tube sewers, for the urban district council.—Messrs. James Diggle & Son, 14 Victoria-street, Westminster, S.W.

Roads.

EAST SUFFOLK.—February 14th.—For the supply of refined or dehydrated coal tar, for the county council.—Mr. W. Jervis, county road surveyor, Ipswich.

LOUTH.—February 16th.—For the supply of granite and slag, for the rural district council.—Mr. F. C. Chard, clerk.

SPENNYMOOR.—February 16th.—For making up a certain street, for the urban district council.—Mr. C. R. Spencer, surveyor.

ALFRETON.—February 16th.—For the supply of a 10-ton steam road roller, fitted with scarifier, water spraying apparatus, and canopy, for the urban district council.—Mr. R. F. Ward, surveyor.

EGREMONT.—February 17th.—For the supply of material and laying kerbs, channels and flagging, for the urban district council.—Mr. James Cowan, surveyor.

FORFAR.—February 17th.—For quarrying and carting metal for road repairs, for the Dundee District Committee.—Mr. J. B. Robertson, road surveyor, Downfield.

THORNE.—February 17th.—For the supply of dress, screenings, granite and tar, for the rural district council.—Mr. G. Kenyon, clerk, Thorne, via Doncaster.

POOLE.—February 17th.—For the supply of coarse gravel, grey grit, kerbing, paving, haulage, and road sweeping brushes, for the corporation.—Mr. S. J. Newman, borough surveyor.

BAILDON.—February 17th.—For works of street repairs, for the urban district council.—Mr. J. Myers, surveyor.

PENDLEBURY.—February 18th.—For the supply of granite setts, macadam, grit setts, flags, kerbs, and limestone chippings, for the urban district council.—Mr. H. Entwisle.

HOLLINGBOURNE.—February 18th.—For the supply of road materials, for the rural district council.—Mr. H. J. Bracher, clerk, 33 Earl-street, Maidstone.

SHARDLOW.—February 18th.—For the supply of Leicester granite, slag, tar macadam, ironstone slag, and dressed granite kerbing, for the rural district council.—Mr. J. S. Wooddisse, surveyor, Aston-on-Trent, Derby.

EASINGTON.—February 18th.—For making up certain streets, for the rural district council.—Mr. G. Waterhouse, surveyor.

HODDESDON.—February 18th.—For carrying out the watering of the streets, for the urban district council.—Mr. W. H. Flood, surveyor.

WALMER.—February 18th.—For the supply of broken granite, for the urban district council.—Mr. F. W. Hardman, clerk.

CROYDON.—February 19th.—For treating road surfaces with Tarvia, for the rural district council.—Mr. R. Chart, junr., highway surveyor.

BRIDGNORTH.—February 19th.—For the supply of road materials and haulage, for the rural district council.—The Surveyor.

LEYLAND.—February 19th.—For the supply of broken granite, slag, tar macadam, limestone dust, rocmac, kerbs, and setts, for the urban district council.—Mr. M. H. Wilkinson, surveyor.

BOSMERE.—February 19th.—For the supply of granite, picked stones, and pit stones, for the rural district council.—Mr. G. Fiske, surveyor, Red House, Coddenham, Ipswich.

KETTERING.—February 19th.—For the supply of granite, slag, and tar macadam, for the rural district council.—Mr. H. J. Parker, surveyor.

THAKEHAM.—February 19th.—For the supply of broken basalt or granite, and unbroken flints, for the rural district council.—Mr. W. Forester, surveyor.

HERTS.—February 20th.—For diverting portion of a main road, for the county council.—County Surveyor, Hatfield.

DERBYSHIRE.—February 21st.—For the supply of team labour on main roads, and haulage by mechanical traction, for the county council.—Mr. J. W. Horton, county surveyor, Derby.

BILLESDEN.—February 21st.—For the supply of granite and granite chippings, for the rural district council.—The Surveyor.

BELVOIR.—February 21st.—For the supply of materials, and cartage, for the rural district council.—Mr. R. J. Kettleborrow, Normanton, Bottesford, Notts.

MARSHLAND.—February 21st.—For the supply of granite, for the rural district council.—Mr. R. W. Faircloth, clerk, 2 Ely-place, Wisbech.

WESTHAMPNETT.—February 21st.—For the supply of surface field flints, hardpit gravel, and binding gravel, for the rural district council.—The Surveyor.

HOLBORN.—February 21st.—For paving works in compressed rock asphalt and tar macadam, and tar-macadam repairs, for the borough council.—Borough Surveyor.

STAFFORD.—February 21st.—For the construction of a roadway embankment, for the corporation.—Mr. W. Plant, borough engineer and surveyor.

RUGBY.—February 21st.—For the supply of granite, for the rural district council.—Mr. I. W. Pendred, clerk.

SOWERBY BRIDGE.—February 21st.—For the supply of road materials, for the urban district council.—Mr. J. Eastwood, engineer and surveyor.

BEDFORD.—February 21st.—For the supply of broken granite, slag, flints, and gravel, for the county council.—County Surveyor, Shire Hall, Bedford.

SIBSEY.—February 21st.—For the supply of broken granite, for the rural district council.—Mr. J. M. Simpson, clerk.

CHESHIRE.—February 21st.—For the supply of macadam, tar-macadam and chippings, for the county council.—Mr. W. Holland, deputy county surveyor, Chester.

HEREFORDSHIRE.—February 21st.—For the supply of tar-macadam, 2½-in. granite, 2½-in. slag, and 3-in. and 9-in. rough materials for foundations, consisting of basalt, limestone, slag, or other suitable materials, for the county council.—Mr. G. H. Jack, county surveyor, Shire Hall, Hereford.

HIGHWORTH.—February 23rd.—For road repair and haulage, for the rural district council.—Mr. O. Kimber, surveyor, Kite Hill, Wauborough.

LONDON.—February 23rd.—For the supply of Channel Island granite, granite siftings, red pit sand, screened river sand, cockle shells, screened gravel, pea gravel, Kentish flints and Kentish rag, for H.M. Commissioners of Works.—The Secretary, Storey's-gate, S.W.

FINCHLEY.—February 23rd.—For the supply of grit for tar-painting, for the urban district council.—Mr. C. J. Jenkin, engineer.

FINCHLEY.—February 23rd.—For the supply of 55,000 gallons of tar for road surface treatment, for the urban district council.—Mr. E. H. Lister, clerk.

ROMFORD.—February 23rd.—For the supply of distilled tar, granite chippings, and clean sand, for the urban district council.—The Surveyor.

BEDWELLY.—February 23rd.—For making up a street, for the urban district council.

EPSOM.—February 23rd.—For making up Rosebery-road, Cheam, for the rural district council.—Mr. T. E. Ware, surveyor of highways.

WEST LANCASHIRE.—February 23rd.—For the supply of granite, granite setts, tar macadam, and tar mixtures, for the rural district council.—Mr. R. Rosbotham, Town End, Ormskirk.

MERIONETH.—February 23rd.—For road rolling and macadamising, for the county council.—Mr. E. Vaughan, county surveyor, Arthog, Dolgelly.

SEATON DELAVAL.—February 24th.—For the supply of tar-macadam, tarred slag, whinstone, and hire of steam roller, for the urban district council.—Mr. A. Dorin, surveyor.

ASHINGTON.—February 24th.—For work of making up, for the urban district council.—Mr. G. Beaty, surveyor.

LITTLEBOROUGH.—February 24th.—For 17,000 super. yds. of granite sett paving and other works, for the urban district council.—The Surveyor.

SOUTHAMPTON.—February 24th.—For private street works, for the corporation.—Borough Engineer.

SMALLBURGHL.—February 24th.—For the supply of flints, granite, marl, beach stones, clay, and team labour, for the rural district council.—Mr. W. L. Lewis, district surveyor, Stalham, Norfolk.

NEWMARKET.—February 24th.—For the supply of road materials, for the rural district council.—Mr. S. J. Emion, clerk.

POOLE.—February 24th.—For reconstructing the High-street, for the corporation.—Mr. S. J. Newman, borough surveyor.

HULL.—February 25th.—For the supply of 8,000 tons of stone for macadamising, for the corporation.—Mr. A. E. White, city engineer.

HEMSWORTH.—February 25th.—For widening and improving a certain highway, for the rural district council.—Mr. T. H. Richardson, surveyor.

WOKINGHAM.—February 25th.—For the supply of granite, chips, broken gravel, flints, and path gravel, for the corporation.—Mr. J. H. Elhston Clipson, town clerk.

DENBIGH.—February 25th.—For the supply of roadstone and tar-macadam, for the county council.—Mr. W. Jones, county surveyor, Eastern Division, Wrexham.

EASTBOURNE.—February 26th.—For the supply of stone, flints, Portslade flints, and stone chippings, for the rural district council.—Mr. T. E. V. Kurtlan, clerk.

WETHERBY.—February 26th.—For the supply of tools and stores in the highways department, for the rural district council.—Mr. A. G. Kilner, surveyor.

WHITLEY.—February 26th.—For steam rolling and the supply of granite, for the urban district council.—Mr. J. Sharp, clerk.

WETHERBY.—February 26th.—For the supply of broken whinstone, limestone, granite, and dross, tar macadam, and cob limestone, for the rural district council.—Mr. A. G. Kilner, surveyor.

MERTON AND MORDEN.—February 27th.—For surfacing 4,000 sq. yds. of carriageway with bituminous macadam or other approved waterproof material, for the urban district council.—Mr. G. Jerram, engineer and surveyor.

BEDWAS AND MACHEN.—February 27th.—For the supply of broken limestone, and repair of roads, for the urban district council.—Mr. A. S. V. Taylor, surveyor.

CANNOCK.—February 27th.—For kerbing, and making up certain streets, for the urban district council.—Mr. R. Blanchard, surveyor.

ASHINGTON.—February 27th.—For the supply of hand-broken whinstone, for the urban district council.—Mr. G. Beaty, surveyor.

OTLEY.—February 27th.—For the supply of granite macadam, furnace slag dust, kerbs and flags, limestone macadam, tar-macadam, brushes, pitch, and carting road metal, for the urban district council.—Mr. C. F. Hodgson, surveyor.

EAST RIDING.—February 28th.—For the supply of 7,000 tons of stone for macadamising purposes, for the county council.—Mr. John Bickersteth, clerk, County Hall, Beverley.

HOLBEACH.—February 28th.—For the supply of granite, granite kerbing, slag, and gravel, for the urban district council.—Mr. T. C. Willders, clerk.

BUCKINGHAM.—February 28th.—For the supply of granite, granite chippings, and slag, for the rural district council.—Mr. Frank L. Reynolds, surveyor.

SAWBRIDGEWORTH.—March 2nd.—For street watering, for the urban district council.—Mr. W. Morris, clerk.

BELPER.—March 7th.—For the supply of highway materials, for the rural district council.—Mr. R. C. Cordon, engineer and surveyor, Duffield, near Derby.

HAYES (Middlesex).—March 7th.—For making up certain streets, for the urban district council.—Mr. D. C. Fidler, engineer and surveyor.

DRIFFIELD.—March 7th.—For the supply of whinstone and granite, broken slag, sea cobbles, sea gravel, and tarred chippings, for the rural district council.—Mr. T. Casson Beaumont, surveyor.

EASTLEIGH.—March 10th.—For making up certain streets, for the urban district council.—Mr. W. Wallace Gandy, engineer and surveyor.

CHESTERTON.—March 12th.—For the supply of 5,000 tons of broken granite, for the rural district council.—Mr. J. Dunn, surveyor, Brunswick House, Cambridge.

DROXFORD.—March 16th.—For the supply of granite or hard stone, for the rural district council.—Mr. A. V. Carter, surveyor.

KING'S LYNN.—March 23rd.—For tar spraying roads, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

DUMBARTON.—(No date).—For the widening of 4 miles of road, for the county council.—Mr. W. Craig, county clerk, County Buildings, Dumbarton.

DISS.—For the supply of granite, for the urban district council.—Mr. Alfred Cooper, surveyor.

Sanitary.

HAMBLEDON.—February 16th.—For the construction of stoneware and iron pipe sewers with manholes, for the rural district council.—Mr. E. L. Lynn, surveyor, 36 High-street, Guildford.

SOUTHPORT.—February 16th.—For the construction of stoneware pipe sewers, surface-water drains, and other works, for the corporation.—Borough Engineer and Surveyor.

TURTON.—February 17th.—For the supply of sanitary, road and general stores, for the urban district council.—The Surveyor, Council Offices, Bromley Cross, near Bolton.

MALDON.—February 17th.—For the construction of 400 yds. of 9-in. sewer, with manholes, for the rural district council.—Mr. W. Almond, surveyor.

CROYDON.—February 19th.—For emptying cess-pools, for the rural district council.—Mr. E. J. Gowen, clerk.

OSWALDTWISTLE.—February 19th.—For the construction of outfall sewage works and other incidental works, for the urban district council.—Mr. R. N. Hunter, surveyor.

HODDESDON.—February 20th.—For scavenging work, for the urban district council.—Mr. W. H. Flood, surveyor.

ASHBY-DE-LA-ZOUCH.—February 21st.—For the construction of sewers, manholes and ventilators, for the rural district council.—Mr. T. L. McCarthy, Central Chambers, Coalville, near Leicester.

BLYTHING.—February 21st.—For the removal of house refuse, for the rural district council.—Mr. C. W. Flaxman, inspector, Holton, Halesworth, Suffolk.

RUGBY.—February 21st.—For the removal of house refuse, for the rural district council.—Mr. J. W. Pendred, clerk.

KIRKCALDY.—February 21st.—For the construction of sewers, for the corporation.—Burgh Surveyor.

ASHTON-IN-MAKERFIELD.—February 23rd.—For the construction of sewage disposal works, for the urban district council.—Messrs. Banks, Fairclough & Stephen, engineers, Leigh, Lancs.

BENTLEY (Yorks).—February 24th.—For the construction of a surface-water drain, for the urban district council.—Mr. R. G. Whitley, surveyor, 264 Bentley-road, Doncaster.

BURY (Lancs).—February 24th.—For constructing sewer and connections, for the rural district council.—Mr. J. H. Hall, 1 Cooper-street, Manchester.

EPSOM.—February 24th.—For the removal of house refuse, for the rural district council.—Mr. W. T. Wooldrige, surveyor.

SEVENOAKS.—February 24th.—For the execution of storm-water sewerage works, for the urban district council.—Mr. Samuel Towson, surveyor.

LONDON.—February 24th.—For the supply of disinfectants, for the corporation.—Town Clerk, Guildhall, E.C.

LEEDS.—February 26th.—For the supply of cement, earthenware drain pipes, sewer ironwork, galvanised dirt boxes, and sewer ventilating columns, for the corporation.—Mr. W. T. Lancashire, city engineer.

BATH.—February 26th.—For sewerage work, for the corporation.—Mr. W. H. Radford, engineer, Albion Chambers, King-street, Nottingham.

ASHINGTON.—February 27th.—For work of sewerage, for the urban district council.—Mr. G. Beaty, surveyor.

READING.—February 28th.—For works of sewerage and surface-water drainage, for the corporation.—Mr. G. Midgley Taylor, Caxton House, Westminster.

SHIPSTON-ON-STOUR.—March 2nd.—For laying 3,632 yds. of 9-in. and 6-in. stoneware pipe sewers, and about 300 yds. of 5-in. cast-iron rising main, also the construction of manholes, lampboles, flushing chambers, engine-house, and other incidental works, for the rural district council.—Messrs. Willcox & Raikes, 63 Temple-row, Birmingham.

COALVILLE.—March 2nd.—For laying 1 mile of 9-in. sewers and 490 yds. of 18-in. sewer, and 300 yds. of 4-in. cast-iron and steel main, for the urban district council.—Mr. L. L. Baldwin, surveyor.

BAILDON.—March 9th.—For the construction of detritus tanks, alterations to settling tanks, percolating filters and sludge filters, for the urban district council.—Mr. J. N. Nicholson, 19 Tanfield Chambers, Bradford.

CHESHAM.—March 14th.—For the reconstruction with cast-iron pipes of about 712 lin. yds. of 12-in., 977 yds. of 9-in., and 935 yds. of 6-in. existing stoneware pipe sewers and house connections with manholes and flushing chambers, for the urban district council.—Mr. Percy C. Dormer, engineer and surveyor.

MADRAS.—March 24th.—For the supply and delivery of 2,000 cast-iron manhole covers and frames, for the corporation.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

Stores.

SWANSEA.—February 16th.—For the supply of general stores, stone, and ironwork, for the corporation.—Borough Surveyor.

LEEDS.—February 16th.—For the supply of iron, chemical, and other materials, for the Tramways Committee.—Mr. J. B. Hamilton, general manager.

HALIFAX.—February 16th.—For the supply of materials required in the electricity department, for the corporation.—Borough Electrical Engineer.

MARPLE.—February 16th.—For the supply of granite macadam, Macclesfield macadam, limestone macadam, 6-in. setts, and sanitary pipes, for the urban district council.—Mr. D. J. Diver, surveyor.

ECCLES.—February 17th.—For the supply of setts, flags, kerbs, broken rubble, broken slag, granite macadam and chippings, prepared tarred slag, prepared tarred limestone, limestone cube chippings, gravel, cinders, castings, pitch, creosote and tar, Simpson's patent street gullies, stoneware passage gullies, stoneware pipes, bends and junctions, mortar, and channel stones, for the corporation.—Mr. Thomas S. Pieton, borough surveyor.

SHOREDITCH.—February 17th.—For laying patent or manufactured stone, asphalt, and supplying broken granite, plumbers' and smiths' work, drain pipes, junctions, bends, drain rods, pails, ropes, timber, sewer ironwork, street posts, lime, cement, general cartage, street name plates, notice boards, ballast, hoggin, shingle, sand, scavenging, and miscellaneous requisites, for the borough council.—Mr. J. A. D. Milne, town clerk.

BELFAST.—February 18th.—For the supply of earthenware sewer pipes, timber, slates, hardwood, iron castings, plumber's work, nails, iron and steel, paints, oils, shovels, spades, graipes, buckets, scavenging brushes, artificial flags, glazed bricks, lime, pitch, felt, tar, sea sand, sea gravel, Lough Neagh sand, and cement, for the corporation.—Mr. H. F. Gullan, superintendent of works, City Hall.

RAWTENSTALL.—February 19th.—For the supply of road metal, earthenware pipes, gullies, timber, pitch, creosote oil, disinfectants, Portland cement, iron castings, local stone, tools, scavenging brushes, horse-shoeing, printing, stationery, and newspapers, for the corporation.—Mr. James Whalley, town clerk.

WESTMINSTER.—February 20th.—For the supply of ballast and sand, barging, bricks, brooms, brushes, carriageway and footway repairs (asphalt), carriageway repairs (macadam), granite sett pavement, wood pavement, cement, lime, disinfectants, dust baskets (new and repairs), flags (sandstone and artificial), footway and channel (mason's work), gas and hot-water fittings, granite (broken), granite setts, kerb and channel, gullies (stoneware), construction, harness, horse hire, cartage work, hose pipe, iron castings, pitch, creosote oil, sewerage and drainage (minor works), shovels, picks, sewer implements, edge tools, stoneware goods, street name-plates, tarpaulin, timber,

tool handles and wood paving blocks, for the city council.—Mr. John Hunt, town clerk.

STOKE-ON-TRENT.—February 20th.—For the supply of Portland cement, blue paving bricks, common bricks, sanitary pipes, gullies, kerbs, setts, macadam and chippings, pitch and oil, cast-iron work, picks, shovels, general ironware, paints, oils, brooms, brushes, ironmongery, general stores and disinfectants, for the corporation.—Borough Surveyor.

OSSETT.—February 21st.—For the supply of materials, stores, and workmen's tools required in highways, gas, lighting, water, sanitary and educational departments, for the corporation.—Borough Surveyor.

FINSBURY.—February 21st.—For the supply of fodder, carbolic acid, castings, chandlery, granite, horse and cart hire, pitch, creosote oil, Portland cement, sand ballast, stoneware goods, timber, wood paving blocks, York paving and patent stone, for the borough council.—Borough Surveyor.

EPSOM.—February 23rd.—For the supply of flints, fine gravel, sand, coal, coke, cement, stoneware pipes, granite kerb, cartage and watering, for the rural district council.—Mr. T. E. Ware, surveyor.

LEIGH.—February 23rd.—For the supply of Barns flags, earthenware pipes, granite macadam, manhole covers, and parapet gutters, for the corporation. Mr. Tom Hunter, borough engineer.

MANSFIELD.—February 23rd.—For the supply of granite, slag and tar-macadam, natural flags, kerbing, concrete flags, Portland cement, stoneware pipes, junction bends, timber, sewer ironwork, castings, coal, ironmongery, paints, brooms, brushes, disinfectants, and harness, for the corporation.—Mr. Thos. P. Collinge, borough engineer and surveyor.

SOUTHEND-ON-SEA.—February 25th.—For the supply of stoneware pipes, bends, flints, bricks, gravel, sand, timber, ironmongery, paints, oils, colours, cement, lime, chalk, team labour, forage, tar-paving, tar-macadam, iron castings, granite kerb, channel, broken Guernsey granite, broken granite, pitch, creosote oil, harness supplies, brooms, brushes, iron, steel, and disinfectants, for the corporation.—Mr. E. J. Elford, borough surveyor.

HAMPTON.—February 26th.—For the supply of hand-broken granite, granite chippings, broken Kentish brown flints, Derbyshire limestone, marble, tar-paving material, forage, coal and scavengers' bass brooms, for the urban district council.—Mr. Sidney H. Chambers, surveyor.

OTLEY.—February 27th.—For the supply of granite macadam, furnace slag, dust, kerbs, flags, limestone macadam, tar-macadam, brushes, pitch, and carting road material, for the urban district council.—Mr. C. F. Hodgson, surveyor.

WINCHESTER.—February 27th.—For the supply of broken granite, chippings, bass brooms, Portland cement, coal, coke, stoneware drain pipes, and concrete paving slabs, for the corporation.—Mr. Walter V. Anderson, city engineer.

EPSOM.—March 3rd.—For the supply of sewerage ironwork, gully gratings, shovels, picks, brooms, forks, dust skeps, disinfectants, Portland cement, stoneware pipes, gullies, kerbing, channelling, setts, broken granite, chippings, limestone dust, tar-paving, tarred macadam, coal, coke, bricks, artificial stone paving, Thames ballast, Thames sand, veterinary surgeon's services, tar, pitch, and team labour, for the urban district council.—Mr. Edward R. Capon, surveyor.

DERBY.—March 9th.—For the supply of bricks, castings, cement, lime, disinfectants, earthenware, freestone, gritstone, granite, gravel, sand, limestone, pitch, tar and slag, for the corporation.—Mr. John Ward, borough surveyor.

BARNES.—March 9th.—For the supply of broken Guernsey or Alderney granite, broken pit flints and Thames ballast, horse and cart hire, disinfectants, ironmongery, Portland cement, forage, litter, granite kerb, channel, paving slabs, oils, paints, and stoneware pipes, for the urban district council.—Mr. C. Bruce Tomes, engineer and surveyor.

Miscellaneous.

GELLYGAER.—February 16th.—For laying out a new cemetery, for the urban district council.—Mr. Frank Read, engineer and surveyor.

TODMORDEN.—February 16th.—For the construction of two bowling greens, for the corporation.—Borough Surveyor.

WESTMINSTER February 20th. For barging refuse from the council's wharves during one year, for the London council.—Mr. John Hunt, town clerk.

KENT February 25th. For the supply of six petrol-driven motor lorries, the body to be constructed of steel with end tipping gear, and capable of carrying a load of 5 cub. yds. for the county council. County Surveyor, Maidstone.

BARNES March 9th. Offers are invited for a motor weather double-cylinder Greenwich steam engine complete with all fittings.—Mr. G. Bruce Tomes, surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance. ‡ Provisionally accepted.

BARNET. For the erection of new council offices, and an underground convenience, for the urban district council.—Mr. W. F. Wilkins, surveyor:

E. Lawrence & Sons, Limited, City-road, N.	£6,471
W. Slough, Barnet	6,460
S. Redhouse & Son, Stotford	6,439
H. Pickrill, Wealdstone	6,365
C. Brightman & Son, Limited, Watford	6,155
P. & H. F. Higgs, Herne Hill	6,035
Ekins & Co., Limited, Hertford	5,996
Markham & Markham, Victoria-street, S.W.	5,993
Allen, Fairhead & Son, Enfield	5,986
Clark & Sons, Cambridge	5,890
C. B. King, Limited, Hampstead	5,798

BIRKENHEAD.—Accepted for the erection of buildings at the refuse destructor, for the corporation.—Mr. C. Brownridge, borough engineer and surveyor:

Davies & Gaskell, Birkenhead, £155.

BRENTFORD.—For the supply of Kentish pit flints, for the urban district council.—Mr. J. W. Croxford, surveyor:

Wills & Paekham, Sittingbourne. 5s. 1d. per yard in barge. Fry Brothers, Greenwich. 5s. 1d. per yard in barge; 6s. 3d. unloaded.

A. S. T. Court, Faversham. 4s. 10d. per yard in barge.

EGREMONT.—For the supply of unclimbable iron fencing, for the urban district council.—Mr. J. Cowan, surveyor:

Raybold & Co., Workington.
Parker & Son, Workington.
Heathcote & Son, Cleator Moor.
H. Herd, Egremont.

GRIMSBY. For the construction of sewers in the Ainslie-street district, for the corporation.—Mr. H. Gilbert Wyatt, borough engineer and surveyor:

Hewins & Goodhand, Grimsby	£10,595
Wilkinson & Boughton, Cleethorpes	10,457
Parker & Sharp, York	10,057
Z. G. Yewdall, Witheringham	9,100
J. H. Thompson & Sons, Limited, Grimsby	8,743
Taylor & Richardson, Grimsby	8,254
H. Lidgard & Co., Cleethorpes	7,169

Borough engineer's estimate, £7,113.

RAMSGATE. For the supply of granite chippings, for the corporation.—Mr. T. G. Taylor, borough engineer:

	Per ton.
	s. d.
Brookes, Limited, London	14 6
W. Griffiths & Co., London	13 9
Rowe & Mitchell, London	13 8
A. & F. Manuelle, London	13 6
Penlee and St. Ives Stone Quarries, Limited, Bristol	13 6
J. Mowlem & Co., London	13 5
Road Maintenance and Stone Supply Company, London	12 9
St. Keverne Stone Company, Cornwall	11 6
Croft Granite, Brick, and Concrete Company, Leicester	10 6

SHERINGHAM.—For the construction of the Beeston Common sewer, for the urban district council.—Mr. F. Hall Smith, engineer and surveyor:

J. W. Weston, Sheringham	£487
E. J. Edwards, Norwich	470
P. Wilson & Co., Wendling	430

SPILSBY. Accepted for the supply of granite to the rural district council:—

R. Robinson, Spilshy, 2,016 tons.
Whitwick Granite Company, 1,309 tons.
Johnson Brothers, London, 1,145 tons.
M. Jackson & Son, Louth, 525 tons.
Tarmac, Limited, Wolverhampton, 150 tons.
Lavender & Bateman, Sutton Bridge, 3,933 tons.
Islip Iron Company, Thrapston, 2,437 tons.
Ellis & Everard, Limited, Peterborough, 1,027 tons.
Stanton Ironworks Company, Nottingham, 260 tons.
Holwell Iron Company, Asfordby, 2,115 tons.

SWAFFHAM. For the erection of nine pairs of cottages, for the rural district council.—Mr. W. Rudyard Kipling, surveyor:

Boulton & Paul, Norwich	£4,085
Foreman & Sons, King's Lynn	3,413
H. C. Tofts, Hingham	3,395
R. Shanks, Hunstanton	3,312
A. E. Harvey, Watton	3,261
Read & Widdbur, King's Lynn	3,241
C. A. Banham, Gaywood	3,190
I. L. Howes, Norwich	3,067
Blyth & Sons, Foulsham	3,020

THIRSK. Accepted for the supply of whinstone, unbroken limestone, slag, and tar, for the rural district council.—Mr. C. A. Lake, highway surveyor:

Whinstone 22-in.—Ord & Maddison, Limited, 10s. 5d. per ton. Craiblock, Allison, Limited, 8s. 11d. per ton. Grubdale Mining Company, Limited, 9s. 11d. per ton. Limestone 12-in.—J. Green & Son, Limited, 8s. 3d. per ton. Bobble dale Lime Company, Limited, 7s. 4d. per ton. Slag 12-in.—S. B. Samuelson & Co., Limited, 4s. 7d. per ton. Middlebrough Slag Company, Limited, 4s. 9d. per ton; E. C. Tomkins, 4s. 8d. per ton. W. C. Clark, Limited, 5s. 2d. per ton. Tinned Slag 1-in., 11s. 8d. Annealed Slag 12-in.—G. Hodson, W. H. Musgrave, and W. C. Clark, 7s. 1d. per ton. Steel Slag, Clokes Extension, Limited, 6s. 3d. per ton. Tar. T. Ness, Limited, 65s. to 62s. 6d. Brotherton & Co., Limited, 55s. 6d.

WATH-UPON-DEARNE.—Accepted for the construction of reservoirs, sand filters, and regulating chambers, for the urban district council.—Mr. J. H. Drew, engineer:—Yorkshire Heunebique Company, Limited, Leeds.

WEALDSTONE. For making up certain streets, for the urban district council.—Mr. H. Walker, surveyor:—

T. Adams, Wood Green, Locket-road, £393; Aberdeen-road, £302; Radnor-road, £176; total, £871.
E. T. Bloomfield, Tottenham. £456; £330; £212; total, £1,010.
E. G. Brummell, Willesden. £104; £300; £173; total, £588.
E. Free & Sons, Maidenhead—£414; £320; £293; total, £1,028.
W. & C. French, Buckhurst Hill.—£370; £290; £175; total, £835.
Willis & Powis, Wembley.—£373; £282; £157; total, £813.
Wimpey & Co., Limited, Hammersmith. £491; £373; £227; total, £1,091.
A. Wooster, Wealdstone. £350; £274; £169; total, £793.
I. Young, Rugby. £411; £321; £212; total, £945.

WINDSOR.—For Contract "B" of the Sunninghill and Sunningdale main sewerage:—

W. Muirhead & Co., Limited, Parliament-street	£110,727
R. C. Brehner & Co., Edinburgh	72,073
F. Osman & Co., Southampton	68,575
J. Riley, Cheltenham	67,959
Wort & Way, Salisbury	66,750
J. Mowlem & Co., Limited, London	65,469
W. Moss & Sons, Limited, Loughborough, Leicestershire	64,000
F. W. Southorn & Co., Leicester	62,562
J. M. Vine, Tunbridge Wells	62,004
Mayfair & Toole, Southampton	60,960
A. Thompson, North Finchley	60,975
E. Hes, senr., Croydon	59,688
W. Wright, Chesham, Bucks	59,676
C. Bentley, Leicester	58,680
Langley & Johnson, Slough	55,436
M. S. Boswell, Wolverhampton	55,221
A. Streeter & Co., Limited, Guildford	54,435
Hardy & Co., Woking	52,600
A. Graham & Sons, Huddersfield	52,500
J. Dickson, St. Albans	52,262

WORKSOP.—For the supply of slag, for the urban district council.—Mr. G. Rawson, surveyor:—

	s. d.
Carr & Co.	7 2
W. Prestwich & Sons, Dronfield	7 2
Parker & Sons, Limited	6 4
Brookes, Limited	6 2
Tarmac, Limited	6 1
T. Feather	5 10
F. R. Carter	5 9
Contract and Works Supply Company	5 7
T. W. Ward, Limited	5 7
Stanton Ironworks, Limited	5 3
F. Hodson & Sons	5 2
Carr & Co.	4 0
Aizlewood & Sons	4 6
Morten & Storer	4 6
Sheepbridge Coal and Iron Company, Limited	4 5
Remishaw Iron Company, Limited	4 3
Clay Cross Company, Limited	4 2

WREXHAM. For the construction of sewer and manholes, for the rural district council.—Mr. J. P. Evans, engineer, Wrexham:—

T. Harris, Bootle	£625
Jukes & Co., Tipton	515
R. Neelham, Brynph	500
H. A. Jones, Wrexham	490
G. P. Trentham, Limited, Birmingham	485

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

FEBRUARY.

- 11.—Institution of Municipal Engineers: Northern District Meeting at Newcastle-on-Tyne.
- 16.—Garden Cities and Town Planning Association: Annual General Meeting, Carpenters' Hall, London Wall, E.C. 4.30 p.m.
- 16.—Institute of Sanitary Engineers: Mr. F. R. O'Shaughnessy, F.I.C., on "The Significance of Colloidal Matter in the Problem of Sewage Disposal." Caxton Hall, Westminster. 8 p.m.
- 20.—Junior Institution of Engineers: Mr. F. F. Evans on "Mechanical Stoking." 8 p.m.
- 20-21.—Institution of Municipal and County Engineers: Meeting at Manchester.
- 21.—Institution of Municipal Engineers: Eastern District Meeting at Oundle.
- 23.—Surveyors' Institution: Annual Dinner, Whitehall Rooms. 7 p.m.
- 28.—Junior Institution of Engineers: Annual Dinner, Holborn Restaurant. 6.30 p.m.

MARCH.

- 1.—Institute of Sanitary Engineers: Mr. J. E. Farmer on "Sewage Disposal and Works Management." 8 p.m.
- 21.—Institution of Municipal and County Engineers: North-Eastern District Meeting at Wakefield.

APPOINTMENTS OPEN.

WADEBRIDGE URBAN DISTRICT COUNCIL.

APPOINTMENT OF INSPECTOR OF NUISANCES AND SURVEYOR OF ROADS, &c.

The above-named Council invite applications for the offices of Inspector of Nuisances and Surveyor of Roads, &c., for their District, which has an estimated population of 2,400.

The person appointed will be required to devote the whole of his time to the duties of the offices, to perform all the duties of an Inspector of Nuisances as defined in the General Order of the Local Government Board, dated 13th December, 1910, and such other duties as may be required under the Public Health Acts, and any other Acts or Orders affecting the office.

He will also be expected to carry out the duties of Road Surveyor, &c., full particulars of which may be obtained on application to the undersigned.

Candidates must possess the qualifying Certificate of the Royal Sanitary Institute, or some other responsible body granting a similar Certificate of qualification.

Commencing salary for the combined offices, £110 per annum, rising by annual increments of £5 to £120.

The appointment as Inspector of Nuisances will be subject to the approval of the Local Government Board, and as Road Surveyor to the approval of the County Council.

Applications, in the handwriting of the Candidates, stating age and qualifications for the office, accompanied by three testimonials, must be sent to the undersigned not later than Saturday, February 21st, 1914. Duties to commence April 1st, 1914.

WALTER O. WELLINGTON,
Clerk to the Council.

Wadebridge,
Cornwall. (1,272)

BOROUGH OF BEDFORD.

TEMPORARY ASSISTANT.

Applications are invited for the appointment of a Temporary Assistant in the Borough Engineer's Office for a period of not less than six months, to assist in preparing drawings, &c., for new Isolation Hospital Buildings. Salary, 50s. to 60s. per week, according to qualifications.

Applications, in candidate's own handwriting, stating age, together with full particulars of experience (and enclosing copies of not more than three recent testimonials), endorsed "Temporary Assistant," to be delivered to the undersigned not later than Saturday, 21st instant.

Preference will be given to candidates with some Architectural knowledge, and who have had experience in Hospital Work.

Canvassing will disqualify.

N. GREENSHIELDS, ASSOC. M. INST. C. E.,
Borough Engineer and Surveyor.

Town Hall, Bedford.
February 5, 1914. (1,274)

KIVETON PARK RURAL DISTRICT COUNCIL.

Temporary Assistant required, experienced in the preparation of Surveys, Plans, Estimates and Appointments under the Private Street Works Act, 1892.

Apply immediately, with copies of testimonials, stating age, experience and salary required, to—

FRANK HEWITT,
Engineer and Surveyor.

Council Offices,
Kiveton Park,
Near Sheffield. (1,289)

BOROUGH OF LEIGH.

The Corporation of Leigh invite applications from suitable persons for the position of Paying and Building Inspector. Wages, £2 10s. per week.

List of duties and forms of application may be obtained from Mr. Tom Hunter, Borough Engineer, Town Hall, Leigh, Lancashire.

Applications, in candidate's own handwriting, and on prescribed forms (none other will be considered), are to be delivered, accompanied by copies of not more than three testimonials, at the office of the undersigned on or before Monday, February 23rd.

W. H. COWBURN,
Town Clerk.

Town Hall, Leigh, Lancashire.
February 11, 1914. (1,287)

COMPETITIONS OPEN.

**BURTON-UPON-TRENT UNION.
TO ARCHITECTS AND SURVEYORS.**

The Burton-upon-Trent Board of Guardians invite competitive designs for Children's Cottage Homes to be erected in Burton-upon-Trent.

Premiums of £25 and £10 offered for the first and second prizes respectively. General Conditions, Instructions and Site Plan may be obtained on application to the undersigned (to whom designs are to be delivered not later than the 25th March, 1914) on receipt of one guinea, such sum being returned upon the receipt of a *bonâ-fide* design.

(By order of the Board)
C. F. CHAMBERLIN,
Clerk.

Union Offices,
Burton-upon-Trent.
February 10, 1914. (1,286)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.



**CORPORATION OF LEICESTER.
TRAMWAYS AND ELECTRICITY COMMITTEE.**

The Tramways and Electricity Committee of the Leicester Town Council are prepared to receive Tenders for the Erection of an Octagonal Brick Chimney Shaft, 212 ft. high, on the Site of the Generating Station, "The Lero."

Plans may be seen, and copies of the Conditions of Contract, Specification, Bill of Quantities, with Form of Tender, &c., obtained, at my Office on payment of the sum of £2, which sum will be returned on receipt of a *bonâ-fide* Tender.

Cheques, &c., to be crossed and made payable to the Leicester Corporation.

Sealed Tenders, on the Form supplied, addressed to the Chairman of the Tramways and Electricity Committee, Town Hall, Leicester, are to be delivered not later than Saturday, 28th February, 1914, endorsed "Tender for Chimney Shaft."

The Committee do not bind themselves to accept the lowest or any Tender.

E. GEORGE MAWBHEY, M. INST. C. E.,
Borough Engineer and Surveyor.

Town Hall,
Leicester.
February 12, 1914. (1,284)

BOROUGH OF KING'S LYNN.

The Corporation invite Tenders for Tar-spraying Roads.

Price per super. yard to include the provision of all tools, plant, materials and labour necessary for the actual Spraying. The Corporation will prepare the Road Surface before Spraying, and provide materials and labour for sanding, &c., afterwards.

Full particulars may be obtained on application to the undersigned, to whom sealed Tenders, endorsed "Tender for Tar-spraying," and accompanied by Tenderer's Specification, must be delivered not later than 10 a.m. Monday, 23rd February.

ALFRED J. SMITH,
Borough Surveyor.

Town Hall, King's Lynn.
February 13, 1914. (1,292)

BOROUGH OF KING'S LYNN.

The Corporation invite Tenders for the supply of Road Materials for the year ending 31st March, 1915.

Full particulars may be obtained on application to the undersigned, to whom sealed Tenders, on Forms and in envelopes supplied, must be delivered, accompanied by Samples, not later than 10 a.m., Friday, 27th March, 1914.

The Corporation does not bind itself to accept the lowest or any Tender.

ALFRED J. SMITH,
Borough Surveyor.

Town Hall, King's Lynn.
February 13, 1914. (1,294)

DISS URBAN DISTRICT COUNCIL. TO GRANITE MERCHANTS.

The above named Council invite Tenders for the Supply and Delivery of Granite.

Specification and Form of Tender may be obtained upon application to the undersigned.

The Council do not bind themselves to accept the lowest or any Tender.

ALFRED COOPER,
Surveyor.

The Terrace,
Diss.
February 9, 1914.

(1,282)

CORPORATION OF MADRAS.

SPECIAL WORKS DEPARTMENT. DRAINAGE SECTION.

CONTRACT M. & M., No. 21.

The Corporation of Madras is prepared to receive Tenders from competent persons willing to enter into a Contract for the Supply and Delivery of 2,000 Cast-iron Manhole Covers and Frames.

Forms of Tender prepared by J. W. Madeley, Esq., M.A., M.INST.C.E., M.A.M.SOC.C.E., &c., Special Engineer to the Corporation of Madras, may be obtained from the undersigned, Agents to the Corporation, on payment of 4 (four) shillings per set, which will not be returned.

Tenders, accompanied by a deposit in currency notes or a draft on a Madras Bank for Rs.200, should be sent direct to the President, Corporation of Madras, so as to reach him at or before 12 noon on the 24th day of March, 1914.

The Corporation does not bind itself to accept the lowest or any Tender.

(Signed) JAMES MANSERGH & SONS,
Agents to the Corporation.

5 Victoria-street,
Westminster,
London, S.W.

February 4, 1914.

(1,253)

CHESTERTON RURAL DISTRICT COUNCIL. CONTRACTS FOR GRANITE.

The Council will, at their Meeting to be held at the Board Room, at Chesterton, on Thursday, the 12th day of March next, receive Tenders for about 5,000 tons of Broken Granite.

Persons willing to Contract are requested to send their Tenders (sealed up) to my Office before 6 o'clock p.m. on Saturday, the 28th February inst.

The Council do not bind themselves to accept the lowest or any Tender.

Forms of Tender may be had upon application to the surveyor, Mr. J. Dunn, Brunswick House, Cambridge, to whom Samples must be sent.

(By order)

JOHN F. SYMONDS,
Clerk.

9 Bene't-street,
Cambridge.
February 10, 1914.

(1,291)

BUCKINGHAM RURAL DISTRICT COUNCIL.

The above Council are prepared to receive Tenders for the supply of Granite, Granite Chippings and Slag, delivered to the various Railway Stations and Canal Wharves in the District at such times and in such quantities as the Surveyor may direct, during the year ending 31st March, 1915.

Conditions of Contract and Forms of Tender may be obtained from the undersigned, to whom Tenders, endorsed "Road Materials," must be delivered not later than 28th February, 1914, together with Samples of such Materials, delivered free of cost, to the Surveyor's Office, Market-hill, Buckingham.

The Council do not bind themselves to accept the lowest or any Tender.

FRANK L. REYNOLDS,
Surveyor.

Council Offices,
Market-hill,
Buckingham.

(1,290)

THE URBAN DISTRICT COUNCIL OF BARNES

ANNUAL CONTRACTS.

The above Council is prepared to receive Tenders for the supply of the following for the twelve months ending 31st March, 1915:—

1. Broken Guernsey or Alderney Granite.
2. Broken Pit Flints and Thames Ballast.
3. Horses and Carts on Hire.
4. Disinfectants.
5. Ironmongery, &c.
7. Portland Cement.
8. Forage and Litter.
9. Granite Kerb and Channel.
10. Paving Slabs.
11. Oils, Paints, &c.
12. Stoneware Pipes, &c.

Particulars and Forms of Tender may be obtained of the Engineer and Surveyor at the Council House, where Tenders, sealed and endorsed "Tender for—," must be sent in not later than twelve o'clock noon on Monday, the ninth day of March, 1914. No Tender will be considered except on the prescribed Form.

The Council will not be bound to accept the lowest or any Tender.

(By order)

G. BRUCE TOMES, ASSOC. M.INST.C.E.,
Engineer and Surveyor.

The Council House,
High-street, Mortlake, S.W.

(1,293)

SHIPSTON-ON-STOUR RURAL DISTRICT COUNCIL.

SHIPSTON-ON-STOUR SEWERAGE AND SEWAGE DISPOSAL WORKS.

CONTRACT No. 1.

The Shipston-on-Stour Rural District Council invite Tenders for the Provision, Laying and Jointing of about 3,632 yds. of 9-in. and 6-in. Stoneware Pipe Sewers, and about 300 yds. of 5-in. Cast-iron Rising Main; also the construction of Manholes, Lampholes and Flushing Chambers, Engine-house and Pump Well, Liquefying and Storm Tanks, Bacteria Beds, Sludge Beds, Approach Road and Footbridge, and other incidental works in accordance with the Drawings and Specification prepared by the Engineers.

Drawings and Specification may be seen, and Bills of Quantities and Form of Tender obtained, at the Offices of the Engineers, Messrs. Willcox & Raikes, 63 Temple-row, Birmingham, on or after the 9th day of February, 1914, on payment of a deposit of Three Guineas, which will be refunded on receipt of a *bonâ-fide* Tender and the return of all documents to the Engineers.

Sealed Tenders, in envelopes supplied, endorsed "Sewerage and Sewage Disposal Works: Contract No. 1," to be delivered at my office not later than 12 o'clock noon on the 2nd day of March, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

WILLIAM ELLIS COE,
Clerk to the

Shipston-on-Stour Rural District Council.
Shipston-on-Stour.
February 2, 1914.

(1,243)

BOROUGH OF LEIGH.

TENDERS FOR MATERIALS.

The Corporation of Leigh are prepared to receive Tenders for the supply of the following Materials during the year ending 31st March, 1915:

- Barns Flags.
- Earthenware Pipes.
- Granite Macadam.
- Manhole Covers.
- Parapet Gutters.

Forms of Tender and all requisite information may be obtained from Mr. Tom Hunter, Borough Engineer, Town Hall, Leigh, Lancashire.

Sealed Tenders, on Official Forms, are to be delivered at the office of the undersigned not later than noon on Monday, the 23rd instant.

W. H. COWBURN,

Town Clerk.

Town Hall, Leigh, Lancashire.
February 11, 1914.

(1,288)

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PATENTED AND REGISTERED.

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The Worm (turning and rising to the occasion after enduring ten minutes' choice language):

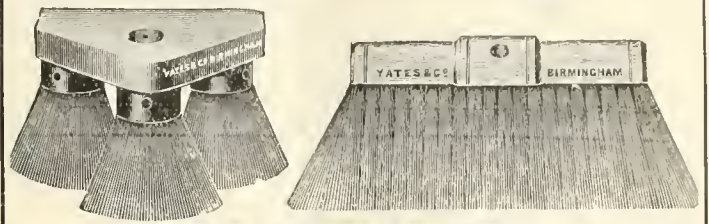
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(With apologies to "Punch.")

Makes Cement Water-proof

FOR DAMP WALLS,
FLOODED BASEMENTS,
AND FLAT ROOFS.

British!—Manufactured at King's Lynn by
KERNER-GREENWOOD & CO., Anne's Gate, King's Lynn



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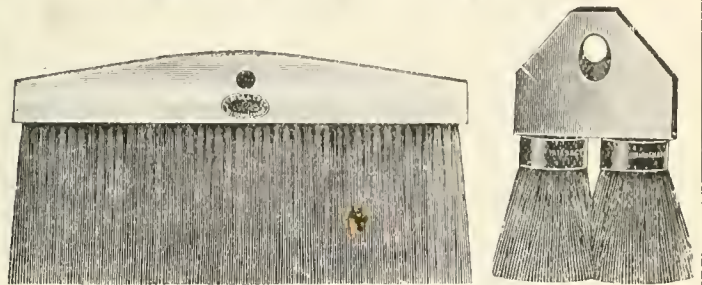
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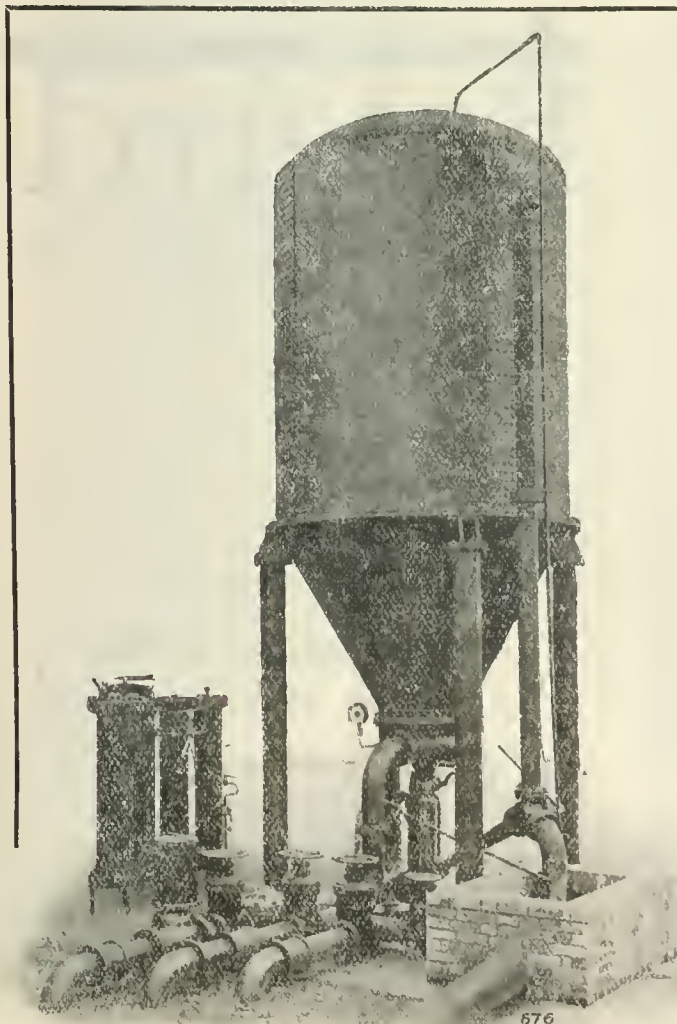
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676

DRIFFIELD RURAL DISTRICT COUNCIL.
HIGHWAYS DEPARTMENT.

TENDERS FOR ROAD MATERIALS.

The Highways Committee of the Driffield Rural District Council invite Tenders for the Supply, for the year ending 31st March, 1915, of the following Materials:—

About 7,000 ton-	Whin-stone and Granite
2,500 ..	Broken Slag.
600 ..	Sea Cobbles.
300 ..	Sea Gravel.
150 ..	Tarred Chippings.

The Materials to be delivered at the several Railway Stations and Wharves of the District.

Particulars and Forms of Tender can be obtained on application to the undersigned (for which stamped addressed envelope must be sent), and to whom Tenders, endorsed "Tender for Materials," are to be sent not later than Saturday, the 7th day of March, 1914.

The Committee do not bind themselves to accept the lowest or any Tender.

T. CASSON BEAUFORT, c.l.,
Surveyor.

Driffield.

February 5, 1914.

(1,278)

CHESHAM URBAN DISTRICT COUNCIL.
RECONSTRUCTION OF MAIN SEWERS.

The Chesham Urban District Council invites Tenders for the Reconstruction, with Cast-iron Pipes, of about 712 lineal yards of 12-in., 977 lineal yards of 9-in., and 935 lineal yards of 6-in., existing stoneware pipe sewers and house connections, together with all necessary Manholes, Flushing Chambers, &c., in Broad-street, Berkhamstead-road, Vale-road, Nash-leigh-hill, Essex-road, George-street, Alexander-street, Hivings-hill, Sunnyside-road, and Bellingdon-road, situate within the Urban District of Chesham.

Plans, Sections, and Specification may be seen

upon application to the undersigned any morning between the hours of 9.30 and 10.30 or at other suitable time by appointment.

The person whose Tender is accepted will be required to enter into a Contract and Bond in an approved Guarantee Society, as surety for the due performance of the Contract, a copy of which may be seen at the Office of W. J. Standing, Esq., Clerk to the Council, High-street, Chesham, to whom Tenders, sealed and endorsed "Tender for Reconstruction of Sewers, &c.," are to be delivered by the first post on Saturday, March 14th, 1914.

The Council does not bind itself to accept the lowest or any Tender.

PERCY C. DORMER,

Engineer and Surveyor.

Council Offices,
Chesham.

February 2, 1914.

(1,281)

KENT COUNTY COUNCIL.

PETROL MOTOR LORRIES.

The Bridges and Roads Committee of the County Council invite Tenders for the Supply of Six Petrol-driven Motor Lorries. The bodies to be constructed of steel with end tipping gear, and capable of carrying a load of five cubic yards.

Specification and Forms of Tender can be obtained upon application to the County Surveyor, Maidstone.

Sealed Tenders, endorsed "Tender for Petrol Motors," must be sent to the undersigned (upon the prescribed Form) not later than 12 noon on Saturday, February 28th.

The Committee reserve the right to apportion the order as they may feel disposed.

The lowest or any Tender will not necessarily be accepted.

W. B. PROSSER,

Clerk to the Council.

Sessions House,
Maidstone.

February, 1914.

(1,280)

**VOIDLESS
ASPHALT MACADAM**

Improved Methods, High-grade Bitumen and Exclusive Machinery solve the problem of Economical and Efficient Construction of Roads at a Low Cost.

WRITE FOR THIS BOOK.

Voidless Asphalt Macadam construction is explained and illustrated in an interesting book issued by Highways Construction Limited. It will be sent on request addressed to:—

HIGHWAYS CONSTRUCTION LTD.,

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Finsbury Pavement, London, E.C.

Bayard
"The First-Grade
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ALWAYS ready for service - reliable - comfortable - and extremely economical to run. There is no better investment for the busy "outdoor" man.

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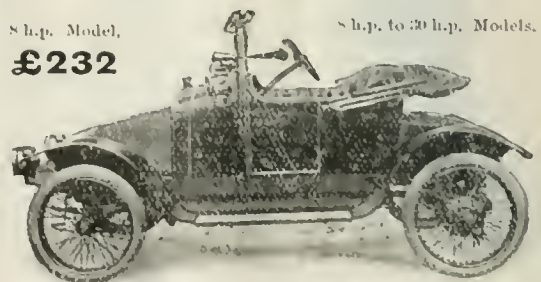
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98 HIGH STREET, MARYLEBONE, LONDON, W.

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The Surveyor

And Municipal and County Engineer.

Vol. XLV.

FEBRUARY 20, 1914.

No. 1,153.

Minutes of Proceedings.

Road Dispute Sequel.

An interesting sequel to the decision in *Tottenham Urban District Council v. Rowley* (noted at p. 254 *ante*) is the case of *Porter v. The Same Council*. The facts to be gathered from the reports of the two cases were briefly as follows: Rowley (the defendant in the first case) laid out, in accordance with an approved plan, a 40-ft. road called Keston-road, bounded on the north by land belonging to the council, and on the south by land of Rowley's, on which houses were afterwards built. Only half the width of the road—viz., the portion next the houses—was made up, but the entire road was thrown open in 1908, and had since been used by the public, both with and without vehicles, without let or hindrance. In 1912 the council entered into a contract with Porter (the plaintiff in the second action) for the erection by him of a school on their land on the north side of Keston-road. The contract provided that the contractor should be at liberty to enter on the land immediately, and that he should complete and deliver up the building fit for use within ten months, subject to penalties if this time was exceeded. The only means of access to the land was over Keston-road, and the council, in order to give the contractor access, made an opening in their fence, and put a gate in it. Porter started work on July 20, 1912. On March 6th, however, Rowley wrote to him claiming the right to prevent carts from passing over the road, and threatening him with proceedings for an injunction. Porter thereupon, considering that he had no alternative, gave an undertaking not to use the road, and discontinued the work, giving notice to the council of what had occurred. Attempts were made by the council to arrange matters amicably with Rowley, but he resisted all overtures, so that the council were forced in the interest of the public to obtain an injunction against him, which they did on May 11th.

The proceedings were prolonged by Rowley's unsuccessful appeals, first to the Court of Appeal and then to the House of Lords. His contention, briefly, was that the unmade half of the road had never been dedicated as a highway, or alternatively that it had only been dedicated as a footpath. But the facts were too strong for him. He had shown by his plan, his intention to dedicate the whole road and this, combined with the unrestricted use of the road by the public, was sufficient evidence of dedication.

The contractor, however, without awaiting Rowley's final discomfiture, resumed work as soon as the injunction was granted by the Court of first instance. But he had already been delayed for over two months, and for this delay he claimed damages against the council. The matter came before an Official Referee, who awarded him £560 12s. 6d. damages, but this decision was overruled by the King's Bench Division. The principle which guided the Court in this ruling appears to have been that Rowley's interference was in the nature of *vis major*, so far as regards the council's undertaking to give the contractor possession of the site. In other words, the council did not by their undertaking ensure that possession should be given, but merely bound themselves so far as their own acts and ability were concerned.

The decision is of the utmost interest and importance to building owners and contractors. The result to the contractor in this case may be hard, but (as Mr. Justice Ridley pointed out) if a building owner were to be held responsible for the acts of a mere trespasser over whom he had no control, it would be difficult to define any limit to his liability.

The Design of Sanatoria.

About a year ago the Local Government Board issued a memorandum—upon which we commented at the time—in which was indicated, in a general way, how inexpensive sanatorium accommodation for tuberculous persons could be erected within a comparatively short period in order to meet any pressing need in a particular locality. This has now been followed by a further memorandum, prepared jointly by the architect and the medical officer to the board, which is designed to afford local authorities and others further assistance in the provision of special residential institutions in connection with permanent schemes for the treatment of pulmonary tuberculosis. The object to be achieved in the design of such an institution is the old one of judiciously combining efficiency with economy, and in the latter connection it is pointed out that the principal factors which go to determine the cost are the cost and character of the site, the planning of the buildings, and the nature of the materials used in its construction. The choice of a suitable site is a most important matter, and among the considerations to which particular attention must be paid are the natural slope and surroundings and the character of the subsoil. It is essen-

tial that the site should be dry, and this must be secured, if necessary, by proper drainage.

Having dealt with questions affecting the choice of a suitable site, the memorandum proceeds to discuss some general considerations as to the accommodation to be provided for the patients. For this purpose, possible patients are divided into four groups—namely, (a) cases in which permanent improvement or recovery may usually be anticipated; (b) cases in which only temporary, though possibly prolonged, improvement may be anticipated; (c) advanced cases requiring continuous medical care and nursing, and (d) cases requiring special observation. Special considerations arise in regard to each of these classes of patients, as, for example, the kind of sleeping accommodation to be provided. Here it is desirable that patients in different stages of disease should, as far as practicable, be treated in different wards or rooms, and it is further desirable, in order to secure adequate and continuous attention to patients along with economy of staff, that, so far as practicable, all patients requiring special nursing should be treated in a section of the institution devoted to this purpose. The memorandum is accompanied by a series of very suggestive drawings, which aim at giving an indication of the lines on which buildings may be suitably designed—drawings which will be of great assistance to those whose duty it may be to provide institutions for tuberculous patients. The drawings comprise block plans of 100-bed sanatoria, with three separate pavilions and with a single pavilion respectively; ground and first-floor plans of a staff block; plans of dining-hall and kitchen block, nursing pavilion for thirty-six beds, and convalescent pavilion for thirty-two beds; and two alternative plans of a two-storied pavilion for 100 beds. Generally, it is recommended that the accommodation should be so arranged that a floor space of at least 64 sq. ft. will be available for each patient, and that the distance between the centres of the heads of any two adjoining beds should not be less than 8 ft., measured along the wall behind the heads of the beds. The building of sanatoria will necessarily proceed with considerable rapidity in view of the provisions of the National Insurance Act, and there can be no doubt that the effort made by the Local Government Board to assist the local authorities concerned by means of this memorandum will be much appreciated.

* * *

Road Crust Types in New York State.

The practice of the highway department of New York State is now of special interest to British road engineers since the new regulations for wheels, loads and speeds of motor vehicles are in several respects similar to our own. The maximum gross weight of 14 tons more or less strikes an average between our traction engine regulations and those for heavy motor cars, and the maximum axle weight of 8 short tons is nearly the same as ours. The speeds allowed are, on paper, greater in proportion to the weights of the vehicles for iron tyres, but for rubber-tyred vehicles weighing up to 6 tons the same (in our case nominal) limit is adopted. The road crusts now being put down on different classes of State roads in New York State are described and illustrated in a recent *Engineering News* article by Mr. W. G. Harger, with special reference to the roads in the division with which he is particularly connected. We have taken the liberty of making extracts from Mr. Harger's article, with brief summaries of the main points from other parts of it, and have reproduced the drawings of cross-sections of the wheelways of the different types of road. Mr. Harger's conclusions as to the merits of the different pavings and crusts employed are extremely interesting. He looks with little favour upon concrete as the wearing crust, and has found that a thin bituminous coat does not effectively protect such crusts. This type of roadway, which we may, perhaps, call the "Ann Arbor

residential street type," is certainly not promising as regards country main roads. Mr. Harger also suggests that the rock asphalt and sheet asphalt types can be eliminated, and he notes that the asphalt roads, as constructed in New York State, provided poor foothold, gave rise to skidding of motor cars, and were not suitable for gradients steeper than 1 in 29. He speaks favourably of grouted bituminous macadam, but, we are not surprised to learn, recommends an increase in the thickness of the wearing course.

As regards the use of brick and of vitrified clay cubes, the low heat conductivity and small specific heats of the materials are against their employment in our variable climate, since the number of times that such a paving is chilled to freezing-point during the cold season is much greater than in the case of other kinds of crust and paving. In this respect a water-bound crust has, when not very dry, a marked superiority over most others, and surface tarring reduces this advantage to only a moderate extent. Any solid crust of fairly high specific heat conductivity, especially if it be in close contact with the road-bed, is superior in this respect to crusts and pavings of an insulating character. Mr. Harger's sections show that the construction of road crusts has advanced considerably in his State, but it may be suggested that some of the designs are defective in that they bring both wearing course and foundation to an abrupt edge; while the proposed modifications, with thinner foundations towards the edges, are by no means to be commended.

* * *

An Institution of Structural Engineers and Architects.

The Concrete Institute is one of the associations in which the bond between the members consists in their common interest in certain kinds of work. It differs from most other associations of a similar character in that the subjects discussed at the meetings and studied by the committees relate largely to structures and processes in which architects are interested; and the institute forms, in fact, a meeting ground for architects and engineers on which matters concerning both professions may be studied and discussed. Modern structural work often presents features which demand the attention of both engineers and architects, and it is of much advantage to both professions, and to the interests of those whom they serve, that they should in these cases act together rather than separately.

The old, vicious idea was that in some cases the engineer would design a structure, such as a bridge, and that the unhappy architect would afterwards "embellish" the design. On the other hand, a building, the design of which really demanded the attention of an engineer from the beginning, would be entrusted to an architect, who would be supposed to call in an engineer to help him in the design of one or more details. The results were far from satisfactory. It is better that works of either character should be designed in one of the three following ways: In many cases it is desirable that the architect and the engineer should work together in unison from the beginning of the design. In other cases, where the design is mainly one which calls for the instincts and technical qualifications of the architect, he should be entrusted with the whole design of the work, but will consult an engineer both as regards certain details and with respect to the effect of these features on the design as a whole. Similarly, an engineer who is designing a structure as to which the opinion of an architect is desired will consult the architect at different stages in the design as well as, and especially, with respect to the design as a whole. It is largely in connection with concrete and reinforced concrete work that engineers and architects meet at the house of the Concrete

Institute, but since no other association specially concerns itself with structural work in which engineers are interested, the range of the institute may well be extended to cover the whole field of structural engineering. While, therefore, concrete and ferro-concrete are still prominently mentioned in the memorandum of association of the institute, that document has now been altered by the inclusion in many of its clauses of the phrases "structural engineering" and "materials employed in structural engineering"; and with this wider range of subjects before it the institute bids fair to attain to an important position among scientific and professional bodies.

* * *

**Underpaid
County Officials
in Ireland.**

Among the many points of Christian ethics that are overlooked or depreciated by a large number of public authorities is the affirmation that the labourer is worthy of his hire. In Ireland this would appear to be the case particularly. Here the obstinate refusal to place an adequate valuation upon skilled service in municipal and county administration is a fault that is far too prevalent, and it is one, moreover, that does not receive the reprobation from public opinion which, considering all things, it certainly ought to. The instance of the Queen's County Council and the salary which it assigned to the office of county surveyor, was recently revived when the matter came up for consideration at a specially convened meeting. The Local Government Board by letter once more pressed upon the council the view that an inclusive salary of £350 for the county surveyor was inadequate, and added that they would not be disposed to object if a suitable allowance for travelling and office expenses were given in addition. The cost of travelling is manifestly a very heavy item in the personal expenditure of a county surveyor, and none can be better aware of this fact than county councillors themselves. These gentlemen, however, remained adamant to the appeal of the Local Government Board, and proceeded forthwith to appoint a gentleman at the salary advertised, "subject to the sanction of the Local Government Board." How far the authority of the board goes we know not, but it is to be hoped that it can or will be exercised in insisting upon the improved conditions of service which they indicated in their letter to the Queen's County Council. In connection with this subject of official salaries a letter appears in the *Irish Times* calling attention to the "paltry" sum of £100 or £120 a year paid to assistant surveyors in the service of county councils, a sum which includes travelling expenses, postage, and other outgoings. That such salaries should be paid is, of course, little less than a scandal, but we fear that not much, if anything, would be gained by an appeal to the Road Board. Lack of jurisdiction renders this authority powerless. The local controlling authority—namely, the county council—ought to be subjected to such pressure from outside as will force it to recognise its responsibilities for the better remuneration of competent officials, and the representative professional associations of Ireland ought to be instant and insistent in creating and directing this pressure for the common good of their members.

* * *

**Sewer
Ventilation.**

In our Special Annual Issue (p. 236) we printed some extracts from a report upon the ventilation of sewers by the Main Drainage Committee of the London County Council, in which the difficulties of preventing the possibilities of nuisance arising from foul emanations from surface openings and from shafts are clearly

described. The result of the consideration of the subject with reference to the particular instances in question was that the committee could recommend no departure from the existing practice of considering each case of complaint on its merits, and, if it is possible, remedying the defect. Reference was made to the Manchester experiments with various mechanical contrivances, and the conclusion arrived at that none of these systems could be recommended for use in the Manchester sewers, and the committee concluded that there would be little to be learned by further experiments on these lines in London. It is, however, interesting to note, in view of the Local Government Board's report upon the intercepting trap, that the committee express the opinion that if the intercepting traps were abolished (presumably along the line of the main sewer in question) this procedure would "go a long way towards the solution if the ventilation problem, as a system of shafts which would serve both as inlets and outlets, would thereby be established." Surely this was an opportunity for the committee to have had the courage of their convictions, and take the bold step of recommending the abolition of the intercepting trap, especially as they could then have safely closed all the surface ventilators as requested by the local borough council, and thus have removed all possibility of complaints in the future. On the other hand it is surprising to notice that the Main Drainage Committee were of the opinion that "bends and elbows" tend to impair the efficiency as ventilators of stack pipes on houses. We referred to this matter in our "Coming-of-age" Issue of January 17, 1913 (p. 81), when we mentioned the experiments carried out by Dr. H. R. Kenwood, and described in a paper he read at the Sanitary Congress in 1892, which demonstrated that the air-currents in soil pipes were not influenced by the number and nature of the bends in such pipes.

* * *

The Canadian people are eminently practical, and among their latest accomplishments is the provision of municipal skating rinks and toboggan slides. Vast possibilities are opened up by their introduction. Sliding and backsliding may now be indulged in by both councillors and officials, and an occasional cropper, while entailing possibly some momentary loss of dignity, will have no injurious effect upon the moral reputation. That elusive member of committee who, blowing hot and cold in the same breath and hunting with hare and hounds, blows cool and steers a midway course when the Press are in the room, may now disport himself at will, turning and twisting and cutting intricate figures to his heart's content. Treading on thin ice will necessarily be avoided with care, although valour may occasionally outrun discretion when the surveyor is being harried into a dangerous corner by a municipal pack in full cry. Tobogganing, too, will have its attractions. On a sled of sufficient capacity the whole council will be enabled to slide in manner both unanimous and dignified, although a team of horses would have to be employed for a similarly qualified backsliding. An official of evil disposition could possibly cajole his council to enterprise in a leaky toboggan fitted to a water-chute, his trouble being well repaid by the final splash. The switchback toboggan would specially commend itself as typical of public office, with its ups and downs (the downs preponderating), its joyous mountings to the empyrean followed speedily by its fearful descents to Avernus, its unexpected turns, its gradual slowing down, and its ultimate and complete stagnation. Certainly there is more in the idea than meets the eye at first sight.

The Building of Sanatoria.

LOCAL GOVERNMENT BOARD MEMORANDUM.

In a memorandum of the Local Government Board dated February 25, 1913, it was indicated, in a general way, how inexpensive sanatorium accommodation for tuberculous persons could be erected within a comparatively short period in order to meet any pressing need in a particular locality. Another memorandum, prepared by the board's architect, Mr. Brook Kitchin, and the medical officer, Dr. Arthur Newsholme, has now been prepared with a view to affording local authorities and others further assistance in the provision of special residential institutions in connection with permanent schemes for the treatment of pulmonary tuberculosis. The unit taken in setting out the details has been 100 beds in buildings, with 10 additional beds in shelters.

ECONOMY IN BUILDING.

In preparing this memorandum economy has been borne in mind throughout, but, it is believed, without any sacrifice of efficiency. The cost of an institution—apart from the cost and the character of the site—depends, it is pointed out, primarily on its planning; after this on the character of the materials used in its

but a site requiring extensive drainage should, as a rule, be avoided.

(6) If drainage into a public sewer is impracticable, the site should be suitable for the provision of an adequate sewage disposal system.

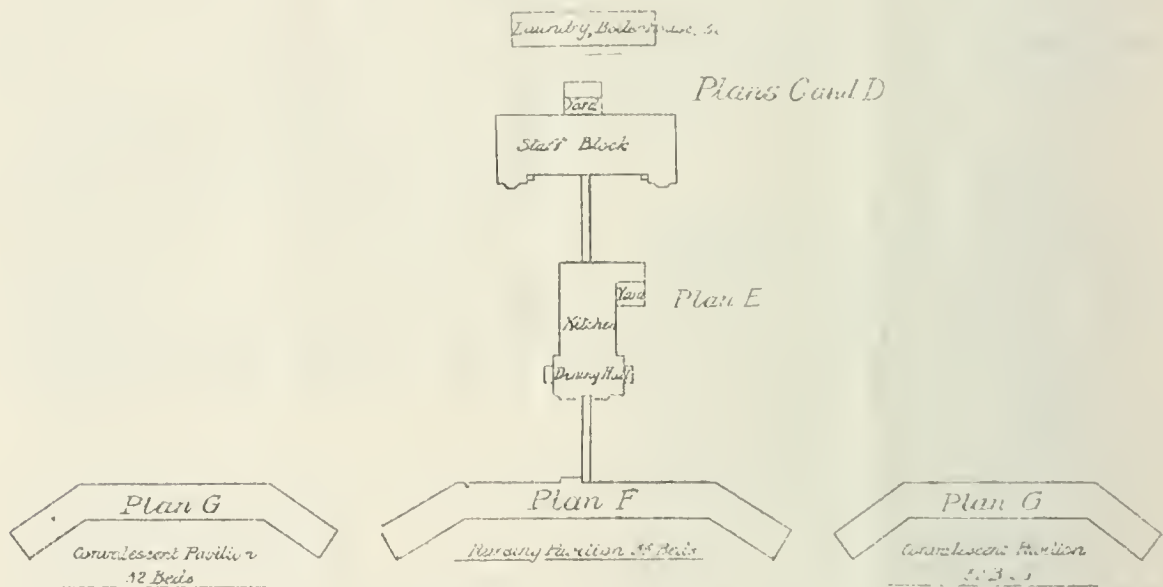
(7) It will be necessary to ascertain that an abundant supply of pure water is available.

(8) The site should, if possible, be within easy reach of a railway station. The cost of carriage from the station to the site will form an important factor, not only as regards construction, but also in the subsequent maintenance of the institution. There is the further consideration that it is undesirable that patients who are acutely ill should be unduly remote from their relatives.

BUILDINGS.

In residential institutions for the treatment of pulmonary tuberculosis the following provision will be required:—

(1) Patients' sleeping accommodation; (2) kitchen, dining-hall, and offices; (3) staff block containing quarters for resident medical officer, matron and staff;



SCHEME I: BLOCK PLAN "A."

construction. The local circumstances must be taken into account in determining the choice of building materials.

SITE.

In the selection of a site the most important considerations to be taken into account are: (1) Area; (2) elevation in relation to surrounding country; (3) cheerfulness of outlook; (4) protection from certain winds; (5) subsoil; (6) drainage facilities; (7) water supply; (8) convenience of access.

(1) The area of land required for the site will depend upon the number of patients and the type of cases. The site of a sanatorium should be sufficiently large to permit of open-air employment of a considerable number of patients. It is desirable that a site of 50 acres in extent should be provided for 100 patients if land is readily available and the cost is low; but an area of not less than 20 acres may suffice for this number of patients where suitable land is difficult to obtain or the cost of land is high. It is desirable that in all cases an area of at least $\frac{1}{2}$ acre should be allowed per patient.

(2), (3) and (4) The site should preferably slope gradually to the south, and be protected on the north and east by high ground, preferably wooded. In some districts protection from westerly and south-westerly gales may be desirable. The site should be moderately elevated above the country lying to the south of it.

(5) The subsoil has importance, not only as regards dampness or dryness, but also because the cost of building may depend somewhat upon its character. The main consideration is that the site should be dry. This must be secured, if necessary, by proper drainage.

(4) outbuildings, including laundry, boiler-house, disinfectant, sputum destructor, mortuary, &c.

GENERAL CONSIDERATIONS AS TO ACCOMMODATION FOR PATIENTS.

As the planning of the institution will depend on the stage of the disease of the tuberculous patients proposed to be admitted to it, it is necessary to set out a classification of cases of pulmonary tuberculosis arranged from the standpoint of accommodation in residential institutions.

Group A.—Cases in which permanent improvement or recovery may usually be anticipated.

Group B.—Cases in which only temporary, though possibly prolonged, improvement may be anticipated. Such cases will include: (1) Patients who may be expected to recover considerable ability to work, as a result of protracted treatment; (2) patients admitted for a short term for educational treatment; (3) patients with advanced disease, many of whom improve greatly under institutional treatment.

Group C.—Advanced cases requiring continuous medical care and nursing.

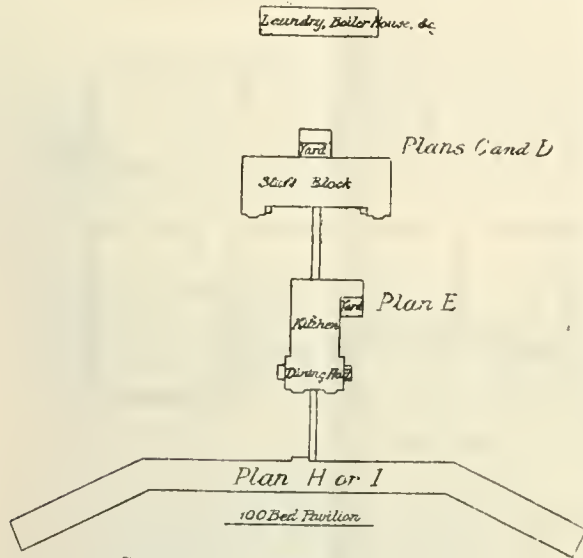
Group D.—Cases requiring special observation: (1) Patients admitted for the purpose of diagnosis; (2) patients needing to be watched before the best form of continued treatment can be determined.

The patients in all four groups may be treated in a combined institution, in separate rooms or pavilions. This arrangement is most suitable for areas with a population too small to require the provision of 100 beds for patients in group A. A combined institution should be so situate as to secure fairly easy access of

relatives to patients acutely ill, while giving good local conditions for patients in group A.

TYPES OF BUILDINGS.

The drawings which accompany this memorandum aim at giving an indication of the lines on which buildings may be designed, and it is hoped that these may be of service to those who are engaged in the



SCHEME II.: BLOCK PLAN "B."

provision of institutions for tuberculous patients.

The following plans are appended to the memorandum:—

- A—Block plan of a 100-bed sanatorium with three separate pavilions.
- B—Block plan of a 100-bed sanatorium with a single pavilion.
- C—Ground plan of staff block.
- D—First floor plan of staff block.
- E—Plan of dining-hall and kitchen block.
- F—Plan of nursing pavilion for 36 beds.
- G—Plan of convalescent pavilion for 32 beds.
- H—Plan of two-storied pavilion for 100 beds.
- I—Plan of two-storied pavilion for 100 beds (alternative design).

It will not usually be practicable to provide in a single one-storied building 100 beds in rooms or

special nursing section, and two separate pavilions for males and females respectively.

Schemes I. and II. have both been prepared upon the assumption that equal accommodation will be required for each sex. They may require modification in this respect according to local needs.

An arrangement is also shown by which ten beds between the duty-rooms in the special nursing pavilion in plan F, and in the central section of the ground floor in plans H and I, ordinarily intended, in each instance, for five male and five female patients, can be utilised either entirely for male or entirely for female patients as occasion may require. Some elasticity in the amount of accommodation for the two sexes is thus secured.

SCHEME I.

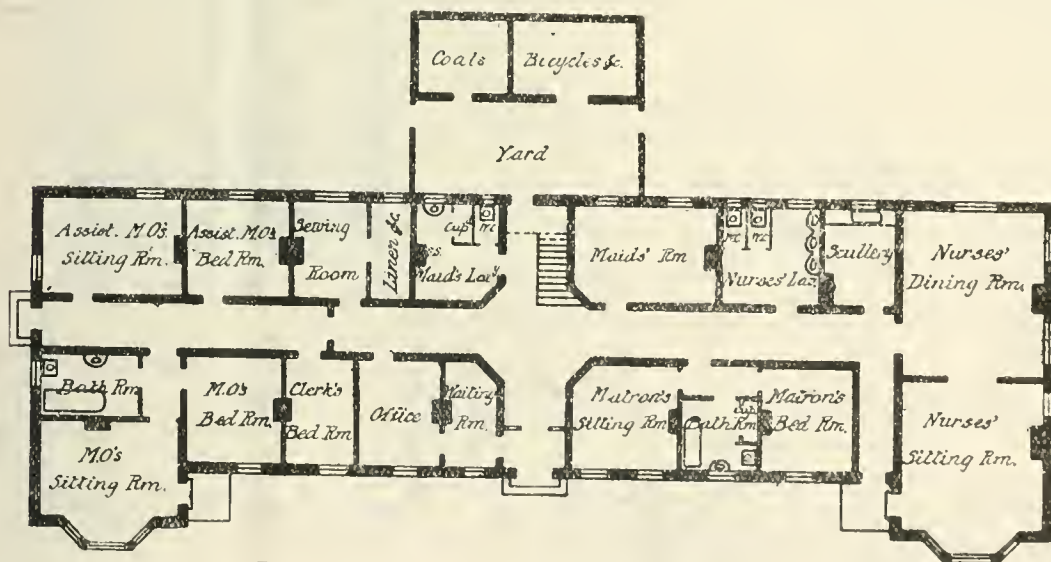
(Details of the various blocks are given in plans C, D, E, F and G).

Scheme I. has been prepared to secure the advantages to be obtained by having one pavilion for patients requiring special nursing or supervision and in the separate pavilions for male and female patients, respectively, who are able to be up and about all day. This arrangement makes for efficiency and economy in nursing, and secures separation of the sexes more efficiently than is possible if all patients are treated in the same building.

It has been prepared for a combined institution, and shows a special nursing pavilion for thirty-six patients, a pavilion for thirty-two male and a pavilion for thirty-two female patients. The plan can be modified so as to make it suitable for a sanatorium by reducing the accommodation in the special nursing pavilion to about twenty beds, and by increasing that in the separate pavilions for male and female patients.

The block plan shows that the central portion of the site is occupied by the staff block, kitchen and dining-hall block and outbuildings, and by the special nursing pavilion; the eastern and western sections are occupied by the separate convalescent pavilions for male and female patients respectively. The portions of the site devoted to male and female patients are thus separated, so far as possible, by administrative and other buildings.

Special Nursing Pavilion (Plan F).—For convenience of service this pavilion is connected with the centrally situated kitchen and dining-hall block by a covered way about 60 ft. in length. The plans show a central service kitchen. On either side of this kitchen is provided a nurse's duty-room and accommodation for ten patients in four double-bedded and two single-bedded rooms. It is intended that this central section should be used for those patients



PLAN "C": GROUND FLOOR OF STAFF BLOCK.

wards with beds arranged on one side only. Such an arrangement would necessitate a very long building, which may be expensive to construct, except on a level site, and which would be inconvenient to administer. For an institution for 100 patients it will often be preferable to arrange for three separate pavilions (scheme I.); under some circumstances it may be found desirable to provide the accommodation in one two-storied building (scheme II.).

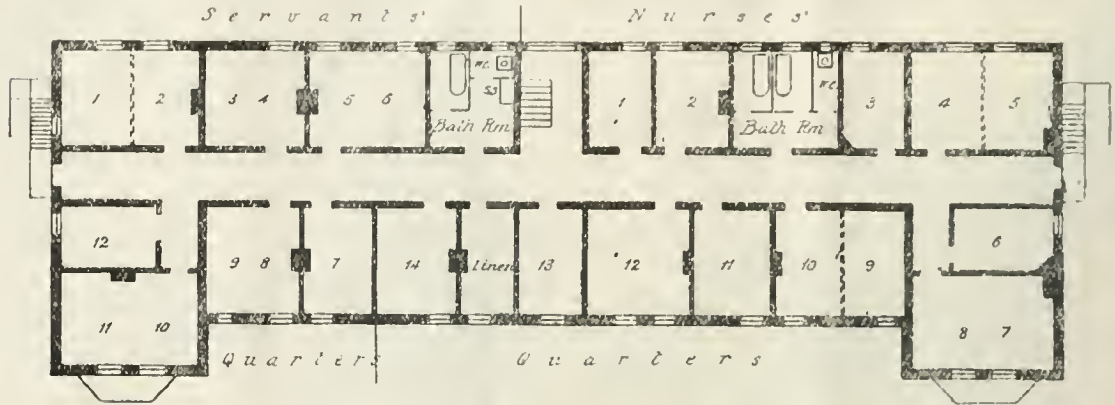
If an institution for more than 100 beds is required it will usually be preferable to adopt a modification of scheme I., with at least three pavilions—one a

who are acutely ill. The north verandah will be useful for nurses attending on the patients. At the end of this verandah a hospital slop sink has been provided. It is desirable that arrangements should be made for heating some of these bedrooms. At each end of these centrally situated rooms is a lavatory section, and beyond this, in the wings, is accommodation for those patients who require only a moderate amount of nursing. This accommodation may be provided either in double-bedded rooms or in small wards. The latter arrangement is shown on plan F. The section between the service kitchen and the duty-room

on each side is practically cut off from the section beyond the duty-room. A small lavatory annex situated behind the service kitchen, and containing two water-closets and one bath-room, has been provided for these sections. This arrangement makes it possible to use these sections entirely for male or entirely for female patients, or for five patients of each sex. In the event of the sections being occupied by

Windows should preferably be of the casement pattern and be hung "to fold" without mullions. Baths should be provided on a scale of about one to twelve patients. They may be of enamelled iron, and should be fitted with large taps and wastes to facilitate filling and emptying. Spray baths may also be provided.

There should be at least one water-closet for every



PLAN "D": FIRST FLOOR OF STAFF BLOCK.

patients of different sexes, each section would have a separate water-closet, but the bath-room would be common to the two.

Convalescent Pavilions (Plan G).—The sleeping accommodation is shown partly in double-bedded rooms and partly in a small ward. As patients occupying these pavilions will be able to take their meals in the dining-hall no provision has been made for the service of food, and the pavilions need not be situated close to the central kitchen block. No provision has been made in these pavilions for special nursing, as it is assumed that patients requiring this will be transferred to the special nursing pavilion.

SCHEME II.

(Details of the various blocks are given in plans C, D, E, H and I.)

Plans of a two-storied building have been prepared to meet those cases where local circumstances make it desirable to provide the whole of the sleeping accommodation for patients in a single building. The plans have been prepared for a sanatorium. If it is proposed to use such a two-storied building as a combined institution, the plan can be modified to secure more accommodation on the ground floor, within the special nursing section.

Provision has been made for a centrally situated special nursing section on the ground floor. The general arrangement of this section is similar to that of the special nursing pavilion included in Scheme I. Arrangements have been made for the accommodation of patients needing little nursing supervision on the first floor and in the wings on the ground floor. As it is suggested that the first floor shall be used only by patients who are able to be up and about, only narrow balconies for access to the rooms have been provided in order that the lighting and ventilation of the ground floor rooms may not be materially interfered with.

It will be noted that the plan of the first floor differs from that of the ground floor, only one duty-room having been provided.

GENERAL OBSERVATIONS.

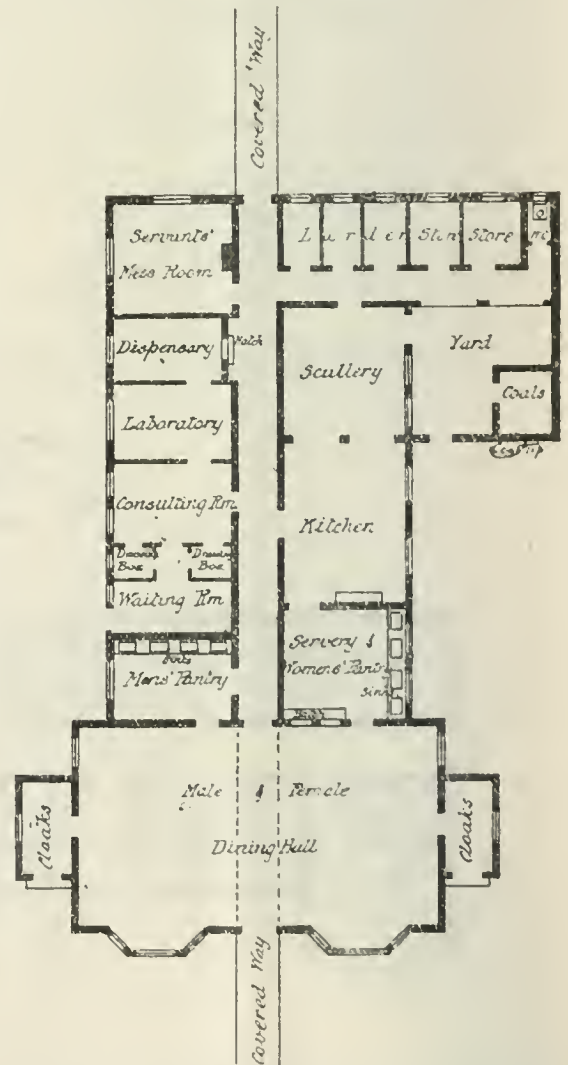
Space for Patients and Height of Walls.—The accommodation should be so arranged that a floor space of at least 64 sq. ft. will be available for each patient; the distance between the centres of the heads of any two adjoining beds should not be less than 8 ft. measured along the wall behind the heads of the beds.

Patients' rooms should not be less than 8 ft. 6 in. high; wards should be higher, but may be carried partly into the roof and ventilated by openings in the gable end.

Doors should be made on the "stable door" pattern, so that in inclement weather the lower portion may be closed while the upper portion is left open. They should be constructed in the form of French casements with a clear opening of not less than 3 ft. 6 in., so that beds may easily be wheeled through them.

twelve patients. Hospital slop sinks should be provided in the special nursing pavilion.

Every institution should have ample storeroom accommodation for linen, clothes, &c., and lockers for boots and shoes. The provision of some arrange-



PLAN "E": DINING HALL AND KITCHEN BLOCK.

ment for drying patients' clothes will also be advisable.

Day Shelters. The question as to whether day shelters shall be provided will require consideration for each proposed institution: if verandah accommodation is not adequate, day shelters will be needed. These should be of inexpensive construction.

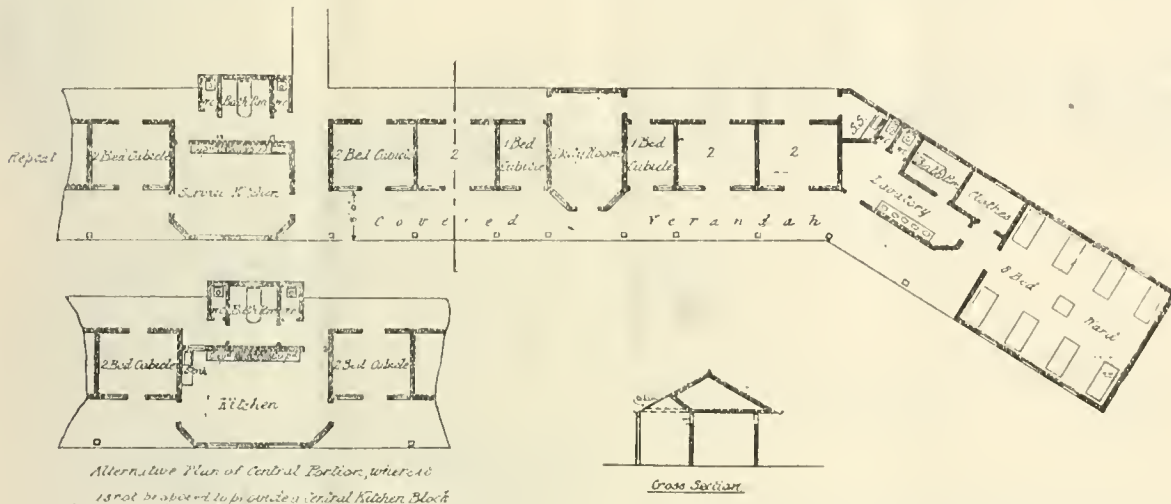
Recreation Rooms. In view of the importance of continuous open-air treatment of patients, it is unwise to encourage them to collect in a recreation-room, except for a very limited time, or on special occasions. In view of these considerations the dining-room has frequently been regarded as sufficing for the use of patients for recreation, lectures, &c. If it is considered necessary to provide special recreation rooms for use on wet days, or in winter evenings, these may conveniently be added at the ends of the pavilions for convalescent patients.

Kitchen and Dining-hall Accommodation (Plan E).—The block containing the patients' dining-hall and kitchen for patients and staff should preferably be a one-story building, which should be placed near to the administrative block and to the rooms for

so that a separate fully equipped kitchen is not required in the administrative block. A small kitchen pantry with food-store is shown on the plan adjoining the nurses' dining-room. This could be provided with a small range or gas cooker for minor cooking.

Out-buildings.—The laundry should consist of receiving room and wash-house, drying-room, and ironing and delivery room. Mortuary accommodation may be provided in the same block.

The amount of boiler-house accommodation will depend on the amount of steam required for laundry, disinfector, heating and hot-water supply, and for driving dynamos if electric current is to be generated in this way for lighting or other purposes. Special provision should be made for the sterilisation of sputum and for the cleansing of sputum cups. Unless



PLAN "F": SINGLE-STORY NURSING PAVILION FOR THIRTY-SIX BEDS.

patients requiring special nursing. It may be connected with the special nursing pavilion, if desirable, by a covered way.

The dining-hall should, if practicable, have a southerly aspect.

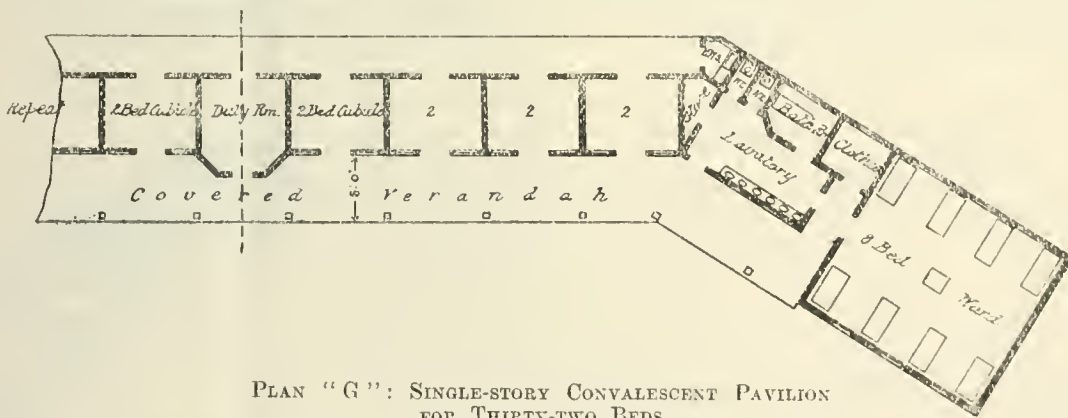
The consulting-room, dispensary and laboratory, which should be centrally situated, may also conveniently be included in this block.

Unless other accommodation is available for the male domestic staff, provision may be made for them

suitable arrangements are available elsewhere, some form of disinfector for clothing and bedding should be provided.

Hot-water Supply.—An ample and constant supply of hot water is desirable, and the system should be capable of easy extension.

Heating and Lighting.—It will usually be unnecessary to heat the patients' quarters, except the dining-hall and some of the rooms for patients requiring special nursing. A system of low-pressure hot-water



PLAN "G": SINGLE-STORY CONVALESCENT PAVILION FOR THIRTY-TWO BEDS.

in an upper floor of the kitchen and dining-hall block above the store rooms, &c.

Staff Block (Plans C and D).—The position of this building should be selected with a view to giving the greatest facilities for economical service and administration. The accommodation for a sanatorium with 110 beds will include medical officer's quarters, offices, matron's quarters, dining-room for nurses, bedroom accommodation for the nurses and servants. Each nurse should have a separate bedroom of an area of about 100 sq. ft. Usually one nurse will be required for twelve patients; but more will be needed if a considerable number of patients with advanced disease are being treated. Baths and water-closets should be provided in the proportion of not less than one to each twelve nurses or servants.

It is desirable that the principal cooking for the staff should be done in the central kitchen block,

heating will be found most economical for this purpose.

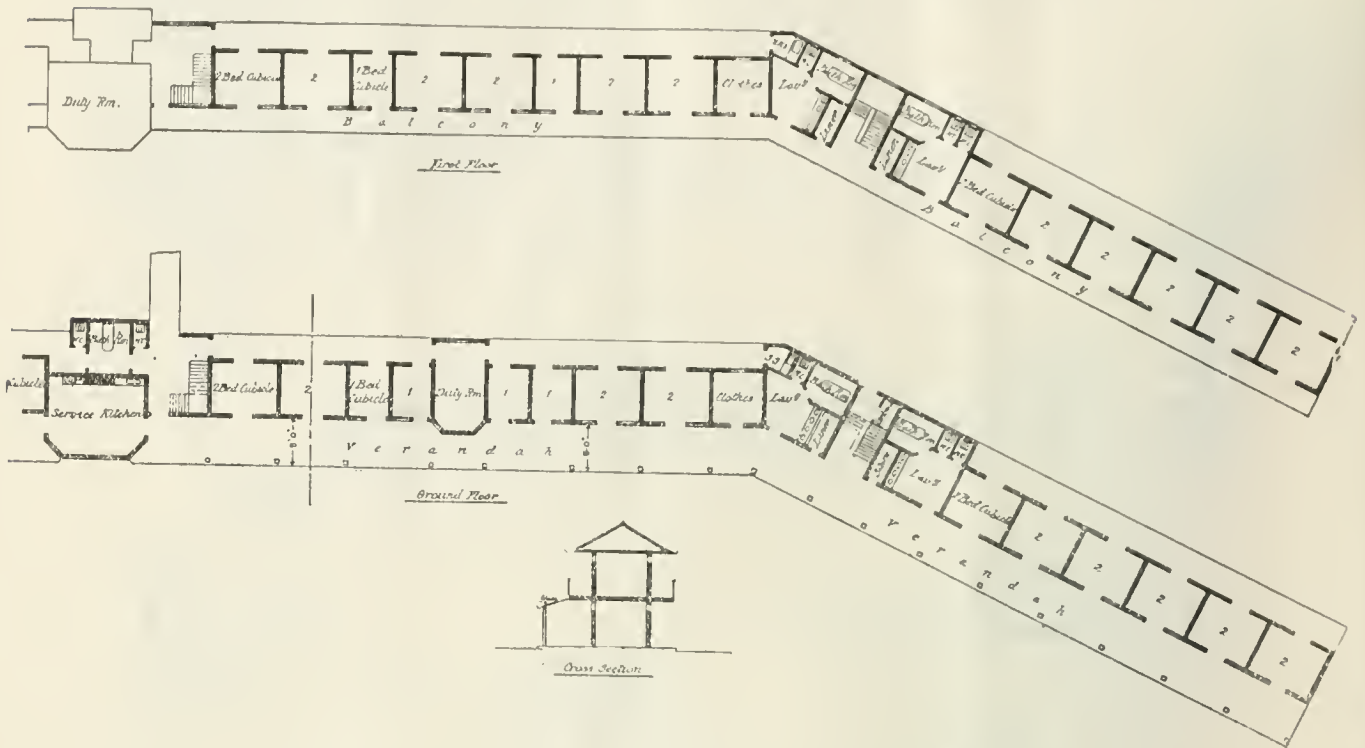
Electric lighting should be employed where electric current is available or can be produced economically. It may be necessary to use coal-gas, acetylene or petrol air gas; these illuminants have been found to be fairly satisfactory for use in sanatoria if suitable fittings are provided and adequate precautions are taken against fire.

Construction.—Where, owing to local circumstances, the use of brickwork would be economical, cheap bricks may often be employed faced externally, if necessary, with rough-cast or cement. Walls in exposed positions should be of hollow construction.

In some districts other materials may be less expensive and may be employed, such as steel framing carrying terra-cotta slabs, or concrete slabs or blocks plastered internally and cemented externally, or

timber-framing lined internally with asbestic sheeting or expanded metal lathing plastered with a hard-setting plaster, rough-cast or coated externally with weather boarding chemically treated. The roofs

Liverpool, Blackburn, Darwen, Oldham, and, of course, many local firms, are exhibiting. Model buildings which will be on view should prove of great interest to architects and other professional men, for whom



PLAN "H": 100-BED PAVILION.

should be of simple construction, and may be covered with slates, tiles or asbestic material. The floors of verandahs should be of impermeable material.

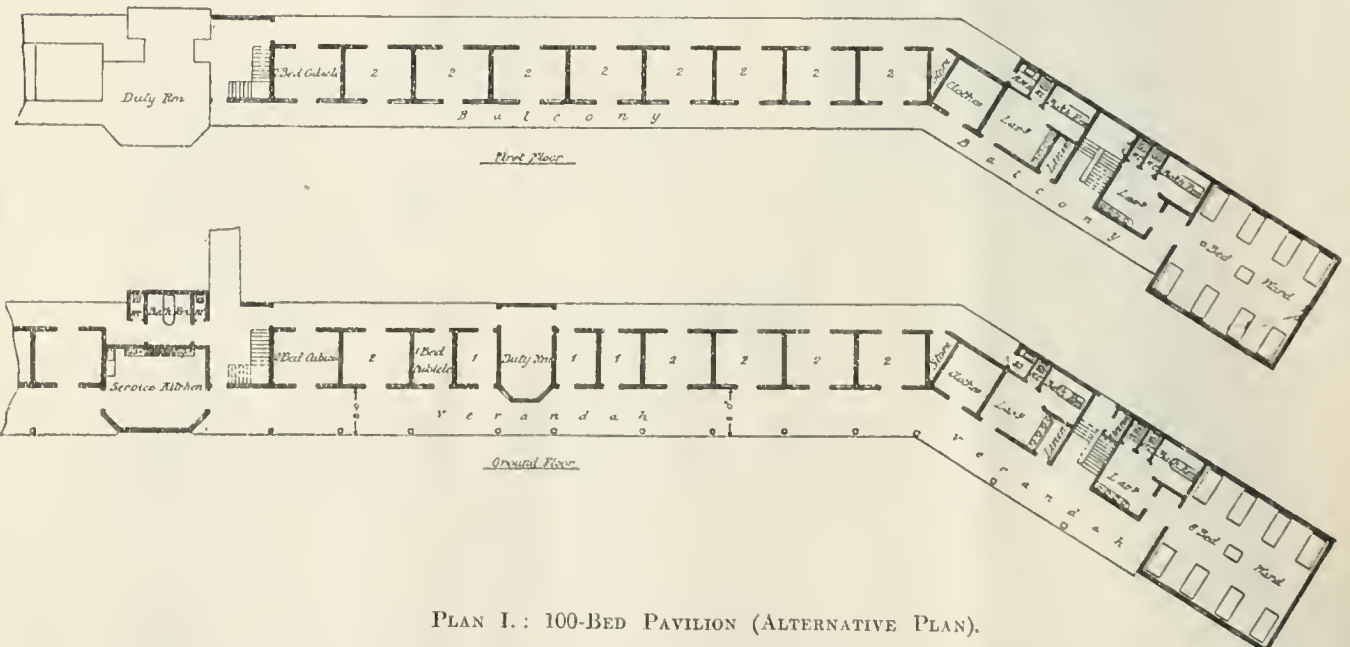
two special days have been set apart—viz., March 5th and March 11th, between the hours of 11 a.m. and 4 p.m.

EIGHTH MANCHESTER BUILDING TRADES EXHIBITION.

The exhibition director is Mr. Charles H. Luke, joint managing director of Messrs. Walter Cawood, Limited, who has had great experience in all classes of exhibitions, particularly those connected with the engineering and shipbuilding industries. The firm of Walter Cawood, Limited, was formed after the death of the late Mr. Walter Cawood to carry on the business, and since they have taken it over it has been extended and increased in all directions.

The eighth Manchester Building Trades Exhibition is now nearing completion, and will be opened on March 3rd at 3 p.m. by the Right Hon. The Lord Mayor of Manchester (Alderman D. McCabe, J.P.). The chair will be taken by Alderman J. R. Wilson, J.P., chairman of the Improvements Committee. The management inform us that in addition to the

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY



PLAN I.: 100-BED PAVILION (ALTERNATIVE PLAN).

majority of the old exhibitors being represented, a large number of new firms have taken space, and are supporting the exhibition. The list of exhibitors show that many firms from London, Belfast, Birmingham,

ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

Types of New York State Roads.

[From an article in *Engineering News*, chiefly relating to Division 5. By W. G. HARGER.]

On October 20, 1913, new regulations limiting the weights of motor vehicles came into force. The gross weight upon State and county highways of vehicle and load is limited to 14 short tons, unless the permission of the State Commissioner of Highways has first been obtained for the passage of a heavier vehicle. The axle-weight is limited to 8 tons. The load per inch width of tyre, wheel, or roller is limited to 800 lb. per square inch (unless permission be obtained from the Commissioner). The width of motor vehicles is limited to 90 in. (7 ft. 6 in.), except traction engines, which may have a width of 100 in. (8 ft. 4 in.). Vehicles of a gross load of more than 4 tons are limited to a speed of 15 miles per hour; and if of more than 6 tons to 6 miles an hour, with iron or steel tyres, and 12 miles an hour with tyres of hard rubber or other similar substance.

[The section relating to projections upon the wheels of traction engines is somewhat difficult to

"(2) Main through automobile routes at a greater distance from the cities which have a large touring-car traffic and a medium heavy farm-produce traffic.

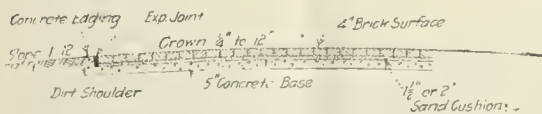
"(3) Secondary feeder roads and cross roads having a medium and light farm traffic and light automobile traffic.

"(4) Pleasure roads or scenic routes that have a heavy touring-car and light steel-tyre traffic.

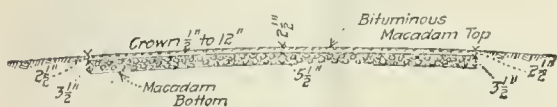
"For Class 1 we have had the best success with a brick surface on a concrete base, using either Hill-side brick or stone block on grades of 5 per cent or higher. We consider this to be the most economical construction in the end.

"For Class 2 the first choice is a grouted bituminous macadam, which seems to be most economical in the long run. The economies in this type of construction are largely confined to selecting the cheapest type of suitable foundation course.

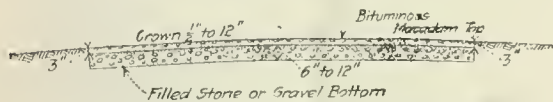
"The second choice is a water-bound macadam



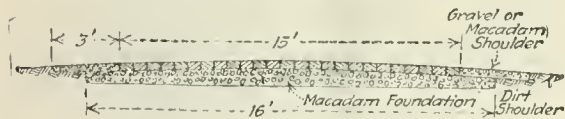
New York State Highway Department Brick Road Construction.



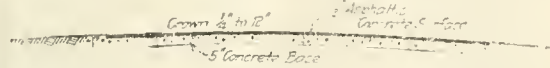
Bituminous-macadam Top on Macadam Bottom.



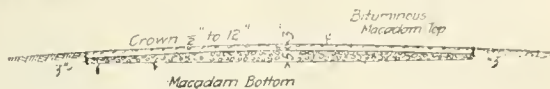
Bituminous-macadam Top on Field Stone or Gravel Bottom Course where Foundation Soil is Poor.



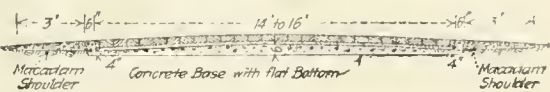
Vitrified-clay Cube Road Construction.



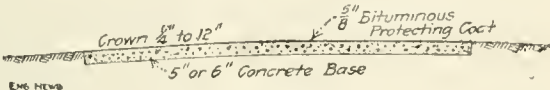
Asphaltic Concrete on a Concrete-base Construction.



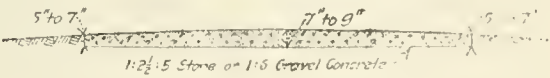
Bituminous-macadam Top on Macadam Bottom Course where Soil is Sand, Gravel or Light Loam.



Proposed Change in Brick Road Foundation.



Present Practice of Construction of Concrete with Bituminous wearing Coat.



Proposed Change in Construction of Concrete with Bituminous wearing Coat.

TYPES OF ROAD CRUSTS AND PAVINGS, DIVISION 5, HIGHWAY DEPARTMENT, NEW YORK STATE.

understand, and the last provision seems to be impossible of accomplishment. This section is therefore given in full.—Ed. SURVEYOR.]

"Section 1.—No traction engine, road engine, hauling engine, trailer, steam roller, automobile truck, motor or other power vehicle shall be operated upon or over the State or county highways, the face of the wheels of which vehicle are fitted with flanges, ribs, clamps, cleats, lugs, or spikes. This regulation applies to all rings or flanges upon guiding or steering wheels of any such vehicle. In cases of traction engines, road engines, or hauling engines which are equipped or provided with flanges, ribs, clamps, cleats, rings, or lugs, such vehicles shall be permitted to pass over said highways provided that cleats are fastened upon all the wheels of such vehicles, and are not less than 2½ in. wide and not more than 1½ in. high, and so placed that not less than two cleats on each wheel shall touch the ground at all times, and the weight shall be the same on all parts of said cleats."

CLASSIFICATION OF STATE HIGHWAYS.

"Roads in this territory can be divided on a traffic basis into four classes.

"(1) Main feeder roads which extend from 10 to 15 miles out of cities like Rochester and Buffalo, and in the business sections of villages and third-class cities, which carry the concentrated garden truck traffic of a large area, and are subjected to continuous auto-truck and touring-car traffic.

surface treated with a surface coat of refined tar of the binder grade and maintained with periodical applications of cold refined tar. The indications are that in the near future the vitrified-shale cube surface will be able to compete economically with bituminous macadam for roads of this class. 'Amesite' and 'Roemac' are satisfactory, but are usually rejected on account of a slightly higher first cost. 'Amesite,' particularly, is a promising material.

"For Class 3 water-bound macadam treated with heavy refined tar and maintained with cold refined tar, or water-bound macadam treated with a light coat of No. 3 or No. 4 road oil once a season, or water-bound macadam treated two or three times a season with calcium chloride gives the best satisfaction.

"For Class 4 grouted bituminous macadam, concrete with or without a protecting bituminous surface, or water-bound macadam with 'Tarvia A.' asphaltic concrete, 'Amesite,' or 'Roemac' gives good results."

AVERAGE COSTS OF 16-FT. ROADS.

Brick on Concrete Foundation.—Cost of excavation \$2,200 (9 per cent); total cost per mile, \$24,400 (£5,083).

Asphaltic Concrete on Concrete Base.—Excavation, \$1,900 (9.9 per cent); total cost per mile, \$19,500 (£4,062).

Bituminous Macadam Surface, on Macadam, Field-stone, or Gravel Bottom Course.—Excavation £1,900 (15.9 per cent); total cost per mile, \$12,300 (£2,562).

Concrete with Thin Bituminous Surface. Excavation, £2,300 (18 per cent); total cost per mile, \$12,500 (£2,604).

The mileages of the different types of pavement as designed are as follows: Brick, 40; California sheet asphalt, 2; rock asphalt, 4; "Hassam" (concrete), 16; concrete, bituminous top, 21; bituminous macadam, 129; water-bound macadam, 4; total, 216 miles.

It does not seem safe to build any more concrete roads with bituminous tops until there has been more opportunity to observe the wear of the roads already built. The "Hassam," the rock asphalt, and sheet asphalt types can be eliminated with a resulting reduction in cost; and some of the brick pavement can probably be changed to another type with advantage. Most of the brick, bituminous macadam and water-bound macadam designs will probably stand without correction, except, possibly, for width.

Brick pavement, though the most available type for the heaviest traffic roads, has the bad features of any rigid construction, and longitudinal cracks develop, due to heave under frost action or settlement on new fills. The pavement is difficult to repair if anything goes wrong. With asphaltic concrete on a concrete base, the $1\frac{1}{2}$ in. thickness is evidently too small, for holes develop rapidly. It gives a poor footing for horses, and motor cars skid easily on it. It should not be used on grades over $3\frac{1}{2}$ per cent (about 1 in 29). Grouted bituminous macadam is available for a large percentage of roads in the section. It has been found that a 2-in. bituminous macadam top is too thin; $2\frac{1}{2}$ in. is successful on a macadam base, but 3 in. is necessary on fieldstone or gravel, and is advisable where the stone is crushed locally and is of large grade. The best results have been obtained with stone ranging from $1\frac{1}{4}$ in. to $2\frac{1}{2}$ in., spread and rolled, a thin layer of $\frac{3}{4}$ -in. stone being rolled in after the bitumen has been poured. Residuum bitumens are not so good for surface coats as are natural asphalt products and refined tars. A single-pour bituminous macadam road gives a good footing on grades up to 8 per cent (about 1 in 12), and a safe surface for motor travel. Bituminous-bound macadam roads have two disadvantages—they require unusually intelligent and conscientious inspection, and they cannot be built late in the season. For water-bound macadam with a refined tar surface coat, a top course of 3 in. has been found to be the best. A layer of $\frac{3}{4}$ -in. stone is rolled in over the tar.

The engineers of the division are not generally in favour of concrete road construction. While less liable to rut than are macadam roads, they crack badly under frost action and settlement, and are hard to repair. Concrete is not reliable as a road surface material, and it is difficult successfully to protect the surface with a thin coat of bitumen, particularly where there is much heavy steel-tyre traffic. But the type has not yet been tested to a conclusion.

Kentucky rock asphalt has not been uniformly successful in this division. It is available for Class 3 traffic, but is usually rejected on account of its costing more than bituminous or tarred macadam.

Vitrified clay cube surfacing may be said to be very promising. It is not unlikely that it will be used extensively in the near future for Classes 2 and 3, and possibly for Class 1.

The roads of division 5 have almost uniformly 16 ft. of metalling, with a graded section from 26 ft. to 32 ft. Mr. Harger believes that, provided the grading is kept the same width as for a 16-ft. road, in a great many cases the metalling can be reduced in width to 12 ft. or 15 ft., using gravel or loose stone on the shoulders, which latter can be widened if needed. With a proper selection of width and type, the average cost of "the balance" of the roads in the State system in the counties under discussion will probably be between \$14,000 and \$16,000 (say £2,920 to £3,330) per mile.

New Refuse Destructor for Lincoln.—The Mayor of Lincoln (Captain H. E. Newsam) recently laid the foundation-stone of a new refuse destructor, which the corporation are about to erect at a cost of £10,850 in Canwick parish, on a site for which a further £7,500 was paid. Councillor J. Mills said that by using at the adjacent sewage pumping station the heat generated by the refuse there would be a saving in their coal bill of about £900 a year. Mr. R. A. MacBair, the city surveyor, said about 65 tons of refuse would be burnt by the destructor each day. The contractors are Messrs. Heenan & Froude.

NEW YORK SEWAGE DISPOSAL.

METROPOLITAN COMMISSION'S REPORTS.

Three further preliminary reports have recently been issued by the Metropolitan Sewerage Commission of New York. Report No. VIII. gives full particulars of the float experiments which were made to show the tidal currents in the harbour, while Report No. IX. deals with the rainfall and the relations between the volumes of domestic sewage, storm water and tidal water in New York Harbour. Report No. X. contains recommendations for the appointment of a commission to construct a system of main drainage and sewage disposal for New York, and shows the urgency of the matter. The following interesting extracts are taken from the last-mentioned report:—

SYSTEM RECOMMENDED.

"The system which will be recommended will consist largely of intercepting conduits to collect the sewage from the local sewerage systems to a number of centrally situated disposal plants where sufficient of the impurities can be removed to permit the effluent to be discharged into the harbour waters without danger or offence. No interference is proposed in regard to the local sewerage systems. The main drainage system would take the sewage from the local sewers, and carry it to suitable points for treatment and disposal, and would thus relieve the harbour from its present excessive contamination.

"The system of main drainage which the commission will recommend is intended for adoption by the city both as a plan and policy for future construction, and should be carried out in successive steps and not as one undertaking. The immediate construction of the whole scheme is not necessary from a sanitary standpoint. Such parts of the system as are needed for the immediate future should be taken in hand at once, and the remainder built as required. The plans will be sufficiently flexible and elastic to permit of indefinite extension, and the adoption of any discoveries or improvements in the art of sewage disposal which may be made in the future.

"When complete the works will constitute a systematic and well co-ordinated scheme of main drainage for the city which will utilise the absorptive capacity of the harbour waters to the greatest extent consistent with due regard to the public health and welfare.

NEED OF IMMEDIATE ACTION.

"As to the urgency of providing a system of main drainage and sanitary sewage disposal, the commission and its advisers strongly recommend that steps at once be taken to correct the evils which exist. Even if corrective measures are begun immediately, it will necessarily be some years before the works can be completed and their benefit can be realised.

"At the present time the crude sewage of a population of over 6,000,000 persons is discharged through several hundred outlets into the harbour without purification, regulation or control of any kind. The discharges—all of which take place at the shore line or beneath the docks and piers—discolour the water, pollute the shores, produce offensive deposits, and cause solid matters, plainly recognisable as of sewage origin, to float about in plain sight. Bathing and the taking of shellfish for food are no longer safe north of the Narrows.

"The pollution, objectionable as it is at the present time, is rapidly increasing. Within the next thirty years the population will be about double what it is to-day, and the quantity of sewage will increase in proportion.

"The commissioners feel confident that their recommendation to place the disposal of New York sewage under a commission having central jurisdiction will prove to be a measure of economy, since this concentration of responsibility for the sanitary disposal of the sewage will ensure an orderly and well co-ordinated development of the city's main drainage works, and prevent either the piecemeal construction of works intended to improve intolerable local conditions or unnecessarily comprehensive and expensive main drainage schemes.

"The pollution is most objectionable in summer, when it is desirable that the water should be cleanest; it is most intense in those sections where the density of population and the congestion of water traffic are greatest.

"The members of the commission feel that they cannot state the need of improvement too strongly.

The public has been made aware of the situation through the numerous reports which the commission has issued from time to time. Among great cities New York is practically alone in not possessing either a system of main drainage and sewage disposal or a plan and policy for the sanitary conservation of its water highways. To facilitate the placing of the work of constructing a main drainage and sewage disposal system for New York in the hands of a commission suitable for that duty, the members of the Metropolitan Sewerage Commission hereby submit their resignations to the mayor, to take effect as soon as their final report, which is now in preparation, can be completed, which the commission intends shall not be later than April 30, 1914."

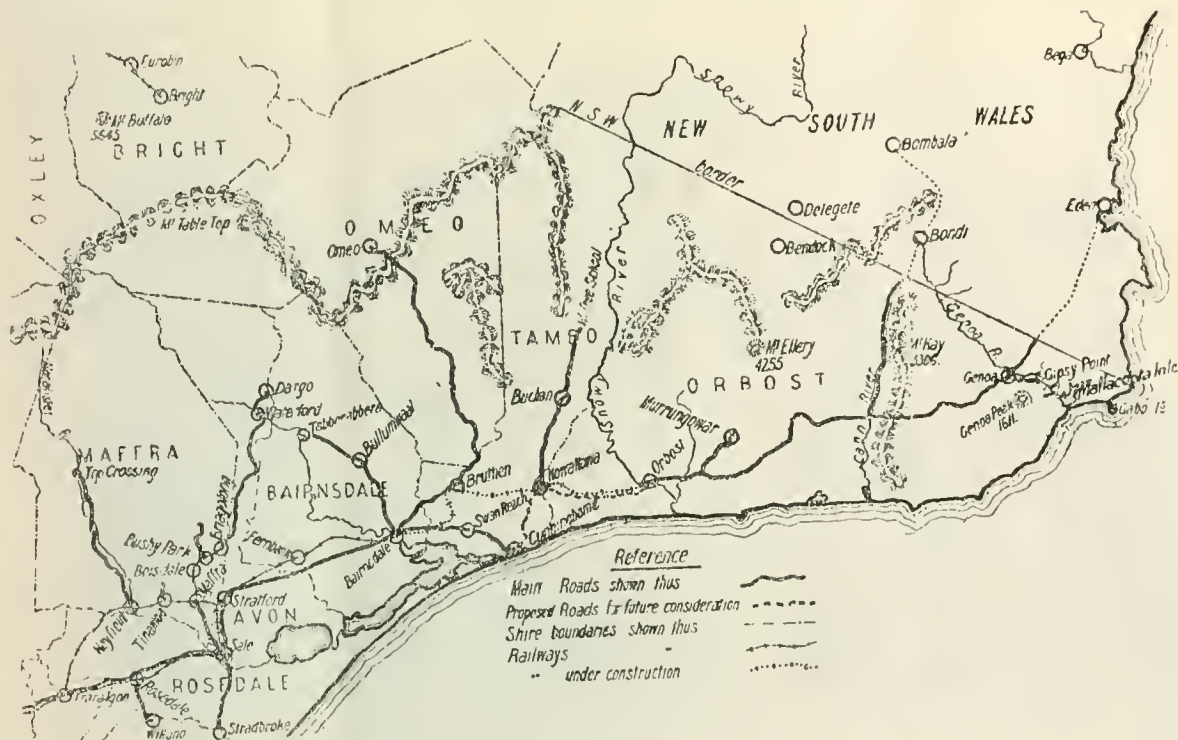
RUSHDEN HOUSING SCHEME.

The Rushden Urban District Council have accepted a tender of Mr. Robert Marriott for the erection of twenty-eight houses of the class A type at £206 5s.

THE COUNTRY ROADS BOARD OF VICTORIA.

PROPOSED MAIN ROADS FOR EAST GIPPSLAND.

The accompanying map, showing the main roads for East Gippsland, decided upon by the Country Roads Board of Victoria, is reproduced from the Melbourne Argus, to a scale only sufficiently open to show the locations of these roads, the names of the shires, and a few other details. A similar map of South Gippsland will be found on p. 11 of our issue of January 2nd. The point of junction is near the place marked "Traralgon" in small type, just over the same word in larger type, in the map of South Gippsland, the same place being marked with a small circle near the extreme left-hand bottom corner of the map, herewith reproduced, of East Gippsland. It will be seen that an important feature is the road roughly parallel with the coast, and that branches of considerable length run up the valleys of the river Cann (towards the east), Snowy River, and Maralister River (ending under the word



PROPOSED MAIN ROAD SYSTEM FOR EAST GIPPSLAND.

each, and one of Mr. W. Thompson for twelve houses of the class C type at £171 5s. each.

The plans have been prepared by Mr. W. B. Madin, the engineer and surveyor.

It is estimated that the receipts and expenditure in connection with the scheme will work out as follows:—

ESTIMATED RECEIPTS.		£	s.	d.
From Rents—				
28 houses (type A) at weekly rent of 5s. 9d.		418	12	0
12 houses (type C) at weekly rent of 1s. 9d.		148	4	0
		566	16	0
Less for empties and losses		18	8	0
		£548	8	0
ESTIMATED EXPENDITURE.		£	s.	d.
Repayment of loans at 3½ per cent—				
In respect of land, £1,485 5s. (80 years)		55	10	3
In respect of buildings, &c., £7,950 (60 years)		318	14	11
Rates at 8s. 8d. in £		99	3	2
Less empties		3	16	3
		95	6	11
Fire Insurance		5	18	6
Water		20	0	0
Repairs and maintenance		52	17	5
		£548	8	0

A loan of £9,436 is to be applied for.

"Maffra" in the west). Another branch runs right up-country in the Omeo shire. It is pointed out in the board's report that, apart from the main road to Bairnsdale, the roads are in the strictest sense of the term "development" roads, and are mostly in localities not served by railways.

Junior Institution of Engineers.—A meeting will be held to-morrow (Saturday) at the Cutlers' Hall, Sheffield, for the purpose of inaugurating a local section of the Junior Institution of Engineers with Sheffield for its centre. The chair will be taken at 8 p.m.

An Asylum Railway.—A short railway, just over 1½ miles in length, has just been completed by the Joint Asylums Committee of the county of Hampshire and the county boroughs of Bournemouth and Southampton. The line connects to the London and South-Western Railway near Basingstoke Station, and its terminus is at the site of the new joint lunatic asylum. The route is devious to avoid buildings, and the line ascends about 100 ft. The gauge is 4 ft. 8½ in., the rails being 87 lb. bull-headed, with ordinary type of chair and sleeper. The line is almost entirely in a cutting through the chalk hills and on embankments. There is one bridge carrying the Kingsclere-road over the line, and there are loop lines at commencement and termination. The line is for the conveyance of material to erect the asylum, and to convey goods to it when completed. The engineer was Mr. W. J. Taylor, M.INST.C.E., county surveyor of Hampshire.

A ROADSTONE QUESTION.

URBAN SURVEYOR'S COMPLAINT.

A question arose at a meeting of the Formby (Lanc.) Urban District Council recently with respect to the action of the surveyor, Mr. T. Grime, in agreeing with a firm of contractors to substitute basalt for granite in a contract entered into with the council. The surveyor said he was called upon to settle the matter, and as basalt was, in his opinion, a much harder stone, there was no loss to the council. The difficulty arose because they could not get Welsh stone, and it was a question of either having basalt or keeping the rollers waiting.

Councillor Buckley said the contract was made on the 14th.

The Surveyor: I did not see the contract. I do not get the chance to peruse the contracts.

Councillor Jones said that was a very alarming statement. He could hardly believe it.

The surveyor said it was quite true. He never got to see a contract or an advertisement before it was put in the paper in relation to his department. He



NEW FIRE STATION, GLOUCESTER.

thought it was most unfair. He had not been at any place which was like Formby in this respect.

Councillor Jones said he had been connected with councils and local boards for many years, and he had always understood that the surveyor was dealt with differently to that.

Councillor Rimmer: Who is the boss here?

Councillor Porter thought the surveyor had done good work to get basalt at the same price as Welsh granite.

The chairman said the surveyor was unable at the time to get the Welsh stone, and they confirmed his action in accepting the basalt stone.

Councillor Low wished to move that in future it be understood that the surveyor should see the contracts relating to his department, but the chairman ruled that it did not arise on the minutes.

Councillor Howe: It may be out of order, but it is quite right.

Trackless Trams for Nelson.—At a recent meeting of the Nelson Town Council it was decided to adopt a scheme of trackless trams for the higher parts of the town. Two lengths were suggested—from the centre of the town along Railway-street and Waids House-road to Halifax-road; the other being from the centre of the town along Railway-street, Netherfield-road, and Barberhouse-road to St. John's Church. The estimated cost is £6,678.

GLOUCESTER'S NEW FIRE STATION.

FERRO-CONCRETE CONSTRUCTION.

In a new station recently erected by the corporation of Gloucester accommodation is provided for two motor engines and for the efficient brigade which has been organised for dealing with outbreaks of fire in the city.

Designed to harmonise, as far as possible, with Bearland House and its surroundings, the new building is of fireproof construction throughout, the floors, roofs and stairs being of Mouchel-Hennebique ferro-concrete, with outer walls of Stonehouse hard burnt brick and Bath stone dressings.

The accommodation provided is as follows:—

Ground Floor.—Engine-room of sufficient size for two engines with escapes, office and instrument room, yard, workshop, coal and petrol stores.

First Floor.—Large recreation-room, two bedrooms, mess-room, bath-room and lavatory.

Second Floor.—Superintendent's quarters, consisting of three bedrooms, kitchen, living-room, sitting-room, bath-room, &c.

At the rear of the main building is a paved yard and a tower 46 ft. high to enable the men to practise with Pompiers ladders, and also for hose-drying purposes. The engine-room and recreation-rooms are heated by a low-pressure hot-water apparatus.

Our illustration—which we reproduce by the permission of *Ferro-Concrete*—shows the front of the new station, and at the right hand may be seen the upper part of the tower behind the main building. The lintels over the two large doors in front are of ferro-concrete, this material having also been used for the floors and roof of the tower.

The design and plans for the building were prepared under the superintendence of Mr. R. Read, Assoc.M. INST.C.E., city surveyor, by Mr. E. W. A. Carter, deputy surveyor, and Mr. G. E. H. Ross, the latter acting also as clerk of works. Details of the ferro-concrete construction were prepared by Messrs. L. G. Mouchel & Partners, of Westminster, who were represented during the execution of the work by their district engineer, Mr. Edmund J. Cullis,

Assoc.M. INST.C.E., of Gloucester. The contractors for the ferro-concrete construction were Messrs. Holbrough & Co., of Southgate-street, Gloucester.

Hours of Dust Collection.—A report on dust collection in other towns was presented recently to the Peterborough Town Council by the borough surveyor, Mr. J. W. Walshaw. This showed that in fourteen towns the hours were practically the same as in Peterborough—from 8 a.m. to 10 a.m. in the town, and from 7 a.m. to 4.30 p.m. in other parts. At four towns the work was finished at 9 a.m., and at two other places at noon. The work is carried out without special hours.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times*.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

CROMER WATER SUPPLY.

NEW FILTERING PLANT.

New water-filtration plant for Cromer, situated at the Metton pumping station of the urban district council, was formally opened on Wednesday afternoon.

Up to the year 1906 Cromer was supplied with water from a pumping station situated about $\frac{1}{2}$ mile from the town, although as early as the year 1900, owing to the growth of the town, it was decided to go further afield to secure a larger supply, and the works were commenced in the following year.

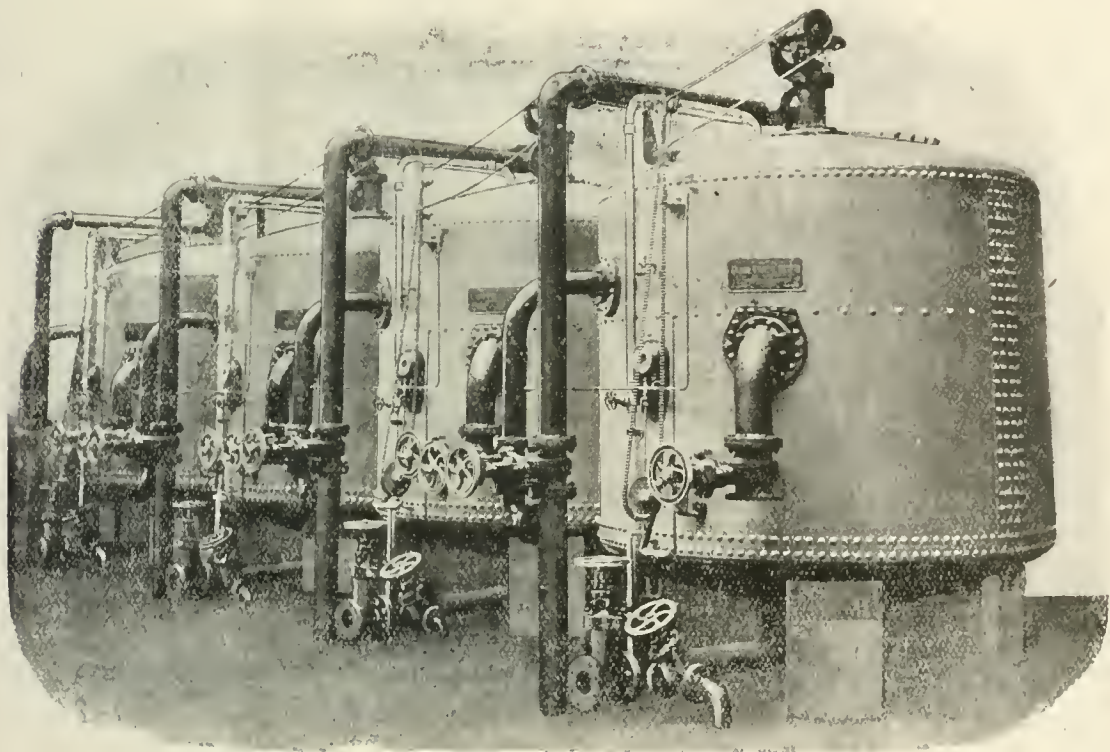
The water is obtained from a well and adits with a borehole sunk 260 ft. into the chalk, and is pumped direct through the Candy high-pressure filters, against a head of 216 ft., up to a covered reservoir on high ground near the Roman Camp, $2\frac{1}{2}$ miles away, and thence through 3 miles of service main to Cromer. The water as obtained from the well is of exceptional organic purity, but contains a certain amount of iron in solution derived from the gravels overlying the chalk, and this soluble

Company for use in their filters. It is produced from a carbonate of iron, and rendered magnetic, absorbent, rustless and imperishable. When it is required to cleanse the filters, the flow of water through them is reversed, a revolving hydraulic double-scouring arm is put into operation, and the iron (which has been oxidised and arrested by the filters) is washed away, this washing process occupying but a few minutes.

The filters are entirely successful in removing the iron without the use and cost of chemicals, for, whereas the unfiltered water is slightly yellow and cloudy, and has a distinct inky taste, the filtered water is clear, bright and tasteless, and is shown by analysis to be of ideal purity, and entirely free from the objectionable iron.

The Royal Sanitary Institute of Great Britain gave their highest awards for the Candy patent iron-removing and purifying filters, and for their oxidising filtering medium, Polarite.

It is interesting to note that many other well-known health and pleasure resorts employ Candy filters for dealing with their public water supplies, among these being the corporations of Harrogate, Tunbridge Wells, Hastings, Hythe and Torquay, so that the Cromer



AN INSTALLATION OF CANDY FILTERS.

iron causes brownish and objectionable deposit in the mains.

After careful investigation of the subject, and full consideration as to the best method of effecting the removal of the iron from the water as it is pumped from the well, the council decided to put down an installation of Candy filters. The work has been carried out under the supervision of the consulting engineers, Messrs. J. C. Melliss & Co., M.M.INST.C.E., of Gresham House, London, who were the engineers for the Metton waterworks. The special filters of the mechanical type were installed by the Candy Filter Company, Limited, of Westminster. The cost of the work, including the filter-house and mains, has been £2,000.

The filter plant consists of four 9-ft. diameter Candy patent oxidising filters of the compound or double bed and double scour type, tested to 160 lb. hydraulic pressure, the filters being constructed of Siemen's best mild steel, and filtering at the rate of 40,000 gallons per hour. These filters combine all the latest improvements for the scientific and economic purification of public water supplies.

The water on entering the filters is aerated under compression, and passes through a coarse filter-bed which breaks up the air, and finally through a fine filter-bed composed of sand and the special oxidising material Polarite, which completes the purification of the water and the removal of the iron. Polarite, as is well known, is a powerful oxidising and purifying material manufactured by the Candy Filter

council, in adopting Candy filters, were following the example of other first-class watering-places.

A goodly number of spectators, comprising members of the district council, officials and visitors, were present at Wednesday's ceremony. In the engine-room of the Metton works ocular demonstration was afforded, by means of a number of samples, of the comparative nature and appearance of unfiltered and filtered water with reference to the presence and absence of iron. In the room containing the four Candy patent oxidising filters, a glass case on the wall showed the nature and arrangement of the filtering layers, and a filter was cleansed in the presence of the company. Mr. Pullen Candy readily and courteously replying to various questions as to the filters and their working.

On the return to Cromer Mr. Candy entertained the company to luncheon at the Hôtel de Paris, Mr. G. W. Wilkin, chairman of the council, presiding.

Mr. Candy proposed "Success to the Council's Water Undertaking."

Mr. Davison, vice-chairman of the council and chairman of its Water Committee, responded, and gave a carefully prepared and extremely interesting little historical review of the water undertaking from before 1891—when the council's powers were extended—to the present time. He observed that they had always had a good and pure supply, but it was found that many visitors were suspicious of the water on account of its colour; hence it was deemed advisable to eliminate the iron, though some authorities would, perhaps,

have exploited the water as chalybeate, and charged 1½d. a glass for it. It was thought at first that the iron might work itself out, but it did not, and they found, on trial, that the Candy system for removing it was a success.

In response to the toast of "The Engineers and Contractors," Mr. Melliss replied for the former, and Mr. Candy, in replying for the latter, said that Cromer now possessed, if not the largest, the most complete and up-to-date installation of the kind in the British Isles, and he showed that it was also economical; while, as regards duration, their system had been in use at Hastings for fifteen years, and was still as good as new.

Several other interesting speeches followed.

THE LAYING OUT OF NEW STREETS.

A SOUTHALL-NORWOOD CASE.

Before the Brentford magistrates on the 12th inst., a Mr. Baxter was summoned, at the instance of the Southall-Norwood Urban District Council, the offence alleged being that he had laid out a new street which was not of the width prescribed by the by-laws.

Mr. E. J. Naldrett, instructed by Mr. Houlder, the clerk to the council, supported the summons, and Mr. Sydney G. Turner, instructed by Mr. A. H. Procter, defended.

Mr. Naldrett, in opening the case, traced the history of the alleged new street. He said that the defendant was the owner of an estate at Southall, and in January, 1912, he had submitted for the approval of the council a plan showing a new street to be called Manor-road, which was on the site of the now alleged new street. This plan was approved, but had never, in fact, been carried out. In April, 1913, plans were submitted for a car factory and approved, the attention of Mr. Baxter then being called to the fact that Manor-road was not being constructed. When this factory was erected, a sleeper road was laid from the gate of the estate in order to give access to it. Prior to the erection of the factory, certain buildings which had formerly been used as stables were converted into warehouses, and in August, 1913, plans of an extension of these buildings were submitted to the council. These plans were disapproved, the council taking the view that Mr. Baxter was, in effect, laying out a new street on the site of the proposed Manor-road without making it in the manner prescribed by the by-laws.

Mr. Reginald Brown, M.A.N.S.T.C.E., gave evidence for the council, and after the defendant had given evidence.

Mr. Turner submitted that the plan in question was not a street within the meaning of the definition in the Public Health Act, and that, even if it were, the defendant had not laid it out between the dates mentioned in the summons. He contended that laying out a street involved the doing of some act to the street itself, and not merely the erection of a building fronting it.

In the result the bench adjourned the case for a fortnight, expressing the hope that in the meantime the parties might be able to come to some agreement.

South Coast Road Scheme.—At a conference of representatives of the boroughs of Eastbourne, Bexhill and Hastings and the Eastbourne Rural District Council, held lately at Eastbourne, the borough surveyor of Eastbourne, Mr. A. E. Prescott, submitted a plan showing the widening of the existing road in the rural district from the borough boundary to Pevensey Bay, and an extension along the coast towards Norman's Bay, with a new road and bridge over the railway to join up with the existing road at Pevensey Sluice, and a new road to the north of the railway adjoining the Cooden golf links, connecting up with the Bexhill road at the tramway terminus. The length of the proposed road would be about 6 miles, of which over 3½ miles would be in the Eastbourne rural district and the remainder in the borough of Bexhill, with a suggested width of 50 ft., and a 36-ft. carriageway. The meeting decided provisionally to approve the plan, and that the four authorities concerned should instruct their surveyors to prepare an approximate estimate of the cost in consultation, after which the Road Board should be asked to receive a deputation to discuss the project. A cordial vote of thanks was passed to Mr. Prescott for preparing the plan.

ROAD MAINTENANCE IN DEVON.

DISTRICT SURVEYORS' MEETING.

The second of the meetings of Devon District Surveyors in No. 1 Division, organised by the county surveyor, Mr. E. J. Stead, ASSOC. M.A.N.S.T.C.E., P.A.S.T.I., M.L.M. AND CO.E., took place on Wednesday, February 11th, at the Guildhall, Barnstaple. Those present, in addition to Mr. Stead, included Messrs. G. R. Folland, H. Bradley, R. P. Roberts, O. Staton, G. Robson (members of Mr. Stead's staff), and the following district surveyors: E. Y. Saunders (Barnstaple Borough), R. E. L. Hookway (Bideford Borough), W. Medland (Torrington Borough), H. E. C. Raynor (South Molton Borough), F. J. Worden (Okehampton Borough), W. E. Champion (Northam Urban), W. Yeo (Lynton Urban), A. A. Richards (Barnstaple Rural), S. Hooper and G. Smale (Okehampton Rural), F. J. Harris (Holworthy Rural), T. B. Fairchild (Torrington Rural), R. Kelland and S. H. Gardner (South Molton Rural).

A good many points in road construction and repair were brought forward, but the chief discussion took place in considering the instructions which have just been issued by the Devon County Council to all district surveyors and roadmen. Each paragraph was taken in detail and keenly debated, Mr. Stead illustrating his replies by means of diagrams.

On the motion of Mr. Fairchild, seconded by Mr. Hookway, Mr. Stead was heartily thanked for arranging the meeting.

A PRESENTATION.

Previous to the meeting Mr. Stead invited his staff and the district surveyors to luncheon at the Golden Lion Hotel, and advantage was taken of the occasion to present Mr. Stead, who is leaving to take up his appointment as county surveyor of Somerset, with a handsome hall clock and dining-room clock, both in oak, and with Westminster chimes, and inscribed: "Presented to Edward J. Stead, ASSOC. M.A.N.S.T.C.E., by his Staff and the Surveyors of North Devon on his leaving the District, March, 1914."

Mr. W. Medland, borough surveyor of Torrington, made the presentation, and Mr. G. R. Folland, chief assistant to Mr. Stead, supported on behalf of the staff.

Mr. Stead, in acknowledging the gifts, said he had had a somewhat strenuous time in North Devon, but what he appreciated was the personal feeling of friendship which existed between all the surveyors and himself. After their first meeting he thought they might eventually form a small association somewhat on similar lines to that which existed in Somerset. All of them were striving to give their best to the main road question. It had never been his good fortune to work with a staff which had given him greater loyalty than that at Barnstaple. A large amount of the success of the work accomplished had been due to the loyalty of his staff.

ALLOCATION OF THE ROAD BOARD GRANTS.

In the course of the debate on the Address in the House of Commons on Wednesday, the administration of the funds of the Road Board was raised by Sir J. Bethell, and in the course of the discussion the customary complaints were heard of unfairness in the apportionment of the grants. It was explained by Mr. Montagu, on behalf of the Treasury, that the funds were allocated upon the basis, roughly speaking, of population, and this worked out as follows:—

England and Wales	82 per cent
Scotland	11 " "
Ireland	7 " "

Scotland got slightly more than the share to which it would be entitled on this basis of population, because the Road Board took into account the exceptionally large volume of what would be described in that country as foreign tourist motor traffic.

Planning of Abattoirs.—A Canadian correspondent seeks information as to the best arrangement of lairages, dressing-houses, passages, cooling and storage rooms for each kind of animal slaughtered, and will be glad to receive catalogues of the apparatus employed at such abattoirs and Smithfields. We would refer our correspondent to the illustrated description of the new abattoirs at Belfast, which appeared in THE SURVEYOR of September 26, 1913; at the same time we shall be pleased to forward to him any material which readers may send to this office.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

BUILDING CONTRACT: ACCESS TO SITE OBSTRUCTED BY THIRD PARTY: LIABILITY OF BUILDING OWNER.—A decision of the utmost importance, alike to building owners and to builders and contractors, is that of the King's Bench Division in *Porter v. Tottenham Urban District Council* (January 21st), reversing the decision of an official referee. The case is a result of the unwarranted claim made by the defendant in the action *Tottenham Urban District Council v. Rowley*, which was recently finally disposed of by the House of Lords (see p. 251, ante). The plaintiff in the present case contracted with the council to build a school for them on ground to which access could only be obtained over Keston-road. The contract provided that the plaintiff was to be at liberty to enter upon the ground immediately and that he was to deliver the building completed within ten months, subject to penalties. In order to give the necessary access the council made an opening in their fence next Keston-road, and put a gate in it. On March 6th last, about a fortnight after he began the work, the plaintiff received a letter from Rowley claiming the right to prevent carts from passing over the road to the council's land, and threatening proceedings for an injunction. The plaintiff had no alternative but to give an undertaking not to proceed with the work, and notice of this was given to the council. Correspondence ensued, but Rowley resisted all overtures, and ultimately the council took proceedings and obtained an injunction against him on May 11th last, after which the plaintiff again proceeded with the work. Subsequently he brought this action to recover from the council damages caused by the delay from March 6th to May 11th. The Official Referee gave judgment for the plaintiff for £560 12s. 6d. From this judgment the council appealed. The Court allowed the appeal and entered judgment for the council. Mr. Justice Ridley, in the course of his judgment, said the reason of the delay and of the failure by the council to perform their obligation to give possession of the site was the interference of a third person, a mere trespasser, over whom the council had no control. If the decision of the Official Referee were right it would be difficult to define any limit to the liability of a building owner. The obligation to give possession was based in the builder's contract to complete the work in a given time. Therefore the liability put on the building owner had relation to the contract. There was no reason to be deduced from the position of the parties to the agreement why one of them rather than the other should be held to assume responsibility in the event of accidents which rendered performance impossible. In his opinion the council did not insure that prompt possession and use of the site should be given; they merely undertook to give possession so far as their own acts and ability were concerned, but not otherwise. Mr. Justice Bankes concurred.

WATER SUPPLY.—In *Bristol Guardians v. Bristol Waterworks Company* (House of Lords, February 6th) the guardians appealed from the decision of the Court of Appeal holding that they were not entitled to have a supply of water at the domestic rate to certain work-houses, offices, and homes for children. Water was supplied by the company to these premises by meter at the rate of 1s. per 1,000 gallons, part of the water being used for domestic and part for non-domestic purposes. The guardians claimed to be entitled to take these supplies separately, and to pay for the water used for domestic purposes at the domestic rate. By sec. 53 of the Waterworks Clauses Act, 1847, every owner of a "dwelling-house" is entitled, on complying with certain conditions, to demand a sufficient supply of water for domestic purposes, and by sec. 68 water-rates are to be payable according to the annual value of the tenement supplied. This Act is incorporated by the Bristol Waterworks Act, 1862, sec. 62 of which requires the company, at the request

of the owner or occupier of a "private dwelling-house," to furnish a supply of water for domestic purposes at water rents based on the rental value of the premises. Thus there is a discrepancy between the provisions of the special Act and those of the public Act incorporated therewith as to the kind of premises in respect of which a supply at the domestic rate can be claimed. The questions for determination, therefore, were whether this section of the local Act overrides the provisions of the public Act so as to limit the right of supply at the domestic rate to private dwelling-houses, and, if so, whether a workhouse is a private dwelling-house within the meaning of the local Act. The Court of Appeal answered the first question in the affirmative, and the second in the negative (Lord Justice Fletcher Moulton dissenting as to the first). The House of Lords affirmed this decision. Lord Loreburn said that if there was a blunder in the special Act, it was not their Lordships' function to repair that blunder; but it was for Parliament to say whether it would interfere. Lords Atkinson, Parker and Sumner concurred, and the appeal was dismissed with costs.

QUERIES AND REPLIES.

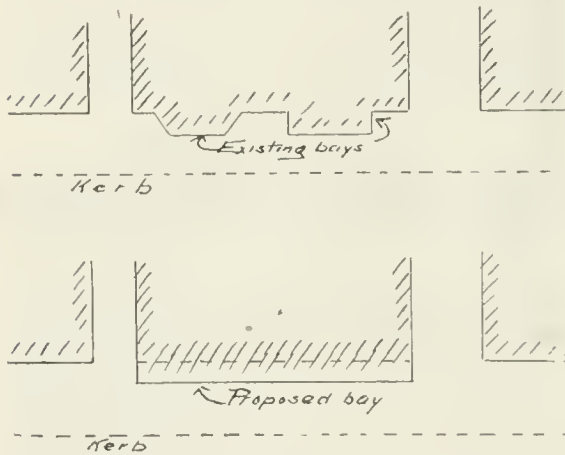
In order to avoid confusion querists are requested to use distinctive words as *noms de plume*. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

WATER SUPPLY: STANDPIPE FOR WASHING CAR: DOMESTIC PURPOSES.—"Hazelwood" writes: (a) In view of the ruling of the High Court in *Harrogate Corporation v. Mackay* (1907), 2 K.B., 211, that the supply of water to a medical practitioner for the purposes of washing his motor car when used for professional purposes is a domestic supply—(1) Do you think, under the Waterworks Clauses Acts, 1847 and 1863, a doctor can demand the right to fix a separate standpipe within the garage to facilitate the washing of the car on the ground that the supply of water is for domestic purposes, without entering into an arrangement with the company to pay a rental for the pipe? (2) When the standpipe has been in existence for four years or more without the knowledge of the company, can the company now enforce payment of a rental after giving the doctor notice? (3) Would the serving of a demand note containing a special rental for the standpipe be held to be a sufficient notice when the doctor immediately protested against the charge on the receipt of the demand? (b) A premises in my district is assessed at £40 nett, and includes a dwelling-house, the front of which has been converted into a fish shop and a butcher's shop. At the back there is a small slaughter-house and a stable where horses are kept for trade purposes—within the same curtilage as the dwelling-house. In charging the water rate on the premises the following rates were made: (1) 5 per cent on the nett rateable value (£40) to cover the supply of water for domestic purposes on the whole of the premises. (This is in accordance with the special Act.) (2) 5s. 3d. per quarter for extra water consumed for trade purposes in the fish shop, on the assumption that such a supply is non-domestic. (3) 5s. 3d. per quarter for extra water used in the stable and slaughter-house, on the ground that the supply is non-domestic. It is contended that under the recent decision of the House of Lords in *Metropolitan Water Board v. Avery* (58 Solicitor's Journal, 171), the water used in the fish shop is a domestic supply. The Special Act contains no special powers. Please advise.

(a) (1) Sec. 19 of the Waterworks Clauses Act, 1863, prohibits a consumer from affixing "any pipe or apparatus" to a pipe belonging to the company, or to a communication or service pipe belonging to or used by the consumer, or from making any alteration in any such communication or service pipe, or in any apparatus connected therewith, without the consent, in every case, of the company. This provision would certainly appear to prevent a doctor from affixing a standpipe to any such pipe as referred to in the section, in the absence of the company's consent; and there seems to be no reason why the company should not make their consent conditional on a rental being paid for

the standpipe. It has been decided that the addition of a stop-tap to a service pipe requires the consent of the undertakers under this section, even although it could not lead to any misuse or waste of water (*Williams v. Llandudno Urban District Council*, 42 *Solicitor's Journal*, 34). (2 and 3) Assuming the erection of the standpipe to have been a contravention of the section, the person who erected it was liable to a penalty not exceeding £5, without prejudice to the right of the company to recover damages from him in respect of any injury done to their property, and without prejudice to their right to recover from him the value of any water wasted, misused or unduly consumed. The existence of a pipe, &c., erected without consent, is not made a continuing offence by the section, and it is too late now to take proceedings for the penalty. Although the company, if applied to for their consent, might have demanded a rental as the price of such consent, I do not see how they could now enforce such a demand. They could, however, recover the value of water "wasted, misused, or unduly consumed," from the person who erected the standpipe. (b) The ground of the decision in *Metropolitan Water Board v. Avery* was that, although the water was used in the trade of a restaurant proprietor, it was actually used for "domestic purposes," such as cooking and washing up plates and dishes. The question, therefore, is for what purposes is the water actually used in the shops, stable, and slaughterhouse? If it is used for purposes which can be properly termed "domestic," then, according to this decision, the supply is a supply for "domestic purposes," notwithstanding that the premises are used for trade. Water for the use of a horse and the washing of a carriage in a stable was held to be for domestic use as far back as 1858 (*Bushby v. Chesterfield Waterworks Company*, 22 J.P., 689).

PUBLIC HEALTH (BUILDINGS IN STREETS) ACT, 1888.—"H. W." writes: I thank you for your reply to my query. [See *THE SURVEYOR* for December 19th, p. 941.] The existing bay is one of the ordinary type,



and the proposed one will not project further beyond the front main wall, but will extend to the whole frontage of the house. I enclose a plan. In these circumstances have the council power to disapprove the plans?

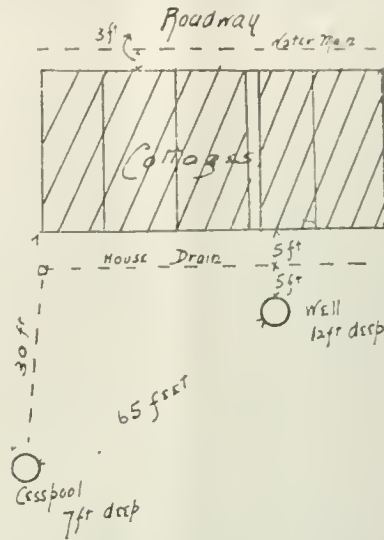
This is a point under the Act which does not seem to have been decided. Reading sec. 3 literally there seems to be no doubt that the proposed alteration would be a contravention thereof, because it prohibits the bringing forward of "any part" of the building. Upon the whole I am of opinion that, in strictness, the council have power to disapprove the plan.

LANDLORD AND TENANT.—"Ajax" writes: A let a house to B for the purpose of a nursing home upon a yearly tenancy at a clear rental, A being responsible only for the maintenance of the main walls, roofs and outside spoutings. Having regard to the fact that the house was to be used as a nursing home, the following clause was inserted in the agreement: "The said tenant agrees to keep the interior of the said premises, the fixtures, locks, bolts, fastenments, blinds, glass and sashcords in as good condition as the same shall be at the commencement of the tenancy, damage by fire excepted, and also do all necessary decoration to the interior of the premises free of all cost to the landlady." B now wishes to terminate the tenancy, and incoming tenants are willing to take the house, but, having regard to the fact that the house has been used for the treatment of sick people, they wish the rooms repapered and decorated, and make this a condition of the taking. Your opinion is asked as to the construction of the before-mentioned clause—viz., if, in considering the nature of the tenancy (which was properly disclosed at the commencement), it is competent for A to call upon B to bear the expense of redecoration for the incoming tenant.

A clause of this kind is always rather difficult to construe, owing to the uncertainty of the sense in which the word "necessary" was intended by the parties to be understood. The general rules as to the construction of agreements are that the construction should be reasonable, liberal, favourable, and allowing for the popular sense of words, and that the whole contract is to be looked to. It is easier to state these principles than to apply them, but upon the whole I think B is bound to do such decoration as may

be necessary to render the house reasonably fit for occupation, having regard to the use to which it has been put.

WATER SUPPLY: WELL.—"Anxious" writes: The accompanying diagram shows five cottages which obtain their water from a shallow well, as shown. I shall be pleased to know whether the local authority can enforce the owner to lay on water from the water main, as shown, to the cottages, and close the well, if



the water is found to be pure. Can the local authority proceed on the grounds that the well is likely to be polluted on account of the drain and cesspool, as shown?

If the water in the well is so polluted as to be injurious to health the authority can take proceedings to have it closed under sec. 70 of the Public Health Act, 1875. In the notes to the latter section in "Lumley's Public Health Acts" (7th edition), p. 148, it is stated that: "The well . . . must be alleged to be polluted, not merely likely to be polluted, even if this is practically certain. The section would therefore not meet the case of the opening of a burial ground in close proximity to a well." But under sec. 62 of the Act the authority can compel the owner to take a supply from the main if it appears to them (on the report of their surveyor) that the houses are without a proper supply. This appears to leave it to their discretion to decide whether, having regard to all the circumstances, the supply is a proper one. No doubt they must exercise that discretion reasonably, and if the owner is aggrieved by their decision he can appeal to the Local Government Board under sec. 268. But if it is practically certain that the water in the well, though now pure, will become polluted in a short time, I think the authority would be justified in concluding that the houses are without a proper supply, and giving notice to the owner, under sec. 62, though they could not close the well until it actually became polluted.

PRIVATE STREET WORKS.—"P. S. W." writes: My council propose to make a portion of the length of a street under sec. 150 of the Public Health Act, 1875. This street is at present only 18 ft. wide, and is built up on one side only, the whole length of the opposite side being taken up by allotment gardens. At no distant date this street will, in all probability, be widened to a width of 36 ft. (a strip being taken from the allotments to widen the street), and houses erected on the opposite side. For the present it is proposed to construct a footpath, with kerb and channel, on the built-up side only, pitching and metalling the remainder of the present width to form the roadway. (1) Should the owners of the allotments be charged, according to their frontage, with a proportion of the work it is now proposed to do? (2) If so, and at some future time the allotment holders decide to develop their land, can the owners of the present built-up side be charged with a proportion of the cost of street works on the widened portion of the street? (3) If the council formally adopt the existing road, when made up, will they be committed to carrying out the street works on the widened portion when such widening takes place? (4) If the allotment holders should decide to at once develop their land, giving up sufficient to widen the street to 36 ft. (by-law width), I presume the whole cost of street works could be properly apportioned, according to frontage, on both sides.

(1) Yes. (I assume, though it is not so stated, that the street is not repairable by the inhabitants at large.) (2) No. Their premises would not front or abut upon the added strip. (3) No. (4) Yes.

ERRATUM.

At p. 290 *ante*, first column, line 5, for "1892" read "1907."

SOME RECENT PUBLICATIONS.*

AN OUTLINE OF LOCAL GOVERNMENT AND LOCAL TAXATION IN ENGLAND AND WALES (EXCLUDING LONDON). By Sir Robert S. Wright and the Right Hon. Henry Hobhouse. Price 7s. 6d. London: Sweet & Maxwell, Limited.

Originally published some thirty years ago, when the reform and simplification of local government was a matter of pressing public importance, this little work has proved so useful that further editions have been called for from time to time. The system as it existed when the book was first published has been vastly improved by the passing of the Local Government Acts of 1888 and 1894. Moreover, the powers and duties of local authorities have been increased out of all knowledge since that time by a large number of statutes. This book has been revised from time to time to incorporate the changes which have taken place, and it still maintains its position as the most authoritative account of our local government institutions within so small a compass. The first part of the work is devoted to an account of the units of local government, separate chapters being given to the parish, the poor-law union, the rural district, the urban district, the municipal borough, and the county. In the second part the several matters of local administration are dealt with, separate chapters being given to the more important, among which we may mention public health, highways, allotments and small holdings, working-class dwellings, drainage and embankment, and many others. Some account of the less important services is contained in the final chapter of this part, so that it is safe to say that no matter has been overlooked. The final part of the book contains an account of local finance, including valuation for local rates and local accounts, local taxation, and loans. In addition to the general index, there is a very useful index of Parliamentary Papers and Debates. Altogether, it would be difficult to conceive a better book than this for the official or student who desires an authoritative yet concise account of the several authorities, their areas, powers and duties, and of the financial basis upon which our local government institutions rest.

REINFORCED CONCRETE RAILWAY STRUCTURES. By J. D. W. Ball, ASSOC. M. INST. C. E. Price 8s. nett. London: Constable & Co., Limited.

This work forms one of the "Glasgow" series of text-books of civil engineering issued by Messrs. Constable under the general editorship of Prof. G. Moncur, B.Sc., M. INST. C. E., and in it the author deals with the application of the principles and processes of reinforced concrete construction to those structures which come within the practice of the railway engineer. The first three chapters are devoted to the consideration of preliminary matters, bending and shearing stresses, and are followed by separate chapters on Floors and Buildings, Foundations and Rafts, Retaining Walls, Bridges, Arched Bridges, and Sleepers and Fence Posts. A very useful final chapter consists of a summary of notation and formulæ. The author has avoided mathematical treatment and adopted graphic methods of procedure wherever possible; further, he has constantly kept in view the practical requirements of the designer, and by the aid of several curve diagrams, calculations can be made with ease and expedition. Moreover, a considerable number of worked examples are included, these covering the great majority of the problems which would occur in practice.

ELECTRO-THERMAL METHODS OF IRON AND STEEL PRODUCTION. By J. B. C. Kershaw, F. I. C. Price 8s. 6d. nett. London: Constable & Co., Limited.

In preparing this work the author has sought to amplify and bring up to date the information relating to electric methods of smelting and refining iron and steel that was presented in his earlier book published some six years ago. It is designed to meet the requirements of men actually engaged in the steel industry rather than for the constructors of large furnaces. Thus, the consideration of the theoretical side of the subject is confined to a general sketch of the scientific principles of electric heating together with the broad lines of furnace design. The main part of the book is occupied with full details of actual instal-

lations of various types, their methods of operation and summaries of the working costs and tests of the raw materials and finished steel. All improvements in design or method of work which have taken place since 1907 are fully dealt with in separate chapters. We fully endorse the view expressed by Dr. J. A. Fleming, F.R.S., in his introduction, that Mr. Kershaw's book may be strongly recommended to those iron and steel manufacturers who are first concerned to know what has already been done, and what are the proved points of value in electrical methods of production.

THE MAINTENANCE OF FORESHORES. By Ernest Latham, ASSOC. M. INST. C. E. Price 2s. nett. London: Crosby Lockwood & Son.

The subject of coast erosion and protection is of such vital importance that a handbook which treats each problem connected with it in a simple, practical and concise manner cannot fail to be of use not only to engineers, but also to many whose interest is only that of laymen. In the first section of this little work Mr. Latham deals with the classification of coast erosion, while the second section, contributed by Mr. A. E. Carey, M. INST. C. E., treats of the findings of the Royal Commission which sat from 1906 to 1911. The next two sections are respectively concerned with the protection and drainage of low-lying lands, and are followed by a section on the protection of high lands. Colonel Crompton, consulting engineer to the Road Board, contributes an article on the surfacing of promenades. Finally, there are chapters on considerations prior to the commencement of structural work on foreshores, and on materials and construction. The author only claims for this little book that it is a *résumé* of a wide and complex field of engineering practice. Although compressed into a small scope, the work has been written thoroughly and clearly, and with a keen eye to those practical points upon which the engineer is most likely to need some assistance.

THE GARDEN CITY. By C. B. Purdom. Price 10s. 6d. nett. London: J. M. Dent & Sons, Limited.

This fascinating work makes its appearance just ten years after the making of the garden city of Letchworth was begun, and it contains an account of the building and development of the town, and a timely restatement of the original ideas that brought it into being. The bold ideal of Mr. Ebenezer Howard, which resulted in the launching of the scheme for the creation of a city containing within itself all the elements of healthy expansion, has been realised to a remarkable extent, and the story of Garden City in the making forms most interesting reading. Mr. Purdom is specially qualified for the task he has undertaken, inasmuch as he has been concerned in the building of the town, and has first-hand knowledge of all the events of its remarkable growth. The growth and life of Garden City in all their aspects are dealt with in this work, which includes chapters on (*inter alia*) architecture, gardens, open spaces and the rural belt, churches and inns, arts and recreations, industries, workmen's cottages, health, and finance. Special matters affecting the scheme are dealt with in a series of appendices contributed by experts. There are four beautiful pictures in colour, and many half-tone and other illustrations. The book forms a thoroughly worthy record of a great enterprise.

VALUATIONS AND COMPENSATION. By Baister Fletcher, F.R.I.B.A., &c. Fourth Edition, by the Author and H. P. Fletcher, F.R.I.B.A. Price 7s. 6d. nett. London: B. T. Batsford.

This well-known standard text-book has been thoroughly remodelled and revised to bring it abreast of the recent developments in valuing practice, and to incorporate the results of recent legislation, which have brought the surveyor's profession into greater prominence and importance. The necessary changes which have accompanied this process have caused the book to be almost completely transformed; the number of pages has been more than doubled, owing to the introduction of several new chapters, such as those on Valuations for Rating, for Mortgage, and in connection with the Finance Acts, 1909-12. All of these are fully dealt with, and elucidated with numerous examples of the working out of actual valuations such as the surveyor meets with in practice. Fresh valuation tables have been added, and yet, by careful arrangement, all these additions have been made without detracting from the handy character of the book, and with only a slight addition to the price, which still remains at a very moderate figure for so valuable and comprehensive a work.

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

CONSTRUCTION AND RESURFACING OF ROADS.

WESTRUMITE ASPHALT.

We have received an illustrated booklet from the British Westrumite Asphalt Company, Limited, which acquired the sole rights for the manufacture of Westrumite asphalt and for the exclusive working of the system in the United Kingdom.

Mr. L. S. van Westrum, who is the inventor of the process, and is chairman of the British company, was also the inventor of a preparation known as the "Westrumite dust layer," which was introduced into this country some ten or twelve years ago. That liquid material, which was a preparation of mineral oil, was applied by water-cart to macadam roads for the purpose of laying dust, for which it proved very effective, being at the present time largely used on the Continent. Some eight years ago, however, Mr. van Westrum had the foresight to realise the future requirements in the construction and resurfacing of roads which the advent of motor vehicles would necessitate, and he therefore turned his attention to

asphalt remains fluid, being of the consistency of treacle. This liquid state, however, is only temporary, and it is a remarkable fact that while in this state Westrumite asphalt has no binding qualities whatever. On the contrary, it acts, so to speak, as a lubricant, coating and lubricating every particle of the mineral aggregate with which it is being mixed. This would not be possible if Westrumite asphalt while in this state had any binding power. When, however, it becomes exposed to the air, Westrumite asphalt rapidly changes from a fluid to a solid, it recovers again its original natural qualities—viz., that of asphalt, which it really is, and instead of acting as a lubricant it becomes an extremely strong asphalt binder.

The most simple way of explaining the construction or the surfacing of roads with Westrumite asphalt is to take, by way of an illustration, the mixing and laying of cement concrete, the only difference being that in this case the binder is natural asphalt instead of cement, the method and the labour-cost being about equal in each case. We observe, by the company's specifications, that, owing to its



WESTRUMITE ROAD IN ANTWERP.

the invention of a process by which the use of natural asphalts, such as Trinidad and Bermudez, as a binder might be simplified. In this he was successful, and the construction of experimental roads on an extensive scale was then started. This was eight years ago, and it was not until the beginning of 1911 that he decided the time was ripe for forming public companies in various countries to operate the system, as, before he would entertain utilising outside capital, he determined that his roads should have stood a test of at least five years under general traffic. During those five years about 2,000,000 sq. yds. were laid, and in 1911 the first European company was formed. In all nine companies have now been formed, five in the United States and Canada, and three on the Continent, the British company being the most recent.

Westrumite asphalt is composed of the best natural asphalts, such as Trinidad Lake and Bermudez asphalt. These asphalts are brought into a liquid state at the company's works by a special process protected by Letters Patent. The finished product is then filled into casks, when it is ready to be despatched to the place where the road work is to be done. There the Westrumite asphalt is mixed with the mineral aggregate cold in a concrete mixer or by hand, during which process the Westrumite

nature, Westrumite asphalt can be used in many ways, for while specifications "A" and "C" are for construction or resurfacing of roads with a 2-in. wearing surface on concrete or macadam foundations, there is specification "D" which provides for the surface-flushing of water-bound macadam roads with a mixture of Westrumite asphalt and limestone dust.

Westrumite asphalt also applies (under a separate specification) to the flushing or void-filling of tar-macadam roads. If, after the tar-macadam has been thoroughly rolled and consolidated, and while the very small interstices are clean, the whole surface is flushed with Westrumite asphalt and limestone dust, an asphalt surface is at once given to it, as a result of which it is hardened and rendered waterproof. Another important feature claimed for this material is the simplicity of its use for the repair of trenches, an operation which can be carried out by an ordinary roadman with Westrumite asphalt and screenings and the use of a rammer, no heating plant being required.

The accompanying view shows a Westrumite road in Antwerp constructed in 1911, since when there have been hauled over it all the materials employed in the erection of about fifty houses. Wagons carrying loads of 12 tons on wheels with 2½-in. tyres are common, notwithstanding which the surface remains in excellent condition.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

Mr. W. H. HALL, to whom was awarded a moiety of the premium for January, has selected the following books:—

- "Further Problems in the Theory and Design of Structures," by Ewart S. Andrews (Chapman).
- "Elementary Principles of Reinforced-concrete Construction," by Ewart S. Andrews (Scott, Greenwood & Son).

These have been duly forwarded.

QUESTIONS.

This week answers are invited to the following questions:—

379. Testing Pipes.—What tests should stoneware pipes be subjected to before they are accepted for use? What defects are often thereby disclosed? (B. W., *Tadcaster*.)

380. Belt Cearing.—A belt running at 1,500 ft. per minute transmits 80-horse power. Find the difference of tension of the two sides of the belt. (T. R.)

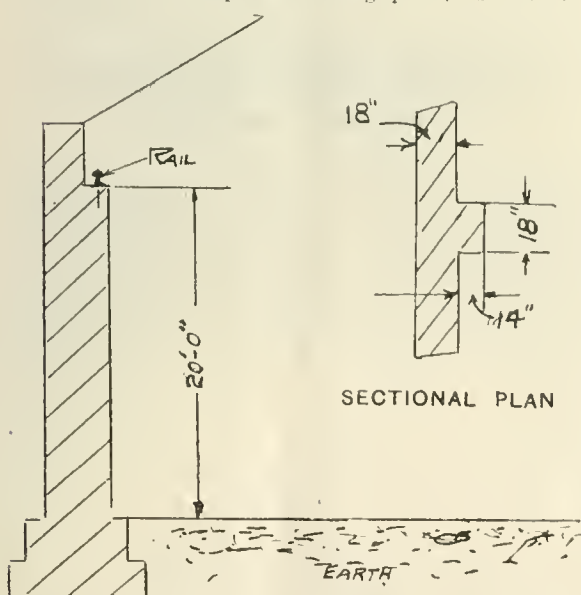
381. Town Planning.—An area of 1,000 acres, chiefly undeveloped, in an urban district, is to be included in a town planning scheme. The approximate number of owners, occupiers and lessees is 250. Assuming that the referencing is to be done by the staff of the urban district council surveyor's office, state the information which should be sought, and the best method of ascertaining and recording it. Give an estimate of the cost of the work if done by professional referencers. Compare the advantages and disadvantages of the two methods, both in the above case and in the case of an area of 1,500 acres in the same district, which includes a considerable extent of partially developed building estates, and is to form the nucleus of a later scheme. (Togun.)

382. Fire Hydrants.—Fire hydrants, 2½ in. in diameter, are taken from a 4-in. and a 12-in. main. What will be the ratio of discharge in the two cases, assuming that the initial pressure is the same in each main? (X. X., *Hounslow*.)

383. Grain Silo.—It is required to construct a grain silo, the bins of which are 64 ft. in height and 8 ft. square in cross-section. What lateral pressure at the base should be provided for? (X. X., *Hounslow*.)

REPLIES TO QUESTIONS.

377. Machine Shop.—An electric crane is to be fitted in a machine shop on existing piers, as shown in



VERTICAL SECTION THROUGH WALL AND PIER.

sketch. The piers are bonded into the wall, and about 12 ft. centres. Assuming the foundations are good,

and the work is in Staffordshire brick set in cement and sand, what is the safe load these piers will withstand? (H. W., *Cradley Heath*.)

The pier is under the influence of a direct compressive stress due to the weight of the pier, and to bending stresses due to the load not being applied at the centre of the section.

Let P lb. be the maximum load that can be applied. W lb. be the weight of the pier.

A be the area of the pier in square inches.

Then direct compressive stress = $\frac{W + P}{A}$ = f_a lb. per sq. in.

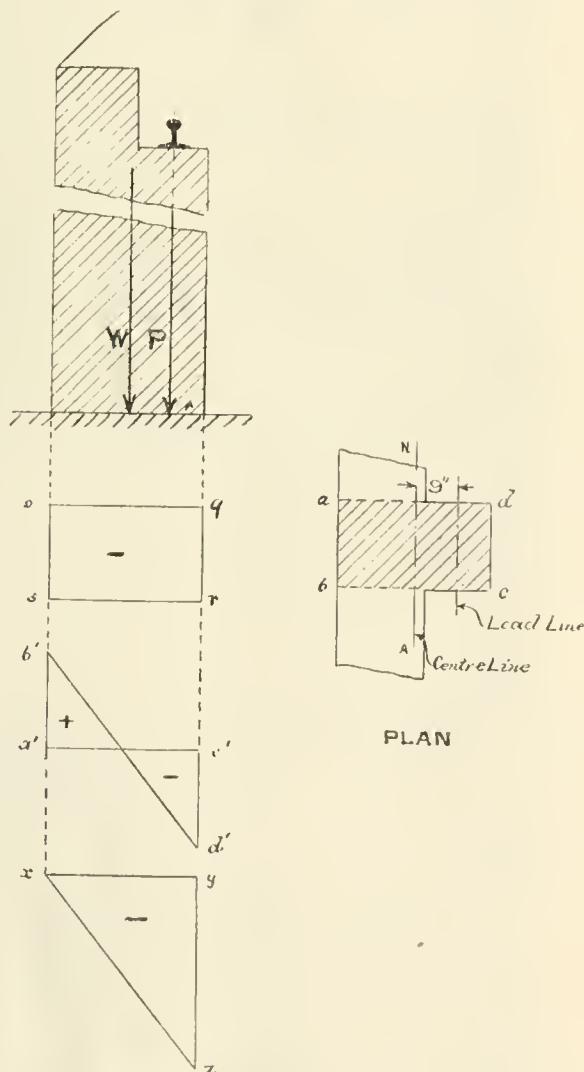
$$A = 18'' \times 32'' = 576 \text{ sq. in.}$$

The weight of 1 cubic foot of Staffordshire brick is 135 lb. (Molesworth)

$$\therefore W = \frac{576}{144} \times 20 \times 135 \text{ lb.} = 10,800 \text{ lb.}$$

$$\therefore f_a = \frac{10,800 + P}{576} \text{ lb. per sq. in. (compression)}$$

This stress will be uniform over the whole section, and may be represented by the rectangle *pqrs*.



The stresses due to bending alone will be tensile on one side of the section (*ab*), and compressive on the other (*cd*). The neutral surface, a plane in which there is no bending stress, bisects the section, and is indicated at *NA*.

The magnitude of the bending stresses depends upon the bending moment applied to the section, and varies inversely as the modulus of the section.

The bending moment upon a pier is found by multiplying the load by its eccentricity. In this case

the load is applied at 9 in. from the centre of the section.

$$\therefore M = P \times 9 \text{ in. lb.}$$

Using the basis formula for bending—

$$M = f_t Z_t = f_c Z_c$$

where f_t, f_c = tensile and compressive stresses
 Z_t, Z_c = moduli for tension and compression

the magnitude of the maximum tensile and compressive stresses in the planes ab, cd may be determined.

As the section of the pier is symmetrical about the neutral axis N.A., $Z_t = Z_c$ and therefore $f_t = f_c$

The modulus of the section $abcd$ about N.A. = Z

$$Z = \frac{B \cdot D^3}{6} \text{ where } B = ab \text{ and } D = cd$$

$$= \frac{18 \times (32)^3}{6} = 3,672 \text{ in}^3$$

$$\therefore \text{Bending stresses } f_t = f_c = \frac{M}{Z}$$

$$= \frac{P \times 9}{3,672} \text{ lb. sq.}$$

$$= \frac{P}{341.33} \text{ lb. sq. in.}$$

The limiting conditions of loading will be realised when the extreme tensile stresses at the base of the pier are balanced by the direct compressive stresses. This condition is found by equating f_t and f_a .

$$\text{i.e., } \frac{P}{341.33} = \frac{10,800 + P}{576}$$

$$\therefore \frac{P}{341.33} - \frac{P}{576} = \frac{10,800}{576}$$

$$\therefore P = \frac{10,800 \times 341.33}{234.67} = 15,700 \text{ lb.}$$

$$= 7.01 \text{ tons}$$

Thus, 7 tons is the greatest safe load that can be applied to this pier in the position shown.

The case may be represented graphically as in the diagram.

$pqrs$ represents the distribution of direct compressive stress.

$a'b'c'd'$ represents the distribution of bending stresses, $a'b'$ being the extreme tensile stress, and $c'd'$ the compressive, and $a'b' = ps$ as above

The resultant stresses upon the pier are obtained by combining the two diagrams, and are shown at xyz .

There is no stress on the face ab of the section at the base of the pier, but the compressive stress is twice the direct stress; but Staffordshire brick is amply strong enough to take this load.

There will be tensile stresses in the brickwork above the bottom section of the pier, but these will never exceed 15 lb. per square inch calculated as above, and the load transmitted by the roof has not been allowed for in neutralising the tensile stresses. Hence, this tension may be neglected, and, moreover, it is well known that good mortar will safely stand 25 lb. per square inch in tension. (H. V. O., West Bromwich.)

378. Cost of Running Steam Engine.—Compare the cost of running a steam engine with that of an electric motor in the following circumstances: The horse-power required is 30; electricity costs 1d. per unit, coal (best steam) costs 18s. per ton delivered; the engine is required to drive a stone crusher working an average of eight hours per day for five days per week. (Crusher.)

In making a comparison of two engines for a certain duty, the initial outlay involved and the suitability of the engine for its work must be considered as well as the running costs.

Comparing the steam engine and motor, we find that a vertical engine with vertical boiler complete, 30-h.p. and 130 r.p.m., will cost from £90 to £100. A D.C. motor, running at 750 r.p.m. on 220 volts, will cost £120.

The work the engine must do is continuous, and its nature indicates that the engine must be capable of resisting shocks and sudden overloads. These conditions indicate the advisability of a steam engine with a belt drive.

The steam engine, being an independent power unit, may be used in any desired place, whereas the motor can only be used in situations where power cables are at hand, and this is not always the case at stone quarries.

On the other hand, if the crusher is installed at

a highway depot, where space may be of importance, a motor would be very convenient.

The running of the engine would be superintended by the hands at the stone crusher, but the steam engine would require more time than the motor on account of stoking.

The running cost for one week's work may now be analysed, commencing with the heaviest item— motive power.

Coal.—The coal consumption of the steam set will be 5 lb. per indicated horse power per hour (see Molesworth)—i.e., 5 lb. \times 30 = 150 lb. of coal required per hour.

There are forty working hours per week.

$$\therefore \text{Weekly coal consumption} = 40 \times 150 \text{ lb.} = 6,000 \text{ lb.}$$

$$\therefore \text{Weekly cost at 18s. per ton} = \frac{6000}{2240} \times 18s.$$

$$= 48s.$$

$$= \text{£}2 \text{ 8s. 6d.}$$

Electricity.—1 unit of electricity is 1 kw.-hour; 1 kw.-hour is equivalent to 1.31 h.p.-hours.

Cost of 1 unit is 1d.

$$\therefore \text{Cost of 1 h.p. hour} = \frac{1d.}{1.31} = \text{746d.}$$

$$\therefore \text{Cost of running 30 h.p. motor for a week of 40 hours}$$

$$= 746 \times 30 \times 40 \text{ pence}$$

$$= 85d.$$

$$= \text{£}3 \text{ 13s. 9d.}$$

The depreciation on an engine per week may be only roughly estimated. The probable life of the engine is taken, and the initial cost is then divided by the number of weeks.

Taking the probable life of the steam engine at fifteen years,

$$\therefore \text{Weekly allowance for depreciation} = \frac{\text{£}90}{52 \times 15} = \text{2s. 6d.}$$

The life of the motor may also be taken at 15 years.

$$\therefore \text{Weekly allowance of depreciation on motor} = \frac{\text{£}120}{52 \times 15}$$

$$= \text{3s. 0d.}$$

The repairs and attention to the steam engine and boiler will be higher than for the motor, and the cost of water will be an added item, which will vary with the situation of the plant owing to extra labour in carting.

The following is a summary of the weekly expense of running a steam engine and motor:—

	STEAM ENGINE.		ELECTRIC MOTOR.	
	£	s. d.	£	s. d.
Coal 40½ cwt. ...	2	8 0	Power—1,200-h.p. hours ...	3 13 9
Depreciation ...	0	2 6	Depreciation ...	0 3 0
Repairs & attention ...	0	7 6	Repairs & attention ...	0 2 6
Oil and waste ...	0	4 0	Lubricants ...	0 1 0
Water ...	0	5 0		
Total... ..	£3	7 0	Total	£4 0 3

(H. V. O., West Bromwich.)

THE TOWN PLANNING INSTITUTE AND MUNICIPAL ENGINEERS.

As an outcome of the representations made to the Town Planning Institute by the council of the Institution of Municipal and County Engineers, it has been resolved that in addition to the Institution of Civil Engineers, the Royal Institute of British Architects and the Surveyors' Institution, membership of the Institution of Municipal and County Engineers shall be accepted as a qualification on equal terms with the societies mentioned above.

The use of the rooms of the institution is to be offered to the Town Planning Institute for the purposes of their meetings.

Rail Corrugation.—A paper entitled "Rail Corrugation and its Causes" will be read by Mr. S. P. W. D'Alte Sellon, M.INST.C.E., at a meeting of the Institution of Civil Engineers on Tuesday evening next.

Change of Address.—After March 1st next the address of the honorary secretary of the Association of Managers of Sewage Disposal Works, Mr. Chas. H. Ball, will be Corporation Sewage Works, Davyhulme, near Manchester.

The Surveyor

And Municipal and County Engineer.

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SURVEYORS' MOTOR CARS.

LIVERPOOL CITY ENGINEER'S REPORT.

The taxation of surveyors' means of locomotion was the subject of a report received from Mr. J. A. Brodie, city engineer of Liverpool, at the last meeting of the council of the Institution of Municipal and County Engineers. Mr. Brodie says:—

"After discussing the above matter with our town clerk, he agrees that the authorities solely responsible for the administration of the motor car licence duties in England and Wales are the various county councils and county borough councils, but any decision to exempt surveyors' vehicles, &c., from the payment of taxation licence duty would, in the absence of any express authority in the Act so to do, be open to criticism by the Government Department to whom the proceeds of motor taxation are paid; which funds are afterwards allocated among the various authorities through a board appointed for that purpose.

"Up to the present I have been unable to get a remission of the taxes in Liverpool, and I am afraid that personal applications are not likely to be successful. I think, however, that it might be well for the institution to consider the desirability of asking the Chancellor of the Exchequer to include a clause in the next Finance Bill to exempt surveyors' motor cars from taxation, for which there are two precedents—viz.:—

"(a) The Locomotives Act, which exempts payment for steam rollers, and

"(b) The Finance Acts, which prescribe payments of half rates for doctors' motor cars."

Action is to be taken to give effect to Mr. Brodie's suggestions.

The Cheltenham Road Conference.—At the last meeting of the council of the Institution of Municipal and County Engineers, the secretary reported that Sir George Gibb intended, if possible, to be present at the conference to be held at Cheltenham, and would probably open the proceedings with an address.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS: ELECTION OF COUNCIL.

To the Editor of THE SURVEYOR.

SIR,—With your permission, I wish to make the following appeal: Corporate members of the institution will soon be called upon to cast their votes. May I appeal to each member to use his vote carefully and deliberately, and to see that it is lodged in time to be recorded?

With an institution of forty years' existence, and some 1,500 members, one would have thought that they could govern the profession and that everything would be well for its members. Instead of this we find men who have been educated and artied turned out into the world, scrambling for positions at a remuneration that would be, and is, looked upon with scorn by a bricklayer.

When successful, these men are struggling with cost of tuition, of examinations and of institution fees, and then very often ultimately only to find that they belong to the wrong institution, or not sufficient institutions, and are debarred from the sweet and refreshing fruits of the profession.

Should this be? I think not, and most members will agree with me. I do not wish to disown the council, or belittle their efforts. They are admittedly the best of the profession, and in their way do their best for the good of the institution, and accordingly deserve our best thanks. Unfortunately, things are not what they should be, and the council, though individually honoured men of the profession, are collectively as a council not, in my opinion, in full understanding of the present-day situation of the majority of the members of the profession. Their methods to me appear to be wrong, and I often think as an institution we would do well to start afresh upon different lines.

Our council strive after abstract things while its members require things material and concrete. Let me give an illustration: A district meeting is held and papers are read and discussed, and here the efforts of the council apparently cease. Later that particular town requires an engineer or assistant; here our men, who may perhaps have assisted in the paper or discussion, are debarred, and other men with other qualifications are sought for. If the knowledge expounded at the meeting is not edifying and does not qualify, why expound at all? Our men must be content to pass examinations, hold membership, pay subscriptions, attend meetings, and generally best qualify themselves for the posts, and then are forced to watch others step in and claim the positions. I do think our council should see that, if our institution does intend to govern the profession, it should do so to the full. If our examination is not the best, then it should be made the best, likewise the membership, and then see that they are fully recognised. As an alternative, let us cease to exist as an institution. Our institution specialises in municipal and county work, and these works solely, so surely it is our due that we should claim these appointments.

Our council should be practical, as well as theoretical, and in addition to an examination board they should form an appointments board to regulate, form rules of conditions, remuneration, qualifications, &c., in a manner similar to that in which the Royal Institute of British Architects regulate competitions; and in this way complete the work they commence in forming the institution and holding examinations.

I am afraid we must hold our present council responsible for letting town planning slip through their fingers into other hands. Surely it was our duty solely to govern town planning. Again, our council are theoretical: they will charge fees, hold examinations, but another institute will call the tune while we pay the piper. This is one more of the many institutions that we will be expected to join. It is a matter of paying and smiling; no wonder we have no money left to pay for our own defence fund. This fund failed, and I feel sure on one score only—viz., the fee was too high and threatened to break the bank. Had it been low (if only to commence

with), as in another institution, I feel sure it would have been a great success.

Before reforming the council was not representative, and now, although there is district representation, we are still unrepresentative institutionally.

Our corporate members number 1,498, or thereabout. Of these 1,038 are non-members of the Institution of Civil Engineers, while the other 450 are corporate members of the Institution of Civil Engineers. How are these represented upon the council? The 1,038 have at the most two members, while the 450 have thirty-five members. Thus the influence of the Institution of Civil Engineers may dominate. Remember, this is a rival institution which (shall I say?) encroaches upon our preserves, and only too frequently rivals or may supplant our qualification.

To illustrate to what extent this influence may predominate our council, may I refer the members to the new additional list to the board of examiners? There are upon that list eighteen, of whom fourteen are corporate members of the Institution of Civil Engineers, while only ten testamur holders can find a place thereon. I say nothing against these fourteen; they are honoured men of standing who will honour the board; but I do say when we have some 557 (at least) testamur holders upon our membership list we can find among them eighteen worthy and capable men who are first entitled to a seat upon the board. These testamur members have experience of the examination, have paid examination fees, supported the examination and set the example, and the council should honour them in return.

What is wanted are some additional non-members of the Institution of Civil Engineers upon our council, some younger men who know what it is to be in the present-day fight, who know the difficulties of keeping pace with modern qualifications of the too numerous institutions, and the expense, &c., attached thereto—men who will fight the rights of and demand full recognition for our institution. I do not ask the members in casting their votes to mislead any present member of the council. They are entitled to honour for their services, but should any not be seeking re-election, I trust the members will in voting vote in the best interests of themselves, and see that those elected in the future will concentrate their efforts and place the interests of our membership, and our institution only, first and foremost.

I must apologise, Mr. Editor, for the length of this appeal, but hope that the points raised will be fully discussed, and thus justify the space these remarks have claimed.—Yours, &c.,

MEMBER OF THE INSTITUTION.

CONTACT BEDS.

To the Editor of THE SURVEYOR.

SIR,—With reference to your remarks on that portion of Mr. Shenton's address dealing with contact beds, it may be of interest to state that a set of five double contact beds (ten in all), put down at Wokingham in 1905 to deal with a strong domestic sewage from a separate system of sewers, are still in good condition, and giving good results. The filtering media from a contact bed which had been in use fourteen years, for the final treatment of the effluent from irrigation plots has been washed, and again put into use, and the loss, if any, was inappreciable. The whole of the filtering material is gas clinker, and is readily washed and regraded in one operation by means of a small hand-driven machine which is easily worked by one man, and the gauges of which can be readily altered. In our case no other water is available, and the washing is done with screened sewage.

The subsoil at the outfall is a stiff clay, and the beds are simply excavations, with ample underdrainage and the necessary valves. The clinker is graded, and from inception care has been taken to keep the surface of the beds free from sewage by discharging the sewage into a grip about 18 in. wide and 6 in. deep in the surface of the bed, the result being that the surface of the greater portion of the beds is as clean as when first constructed. This permits free ventilation over the whole area, and no other provision is made for ventilating the underdrains.

Seventeen other beds have since been constructed on the same lines, and have given equally good results, with the exception of one primary bed, the clinker of which was much finer than that in general use here, the result being that the bed has lost capacity to a much greater extent. The clinker is therefore being washed, and will be used for secondary beds.

The grades in use are 3-in. to 12-in. for primary, 4-in. to 3-in. for secondary, and 2-in. to 4-in. for tertiary beds, with a layer of coarse clinker over the underdrains. I am fully aware of the merits of percolating beds, but, on the other hand, we find that in our case, owing to the configuration of the ground and a strong clay subsoil, contact beds can be cheaply and readily constructed, and give good results.

I may add that the effluent discharges into a tributary of the Thames, and is under the constant supervision of the Thames Conservancy. Yours, &c.,

C. W. MARKS,
Borough Surveyor.

Town Hall, Wokingham.

February 14, 1914.

SEWAGE DISPOSAL BY DILUTION.

To the Editor of THE SURVEYOR.

SIR.—Mr. Stowell, in his letter of February 7th, has raised an interesting point, but I feel sure that he has taken the wrong view.

If the Eighth Report of the Sewage Disposal Commission is carefully studied it will be seen that, although there are certain cases in which quality of water may be left to river authorities, it is quite clear that for purposes of the system of standards recommended by the commission dilution is to be the main consideration and not quality of river water (see Eighth Report, p. 5, par. 16, lines 8 and 9, and also p. 15, par. 55, lines 5, 6 and 7).

The paragraph on p. 7 of the Report to which you refer in your "Minute" bears this out. It is there recommended that, even in the extreme cases referred to, regard should not be had to the quality of the water, but only to dilution. These extreme cases are thus intended to be treated in the same way as normal cases, so far as quality of water is concerned.

Why should a small community on a large river be penalised by reason of the fact that the river which passes them is already polluted by the default of large towns higher up the river? (See Eighth Report, sec. 16.) The remedy consists in bringing pressure to bear upon the large towns who are producing the bulk of the pollution (see Eighth Report, sec. 55), and when this has been done, the river will be in a position to deal with the sewage from small communities by dilution.

The figure 0, in your "Minute" (p. 314, line 17) should be 2. Yours, &c.,

G. BERTRAM KERSHAW.

West Wickham,
Kent.

February 17, 1914.

STORM DAMAGE AT MORECAMBE.

To the Editor of THE SURVEYOR.

SIR, May I trespass on your valuable space to contradict entirely certain sensational paragraphs in many newspapers on the 16th inst. alleging immense damage to have been done to the sea walls in Morecambe during the heavy gale on Sunday last?

As a matter of fact, no damage whatever was sustained by any sea wall, and the total damage to the promenade does not exceed £7.

I ask your kind assistance in this matter, as the publication of fabrications of such a description are liable to do the responsible engineer a great injury professionally. Yours, &c.,

J. W. HIPWOOD,
Borough Surveyor.

Morecambe.

February 17, 1914.

Lostock Junction Railway Widenings.—Messrs. L. W. Pearce & Co., Limited, Bank Chambers, Ramsden-square, Barrow-in-Furness, have been successful in obtaining the contract for the widening of railway lines and sidings at Lostock Junction for the Lancashire and Yorkshire Railway Company. The works are estimated to cost about £36,000.

Metropolitan Water Board's New Offices.—The Metropolitan Water Board have decided to remove their central offices from Savoy-court, Strand, and to start building in about six months' time offices to accommodate about 800 persons, on one of the 7 acres of the freehold property which they own near Rosebery-avenue. One acre will be utilised for the new offices, and the remaining six, it is stated, will be sold for building purposes.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bridgwater R.D.C. (February 13th. Mr. W. O. E. Meade-King).—£1,400 for works of water supply at Othery.—Mr. T. M. Reed (clerk to the council) stated that it was proposed to supply water for 400 inhabitants. Evidence in support of the application was given by the surveyor, Mr. W. A. Collins, the medical officer, Dr. Wilberforce Thompson, and the inspector of nuisances, Mr. R. Popham.

Burnley R.D.C. (February 10th. Mr. F. O. Stanford).—This was an inquiry into an application for power, under the Land Clauses Act, to acquire land for extending the water facilities of the township.—Mr. H. Pritchard, surveyor, said it was estimated that the proposed scheme would cost about £2,300. The scheme was essential.

Exeter T.C. (February 17th. Mr. W. M. Cross).—£1,110 for the provision of underground sanitary conveniences in Sidwell-street and Magdalen-street.—The town clerk (Mr. H. Lloyd Parry) asked for the loan for a period of thirty years.

Haywards Heath U.D.C. (February 17th. Mr. R. H. Bicknell).—£1,700 for the purchase of land forming part of Petland Wood for the purpose of a cemetery.—The proposed site, it was explained, comprises slightly over 14 acres. Eleven acres will be suitable for cemetery purposes, and it is proposed at first to lay out only 4 or 5 acres.

Liverpool T.C. (February 12th. Mr. T. C. Ekin).—£70,000 for the erection of pierhead baths and offices, and £9,000 for extensions to central library, museum, and Walker art gallery.—It was stated that the proposed site of the baths measured 3,718 sq. yds., and cost £18,590. The designs for the baths and offices had been prepared by Mr. Saxon Snell, and the city surveyor (Mr. T. Shelmerdine), the latter being responsible for the offices and the elevation. It was estimated that on the first year's working there would be a deficiency of £3,833, or about 1-5d. rate. With respect to the second loan, evidence was given that both the health of the staff and the convenience of the public called for the suggested improvements.

Manchester T.C. (February 17th. Mr. T. Adams).—This was an inquiry into an application by the corporation for authority to prepare town-planning schemes for two small areas in North Manchester. The schemes are additions to those already in progress, and together did not add more than 250 acres to the total area it is proposed to plan out in various parts of the city, and are largely on the southern side.—Mr. John Luke, deputy city surveyor, described the scheme, and gave reasons why it ought to be carried out.

Mansfield T.C. (February 12th. Mr. M. K. North).—£900 for the purchase of property in Chumber-street for street improvements, and £300 for the purchase of land in Nottingham-road as an open space.—The necessary evidence was submitted by Mr. A. H. Limb, from the town clerk's office, and the borough surveyor, Mr. T. P. Collinge.

Merton and Morden U.D.C. (February 9th. Mr. R. H. Bicknell).—£1,600 for the erection of a fire station, and £575 for the extension of the depot.—Mr. C. J. Mountfield, the clerk, stated that the area of the district was 3,236 acres, and the population, which in 1901 was 5,470, was now estimated at 17,000. It was asked that repayment of the loan should be spread over thirty years.

Surbiton U.D.C. (February 16th. Mr. R. H. Bicknell).—£6,900 for the purchase of 13.25 acres of land adjoining the new sewage disposal works, at about £142 per acre, for burial purposes, and £6,900 for the purchase and laying out of the land.—Mr. H. T. Mather, surveyor to the council, said he had prepared plans for under-drainage to an average depth of 12 ft., and also for surface-water drainage. The total estimate for the purchase and laying-out of the site was £5,000, and there was included in the application the estimated cost of erecting a chapel, lodge, lavatories, &c. Mr. W. B. Crouch, assistant surveyor, and Mr. R. H. Jeffes, surveyor to the Maldens and Coombe Urban District Council, were also present.

APPLICATIONS FOR LOANS.

Ashton-under-Lyne T.C.—£13,000 for sewage works extension.

Bedlington T.C.—£3,000 for sewerage works.

Bristol T.C.—£971 for road widenings.

Finchley U.D.C.—£1,170 for a recreation ground.

Harrogate T.C.—£2,096 for street improvement works.

Hinckley U.D.C.—£2,720 for a housing scheme.

Hitchin R.D.C.—£8,950 for a new isolation hospital.

Orsett R.D.C.—£5,592 for a housing scheme.

Paddington B.C.—£2,000 for the reconstruction scheme in Cirencester-street.

Rushden U.D.C.—£9,136 for the provision of working-class houses.

Sheffield T.C.—£6,500 for telephonic street fire alarms.

Tonbridge R.D.C.—£9,439 for the erection of forty-eight dwellings.

Twickenham U.D.C.—£5,910 for private street works.

Wakefield T.C.—£1,000 in connection with the electricity undertaking.

Widnes T.C.—£450 for road improvement works.

Wrotham U.D.C.—£12,000 for drainage works.

LOANS SANCTIONED.

Bromley T.C.—£528 for the purchase of land for road widening.

Castlederg R.D.C.—£3,230 for the provision of cottages.

Clones No. 2 R.D.C.—£1,300, supplemental loan for workmen's dwellings.

Croydon T.C.—£96,000 in connection with the water undertaking.

Harrogate T.C.—£7,639 for the electricity undertaking.

Islington B.C.—£9,300 for paving works.

Kiveton Park R.D.C.—£540 for works of road improvement, and £1,210 for surface-water drainage.

Leicestershire C.C.—£2,189 for the erection of dwellings.

Lowestoft T.C.—£1,750 for hospital extension, and £465 for road improvement.

Pembroke (Co. Dublin) U.D.C.—£12,000 for workmen's houses.

Raunds U.D.C.—£600 for the construction of a culvert.

Rushden U.D.C.—£476 for the recreation ground.

St. Mellons R.D.C.—£3,000 for road works.

Thornaby T.C.—£5,330 for road improvement works.

Watford U.D.C.—£2,852 for street improvement.

FORTHCOMING INQUIRIES.

	FEBRUARY.	£
23.—Melton Mowbray.	For the provision of a refuse destructor (Mr. R. H. Bicknell)	2,150
21.—Bridlington.	For road widening purposes (Mr. F. H. Tulloch)	1,300
24.—Frinton-on-Sea.	For the purposes of fire service and public offices (Mr. W. O. E. Meade-King)	2,770
21.—Turton.	For sewage disposal purposes (Mr. P. M. Crosthwaite)	8,361
21.—Wantage.	For a housing scheme (Mr. H. S. Stewart)	1,600
25.—Bradford.	For the purposes of cottage baths, a bowling green, and pleasure grounds (Mr. F. H. Tulloch)	8,527
25.—East Stow.	For a water supply scheme (Mr. W. O. E. Meade-King)	1,147
25.—Haslingden.	For works of sewerage (Mr. M. K. North)	600
25.—Prestwich.	For private street improvement (Mr. M. K. North)	3,443
25.—Ware.	For works of street improvement (Mr. Edgar Dudley)	1,000
26.—Belper.	For works of water supply (Mr. M. K. North)	1,300
26.—Droylsden.	For canal bridge reconstruction (Mr. F. O. Stanford)	1,716
26.—Wilmslow.	For works of street improvement (Mr. P. M. Crosthwaite)	1,100
27.—Great Yarmouth.	For works of paving (Mr. W. O. E. Meade-King)	4,800

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Dudley £40,000, Leicester £12,350, Paddington; housing and town planning—Dublin, Newport, roads and materials—Aberdeen, Sunderland; sewerage and sewage disposal—Cuckfield £12,750; water, gas and electricity—Bradford £180,000. Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Brighton T.C.—The Tramways Committee approve of the proposal to erect a tramway shelter at the south-west end of the approach to the cemetery. The provision of additional office accommodation at North-road works, at an estimated cost of £1,500, is approved by the Finance Committee.

Dudley T.C.—It is proposed to erect during the next four years a comprehensive suite of municipal buildings at an estimated cost of £40,000.

Esher and the Dittons U.D.C.—Proposals to acquire a site for and to erect new offices and depot buildings, at an estimated cost of £6,000, were discussed at last week's meeting, and were referred back for the special committee reporting to consider the question of acquiring a site for offices only.

Frome U.D.C.—Extensions are to be carried out at the Victoria Hospital at an estimated cost of £1,250.

Harrogate T.C.—The renovation of the baths is being proceeded with, and additional accommodation is to be provided at the sulphur wells pump room.

Leicester T.C.—A scheme has been adopted for the erection of sanatorium buildings for tuberculosis patients, on land adjoining the isolation hospital belonging to the corporation, at an estimated cost of £12,350.

Lowestoft T.C.—It has been agreed to erect a shelter on Ganton Cliffs.

Paddington B.C.—The council on Tuesday decided upon the completion of the purchase of land near Porchester-road, Paddington, at a cost of £16,000, for the purpose of public baths.

Sheerness U.D.C.—The surveyor, Mr. T. F. Berry, has received instructions to prepare a site plan for a new public convenience.

Sheffield T.C.—The Health Committee recommend the corporation to purchase, at a price not exceeding £3,244, a plot of land of 36 acres at Rivelin for the purpose of a sanatorium.

HOUSING AND TOWN PLANNING.

Dublin T.C.—A scheme for the erection of 156 houses, at an estimated cost of £44,810, was submitted to the council on Monday. It was proposed by the Housing Committee that the rents should be fixed at 7s. weekly for four-roomed houses, 6s. 6d. for three-roomed houses, and 4s. 6d. for two-roomed houses, but an amendment was carried fixing the rents as follows: Four-roomed houses, 7s. weekly to 6s.; three-roomed houses, 6s. 6d. to 4s. 6d.; two-roomed houses, 4s. 6d. to 2s. 6d.

East Preston (Sussex) R.D.C.—A scheme has been approved for the erection of eight cottages in the neighbourhood of Angmering.

Hereford T.C.—A scheme has been adopted for the provision of about ninety working-class dwellings.

Midhurst R.D.C.—The surveyor, Mr. A. G. Gibbs, has received instructions to complete the draft plans for workmen's dwellings at Milland, and obtain tenders for the work.

Newport (Mon.) T.C.—It has been agreed to promote a scheme for 100 workmen's dwellings.

Newton Abbot R.D.C.—It has been agreed to build twelve houses at Chudleigh in two blocks of six, the estimated cost of each house being £200, exclusive of the cost of the land.

Stratford-on-Avon T.C.—The borough surveyor, Mr. R. Dixon, has received instructions to prepare a scheme for the erection of thirty-six cottages.

Westhampnett R.D.C.—A housing scheme has been adopted for North Bersted, the estimated cost being £1,000. It is proposed to provide six cottages to be erected in three pairs, and to let them at a rental of 4s. 3d. per week.

REFUSE COLLECTION AND DISPOSAL.

Hammersmith B.C.—It has been agreed to increase the charge for the removal of trade refuse from 5s. 6d. to 7s. per ton.

ROADS AND MATERIALS.

Aberdeen T.C.—The Links Committee have approved the plans of the new street from King-street, at East North-street, through Shuttle-lane and along the north side of Frederick-street school to Park-street, and thence by Constitution-street to the Links. The estimated gross cost is £101,000, from which about £31,000 would be recovered from feuing and resale of property, leaving a net cost of £70,000. Of this amount over £20,000 would apply to the clearing out of slum property, which is not actually needed for the formation of the street.

Brighton T.C.—It is proposed to purchase several properties in West-street with the view of improving that thoroughfare, which is in a direct line from the railway station to the sea.

Cardiff T.C.—The Health Committee have included in their estimates for the ensuing year £899 for twelve additional road sweepers and twelve more hand-carts.

Chiswick U.D.C.—It has been decided to surface spray with "Tarco."

Cornwall T.C.—Having regard to the increasing expenditure on main roads, the council last week passed a resolution asking that they should be given statutory powers to levy and retain a tax on motor lorries and other mechanically propelled vehicles, the proceeds to be expended on the maintenance of local roads.

Dumfriesshire C.C.—The extra expenditure of about £1,000 a year for the ensuing eight years in improving the southern section of the Carlisle and Edinburgh road between Scotchdyke and Mosspace will be met, as regards three-fourths of it, by a grant from the Road Board.

East Preston (Sussex) R.D.C.—It has been agreed to purchase 12,000 gallons of tar for treatment of the roads, and the tender of Messrs. Wicks, of Maidstone, at £35, has been accepted for the supply of a tar-sprayer.

Esher and the Dittons U.D.C.—The Surrey County Council wrote asking the Esher Council to reconsider its decision as to the provision of land for the widening to 50 ft. of the road from Giggs Hill-green to Windows Bridge, but it was decided not to reconsider the matter. The surveyor, Mr. H. C. Fread, said the estimated cost of the widening would be £560, after deducting promised contributions from the county council and the Road Board.

Forden (Montgomery) R.D.C.—It has been agreed to obtain specifications for the purchase of a steam tractor. The surveyor, Mr. W. P. Hole, presented a statement showing the difference between the cost of the hauling of stone, &c., by hired traction compared with that of the purchase of a steam tractor. It was stated that the cost of the tractor would be £510, convertible gear for roller, £99, two-side tipping trailers, £128, sleeping van for five men, £57 10s., water cart, £27 10s., total, £852. The annual expenditure was estimated as follows: Interest on capital outlay, £31 1s. 7d.; depreciation and repairs at 20 per cent, £170 8s.; licence, £10; driver, fifty-two weeks at 30s., £78; coal, 52 tons at 20s., £52; lubrication and waste, £15 12s.; steerer (half wages), fifty-two weeks at 10s., £26; total, £386 1s. 7d. The cost of hiring a tractor he estimated at £517 per annum as follows: Breaking and rolling, 180 days, £180; hauling, 132 days, £181 10s.; coal, 104 tons, £104; and steerer, £52.

Huntingdon C.C.—The council have entered into a contract for the supply of "Tarco" for surface spraying.

Lancashire C.C.—A contract has been signed for a supply approximately of 300,000 gallons of "Tarco" for spraying purposes during the coming season.

Lowestoft T.C.—The question of acquiring an additional plot of land for the development of the Esplanade has been referred to a special committee for inquiry and report.

Marylebone B.C.—Lord Portman is to be asked to surrender the land necessary for the widening of Park-road by 10 ft.

Plymouth T.C.—The borough surveyor, Mr. J. Paton, has submitted to the Tramways Committee an estimate of the cost of constructing a track from Mutley Plain down Alexandra-road as far as Chudleigh road. He estimates the cost of constructing a single track with crossing places at £6,000, and a double track at £8,300.

Ross-shire C.C.—It has been agreed by the Mid Ross District Committee to apply to the Board of Agriculture for a grant towards the construction of a road from Inverbrum Bridge to Loggie, the estimated cost of which is £2,500. The proposed road is $5\frac{3}{4}$ miles in length.

St. Austell U.D.C.—It has been decided to proceed with the East-hill (a main road) improvement at an estimated cost of £550, towards which the county council have promised a contribution of £120.

Slough U.D.C.—It has been agreed to use "Tarco" for surface painting, and "Bi-tarco" for the construction of improved tar-macadam.

Stepney B.C.—In the course of a question with regard to the visibility of street names, it was suggested that they should be rendered visible by night. Councillor Barber replied that the committee were considering this matter.

Stirlingshire C.C.—The Eastern District Committee have authorised the road surveyor to proceed at once with the laying of an experimental length of different kinds of road surfacing with a view to ascertaining the most suitable system for general adoption. The trial is to be made on the road from Bonnybridge to Carmuir.

Sunderland T.C.—It is proposed to draw up a list of streets in which a heavy expenditure is necessary for permanent work, and to apply to the Local Government Board for sanction to borrow the money to cover the cost.

Weston-super-Mare U.D.C.—The council have agreed to an undertaking with the Road Board to advance to the urban district council by way of loan toward the cost of strengthening and surfacing a section of the Boulevard, estimated at £2,500, the sum of £2,000, free of interest, repayable by five equal annual instalments.

SEWERAGE AND SEWAGE DISPOSAL.

Bampton U.D.C.—Tenders are to be invited for flushing tanks at the new sewage works in Frog-lane and Millhead.

Cuckfield R.D.C.—A scheme is to be prepared for the sewerage of Handcross, Staplefield, and Slaughtam, by two main sewers, one running from Handcross to Staplefield, and the other from Handcross *via* Truckers Hatch and Slaughtam to Staplefield. The approximate estimate for the sewerage is £12,750, to which will have to be added the cost of outfall works. With regard to Warninglid, a small separate scheme, the Sanitary Committee consider, might be carried out with separate outfall, and a van system used for outlying places.

Newcastle (Ireland) U.D.C.—The tender of Mr. John Callan, Castleblayney, at £5,800, has been accepted for the sewage disposal scheme, the plans of which have been prepared by Messrs. Swiney & Crossdaile.

Norwich T.C.—Specially prepared, electrically driven, air-compressing plant is now being erected under the supervision of Mr. Arthur E. Collins, M.INST.C.E., the city engineer, in connection with an extensive scheme for the purpose of raising the sewage from one level to another, and for conveying it to the irrigation sewage farms at Newmill. This air-compressing plant, costing about £1,000, has been made in Aberdeen, and operates ejectors of the latest automatic type. A special feature about the plant is that the electric motor is directly coupled to the air-compressor, and no gearing or belts are used for the transmission of the power. The motor develops

65 h.p., and the output of the compressor is about 800 cub. ft. of free air per minute—amply sufficient for its purpose. It is expected the plant will be in full operation in about one month.

Seaton U.D.C.—The Local Government Board have refused to sanction the council's proposed scheme for the sewerage of Seaton Hole. The proposal was to pump the sewage into an extension of the existing sewer, at an estimated cost of £150. The scheme suggested by the Local Government Board, on the other hand, would, it was stated, cost £1,222, with an estimated expenditure of £26 a year for working, exclusive of renewals. The matter has been referred to the General Purposes Committee.

WATER, GAS, AND ELECTRICITY.

Battle U.D.C.—The question of an improvement in the water supply is to be considered at the next meeting of the council.

Bradford T.C.—It is proposed to duplicate the water supply pipes from the Nidd Valley to Chellow Heights at an estimated cost of £180,000.

Essex and the Dittons U.D.C.—It has been agreed to renew the contract for public lighting and maintenance with the Kingston Gas Company for three years, at £2 12s. 6d. per annum for part-night lamps, and £3 6s. per annum for all-night lamps.

Halifax T.C.—A new 3,500kw. turbo-alternator has been installed at the electricity works at a cost of £11,310.

Ipswich T.C.—The Admiralty and the Safford Rural District Council have jointly agreed to bear the cost of laying a 7-in. main from Bourne Bridge to Shotley for the purpose of a water supply.

PERSONAL.

Mr. Wm. H. Lambert has been appointed assistant surveyor of Rathmines district.

Mr. J. T. Pegge, city surveyor of Durham, has been voted an increased salary of £35 per annum.

Mr. G. B. Goodfellow, Buglawton (Cheshire), has been appointed surveyor to the Buglawton Urban District Council.

Mr. A. W. Hawtrey, ASSOC.M.INST.C.E., deputy engineer and surveyor of St. Pancras, has been voted an increased salary of £50 a year.

Mr. Richard F. Braithwaite has been appointed to succeed his late father as surveyor and inspector to the Selby Rural District Council, at a salary of £180 per annum.

Mr. E. J. Silcock, M.INST.C.E., of Westminster and Leeds, has been engaged by the Corporation of Eye to prepare a scheme of sewerage and sewage disposal for the borough.

Mr. S. J. James, surveyor to the Sherborne Rural District Council, was married recently to Miss E. M. Spurge, only daughter of Mr. and Mrs. Spurge, of Westcliff-on-Sea.

Mr. John Rorke, Clondalkin, has been appointed county surveyor of Queen's County, at an inclusive salary of £350, subject to the sanction of the Local Government Board (Ireland).

Mr. James Hine, a well-known West of England architect, who designed the Plymouth Guildhall and municipal buildings, died at Lanneston, Cornwall, on Sunday, aged eighty-four years.

Mr. Chas. H. Ball, manager of the Withington sewage works of the city of Manchester, has been appointed manager of the Davyhulme works of the city, the transference to date from March 1st next.

Mr. W. Nesfield, sanitary inspector to the Surrbiton Urban District Council, has been authorised to attend the Royal Sanitary Institute's Congress at Blackpool, the council paying reasonable expenses thereby incurred by him.

Mr. W. Holland, assistant county surveyor, has been appointed county surveyor of Cheshire in succession to the late Mr. H. Bull. The appointment was made unanimously by the county council. Mr. Holland was appointed a district and main roads surveyor in February, 1890. He held that office up to 1898, when he was appointed assistant county surveyor.

Mr. Alan Bromly, who has been Mr. Carter's assistant at Croydon for the past fourteen years, was on Tuesday unanimously elected borough surveyor and

water engineer to the Godalming Town Council. The rapid growth of Croydon during this period has given Mr. Bromly an extensive practical experience, and his qualifications include those of the Institution of Civil Engineers, the Institution of Municipal and County Engineers, the Surveyors' Institution, the Royal Sanitary Institute, and the Society of Architects.

Messrs. D. Calloway, burgh surveyor, Inverkeithing; W. Holland, county surveyor, Cheshire; H. Lister, town engineer, Barberton, Transvaal; L. D. Thompson, deputy county surveyor, Lancashire; and W. E. Woollam, engineer and surveyor, East Grinstead Urban District Council, have been elected members; H. I. Cutler, engineering assistant under Richmond Corporation; W. Platt, engineering assistant under Manchester Corporation, associate members; and Alan Entwistle, county surveyors' office, Preston; E. Small, assistant surveyor, Urnston Urban District Council; and B. A. Farley, assistant surveyor, Malling Rural District Council, students, of the Institution of Municipal and County Engineers.

Alderman R. W. Richards, a member of the Institution of Municipal and County Engineers since 1888, and hon. corresponding secretary for Australasia, has been elected Lord Mayor of Sydney. Mr. Richards entered the service of the Sydney City Council in 1879, being articled to the city surveyor. As soon as he had completed his articles, he was appointed surveyor and draughtsman in that department, and in 1887, when only twenty-three years of age, was placed in charge as city surveyor. He resigned from the service in 1902 to enter private practice, and was elected as a member of the council, being returned for Cook Ward. In 1905 he was appointed town clerk and city engineer of Dunedin (N.Z.), and after four years' service there returned to his native city, and was re-elected last year as a representative for Cook Ward.

FOR OTHER ADVERTISEMENTS

See End of Paper.

MADRAS CORPORATION, INDIA.

WANTED ASSISTANT WATERWORKS ENGINEER.

The President, Corporation of Madras, invites applications for the appointment of a Waterworks Assistant to the Special Engineer (J. W. Madeley, Esq., M.A., M.INST.C.E., M.AM.SOC.C.E., &c.).

The duties will be to assist the Special Engineer in the design, construction and maintenance of works connected with the Water Supply Distribution System of the City of Madras, especially cast-iron main laying and the installation and working of waste water meters.

The salary will be Rs.500 (£33 6s. 8d.) per mensem. An allowance of Rs.30 (£2) per mensem will be paid to the Officer appointed so long as he maintains and uses on the work a first-class motor bicycle in good running order. No other allowance of any kind will be made.

Before sailing for Madras the successful candidate will be required to sign a three years' Agreement, to be prepared by the Corporation. By mutual consent the appointment may be extended for a further period.

The Corporation reserves the right to determine the appointment at any time by three months' notice in writing, or by payment of one month's salary.

The Officer appointed will be allowed ordinary first-class railway fares and second-class steamship passage to Madras, *via* Marseilles and Bombay, by P. and O. steamer. A like class return free passage will be granted on the termination of the appointment, subject to satisfactory service, according to the conditions of the Agreement. Half-pay will be granted on the voyage out from the date of leaving England.

Leave will be granted on full pay to the extent of one month for every eleven months of active service, but for not more than three months at a time.

Preference will be given to candidates who have had experience in the design and maintenance of water-pipe distribution systems, including detection and prevention of waste by waste water prevention meters, stethoscopes and other means.

Applicants must not be more than 35 years old, and copies of certificates of age, testimonials and medical certificate of fitness for service in India must be enclosed with the applications; which must reach the undersigned *not later than* 11th March, 1914.

The applications will be sent out to Madras, where the selection will be made by the President of the Corporation.

The President reserves the right of rejecting all applications without giving reasons.

The Officer appointed will be required to commence his duties in Madras not later than eight weeks after he has received notification of the acceptance of his application.

Applications must be in writing, and should be sent to the undersigned in envelopes superscribed "Waterworks Assistant."

JAMES MANSEERGH & SONS,

Agents to the Corporation
of Madras.

5 Victoria-street,
Westminster.

London, S.W.

February 19, 1914.

(1,338)

SETTLE RURAL DISTRICT COUNCIL. SANITARY SURVEYOR'S DEPARTMENT.

The above Council invite applications for the post of Junior Assistant in the Sanitary Surveyor's Department.

Applicants must have had previous experience in a similar office.

Salary £52 per annum.

Applications, stating age, qualifications, &c., accompanied by copies of three recent testimonials, to be addressed to me the undersigned, endorsed "Junior Assistant," and received by first post on Monday, the 2nd March next.

(By order)

T. E. PEARSON,

Clerk to the Council.

Council Offices,

Town Hall,

Settle, Yorks.

February 18, 1914.

(1,339)

BOROUGH OF NUNEATON. ANNUAL CONTRACTS.

Tenders are invited for the Supply of the under-mentioned Materials during the twelve months ending the 31st day of March, 1915:—

1. Blue Bricks, Kerbs, &c.
2. Coal, Slack, &c.
3. Disinfectants and Soap.
4. Earthenware Pipes, &c.
5. Granite Kerbs and Setts.
6. Iron Castings.
7. Petroleum.
8. Portland Cement.

Conditions of Contract and Forms of Tender may be obtained on application at my office, and sealed Tenders, endorsed "Tenders for Supplies," must be delivered to me not later than 12 o'clock noon on Tuesday, the 3rd March.

The Corporation do not bind themselves to accept the lowest or any Tender.

F. C. COOK,

Borough Surveyor.*

Municipal Offices,
Nuneaton.

February 19, 1914.

(1,340)

CUDWORTH URBAN DISTRICT COUNCIL. TO STONE MERCHANTS.

Tenders are invited for the supply and delivery of the following Materials:

- About 1,000 tons Tarred Slag.
- About 250 tons Granite.
- About 500 tons Slag.

Further particulars and Form of Tender can be obtained from W. T. Lynam, Surveyor, Council Offices, Cudworth, upon receipt of a stamped addressed envelope.

Sealed Tenders, endorsed "Tender for Road Material," and samples of same, to be addressed to the Clerk to the Council, Council Offices, Cudworth, on or before Wednesday, March 4th, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

W. E. RALEY,

Clerk to the Council.

Council Offices,
Cudworth.

February 18, 1914.

(1,336)

EAST BARNET VALLEY URBAN DISTRICT COUNCIL.

The East Barnet Valley Urban District Council is prepared to receive Tenders for the supply of the undermentioned for One Year, ending March 31st, 1915:—

- Broken Granite or Basalt for Roadways.
- Gravel, Hoggin, &c., for Roadways.
- Portland Cement.
- Stoneware Pipes.
- Tar-paving Materials.
- Brooms.
- Forage.
- Horse Hire and Cartage.

Specifications and Forms of Tender can be obtained on application to Mr. Henry Yorke, C.E., Surveyor to the Council.

Tenders must be on the Forms supplied, and delivered at the Council Offices, addressed to the Chairman of the Council, not later than 12 noon on Thursday, the 5th March, 1914.

Samples of materials must be deposited with the Tenders.

The Contractor or Contractors will be required to pay the local rate of wages prevailing in the district for the same class of work for which his or their Tender is accepted.

The Council do not bind themselves to accept the lowest or any Tender.

T. A. BUCKLEY,
Clerk.

Offices of the Council,
Station-road, New Barnet.
February 18, 1914. (1,337)

COUNTY BOROUGH OF SWANSEA.

VICTORIA BRIDGE, WITH APPROACHES THERE TO.

TO BRIDGE CONTRACTORS.

The Corporation of Swansea invite Tenders for the Construction of Masonry and Concrete Approaches, Piers, &c., for a Steel Girder Bridge of 111 ft. span, also for the Supply and Erection of Steelwork for the said Bridge.

The Contract has been drawn up in two parts—viz.:—

1. Masonry, &c., in Approaches and Piers, and
2. Steelwork for the Bridge.

but Contractors may submit Tenders for one or both parts.

Particulars, Detailed Plans, and Forms of Tender may be obtained from the Corporation's Consulting Engineer, Mr. H. Howard Humphreys, at 28 Victoria-street, Westminster, or from the undersigned, either by personal application or by letter, on any day after the publication of this advertisement, and until Tuesday, the 17th March.

Intending Contractors will be required to deposit a sum of Three Guineas prior to particulars being furnished, such sum being returned on receipt of a *bona-fide* Tender.

Tenders, endorsed "Victoria Bridge," must reach the undersigned not later than 11 a.m. on the 31st day of March, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender for either part of the Contract.

H. LANG COATH,
Town Clerk.

The Guildhall,
Swansea.
February 20, 1914. (1,341)

COUNTY COUNCIL OF WEST SUFFOLK.
MAIN ROADS.

Tenders are invited for the supply of Broken Material, to be delivered at Railway Stations and Wharves in the County.

Conditions of Contract, with Specification and Form of Tender, may be obtained on application to the undersigned.

Tenders to be sent in by 10 a.m. on Monday, 2nd March, 1914.

W. LIONEL JENKINS, A.M.I.C.E., P.A.S.I.,
County Surveyor.

County Surveyor's Office,
Shire Hall,
Bury St. Edmunds.
February 18, 1914. (1,340)

EAST SUFFOLK COUNTY COUNCIL.

MAIN ROADS.

TENDER FOR ROAD MATERIALS.

The East Suffolk County Council are prepared to receive Tenders from actual Quarry Owners or Proprietors for the Supply of Road Materials for the three Districts in the County—namely, Ipswich, Halesworth, and Eye—to the 31st March, 1915.

Specification and Forms of Tender can be obtained on application to the undersigned, and applicants are requested to state for which District they wish to tender.

Scaled Tenders, endorsed "Tender for Road Materials," must be delivered at the Offices of the County Road Surveyor, County Hall, Ipswich, on or before the 7th March, 1914.

The Council does not bind itself to accept the lowest or any Tender.

W. JERVIS,
County Road Surveyor.

County Hall, Ipswich.
February 18, 1914. (1,342)

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

RECONSTRUCTION OF LANGFORD BRIDGE, ONGAR.

Tenders are invited from Contractors licensed to execute Ferro-Concrete Construction on the Hennebique system for Building a New Bridge over the River Roding on the main road from Chipping Ongar to Brentwood.

Drawings may be seen, and Bills of Quantities and Specifications obtained, upon application to the undersigned.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, endorsed "Langford Bridge," are to be delivered to this Office not later than Monday, March 2nd.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

Chelmsford.
February 18, 1914. (1,335)

BOROUGH OF STRATFORD-UPON-AVON.

The Town Council of Stratford-upon-Avon invites Tenders for the undermentioned Works:—

CONTRACT No. 1.

Laying and Jointing 1,200 yds. 3-in. Cast-iron Water Mains in Shipston and Clifford Roads.

CONTRACT No. 2.

Laying and Jointing 3,000 yds. 4-in. Cast-iron Water Mains for New Supplementary Water Supply.

CONTRACT No. 3.

Erection of a Mechanical Filter and Pumping House, Warwick-road.

CONTRACT No. 4.

Construction of a small plain Concrete and Brick Reservoir at "Bluecap," Rowley.

Specification, Quantities, and Plans can be seen, and Form of Tender obtained, upon application to the undersigned.

Tenders, sealed and endorsed "Waterworks," must be delivered to the Town Clerk, Municipal Offices, Stratford-upon-Avon, not later than One p.m. on Monday, March 2nd, 1914.

The Town Council does not bind itself to accept the lowest or any Tender, and reserves the right to divide the work.

RODEN DIXON, ASSOC. M.INST.C.E.,
Borough Surveyor.

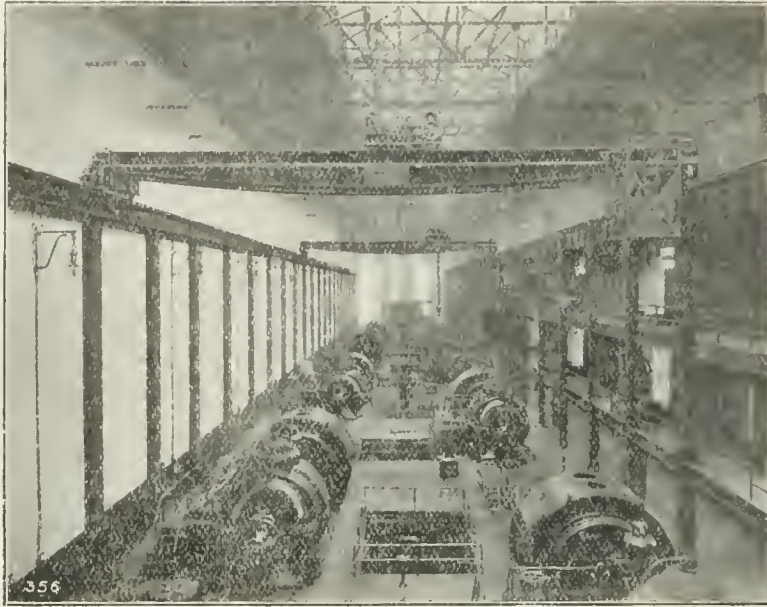
Stratford-upon-Avon.
February 12, 1914. (1,342)

GENTLEMAN (31, Diploma at Agricultural College, qualified Surveyor, P.A.S.I.) seeks position in town, country, or abroad; six years' experience as assistant in well-known firm of surveyors and valuers, one year's experience on engineering staff of Canadian Railway Company; good references.

Box 1,381, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,334)

MODERN LIFTING APPLIANCES.

The problems which come before municipal and county engineers for solution are many and varied. Whenever the question of lifting and shifting is involved in such problems we strongly recommend to the notice of our readers the catalogue issued by Messrs. Herbert Morris, Limited, of Empress Works, Loughborough, Book 507 "Modern Lifting." In this book, which gives some idea of the wide field covered



MORRIS ELECTRIC OVERHEAD TRAVELLING CRANES IN POWER-HOUSE.

by the firm's productions, lifting and shifting appliances of every description, and for almost every conceivable purpose, are fully illustrated and described.

As may be seen on reference to page 11 of the catalogue, specialities manufactured by Messrs. Herbert Morris, Limited, have been extensively adopted for use in sewage works, gasworks, waterworks, power-houses and other municipal departments. The various plants illustrated are most suggestive, and should be studied by all who are in any way interested in economical transport. They offer remarkable facilities, and are manifestly great time and labour savers.

In the book before us, cranes (electric and hand) are seen in actual operation under widely varying conditions. Prominence is given to the firm's Class 60 electric overhead travelling cranes. These cranes are made to hoist on wire rope, and they may be operated either from the floor or from a cage attached to and travelling with the crane. The crane may be electrically operated in all its motions, or any one or two of the three motions can be by hand. Cases are innumerable in which a hand-crane meets all requirements except that quicker lifting is desirable. It is claimed that Class 60 meets just such a want.

The Q. E. F. Runway, which is also illustrated under a great variety of conditions should particularly appeal to municipal and county engineers. Its flexibility, easy running, and perfect adaptability render it eminently suitable for adoption in cases where difficult and exacting conditions do not permit of other systems of lifting and shifting being installed. With the Q. E. F. Runway there can be a perfect maze of twists and turns. The runway can go anywhere, through doors, into corners, close to walls, in the open, and through stores, warehouses, sheds, and yards of all descriptions. Stuff can be dumped on the floor, and will not be in the way of the runway.

The Q. E. F. Runways are made in sizes from 2½ cwt. to 5 tons. The lifting gear, which is the well-known H. M. B. pulley-block, is attached to a trolley with ball bearings. The trolley travels along steel joists of I-section, which are fitted with junctions to allow the load to be run on to side tracks. The junctions are so designed that no stop is necessary at any point, the trolley being able to pass in any of the three directions open from the junction without pause or loss of impetus. There are no moving parts in the junctions, and therefore no vexatious delays or other "loose part" annoyances to be feared. There can be any number of trolleys on the system without complication, and as many side tracks as may be required. A great feature of the system is that, if desired, it can be adopted to quite a limited extent at first, and added to from time to time without detriment to the ultimate whole. The possibilities of an installation may perhaps be better realised when it is stated that a lad can pick up a ton and transport it 300 ft. inside a minute.

That Q. E. F. Runways have received a most enthusiastic welcome is proved by the fact that considerably over £500,000 worth have been erected in various works. Apart from admirably fulfilling the primary purpose for which they are installed, the experience of users proves that wherever Q. E. F. Runways have been erected they tend greatly to increase the efficiency of both workmen and plant, and by reason of the ease and speed with which material can be moved to its appointed place, they are also conducive to orderliness in every direction.

Many interesting examples are also given of the Morris electric runways, which are a valued part of the equipment of many of the leading dockyards, arsenals, and industrial firms at home and abroad.

The H. M. B. pulley-blocks manufactured by Messrs. Herbert Morris, Limited, are too well known to need detailed description. They are stocked in all sizes from 2½ cwt. to 60 tons, and are made from materials of the very highest quality, with cut gears



THE Q. E. F. RUNWAY IN GASWORKS.

throughout. All parts are made to limit gauges, and are interchangeable. The blocks are designed to give the highest possible efficiency, and it is to be noted that they are not rated by their test loads, but by the loads they are intended to lift in daily work. Each block is tested with a load 50 per cent greater than that which it is said to lift, and a certificate of test is issued with every block.

The tubular shear-legs illustrated may be specially

interesting to some of our readers. These useful appliances are extremely handy for pipe-laying and many other purposes. They are strongly yoked at the top, and carry a shackle for hanging the tackle into. The feet are pointed.

The remarkable developments which have been witnessed at Empress Works are largely the result of perfect business organisation, scientific works management, and standardisation. All manufactures have



TUBULAR SHEAR-LEGS—PIPE LAYING.

been gradually perfected and reduced to repetition lines with limit gauges and automatic machinery.

A copy of Book 50, "Modern Lifting," may be obtained from Messrs. Herbert Morris, Limited, free on application.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

WEST MIDLAND DISTRICT.

A meeting of the West Midland District will be held at Birmingham on March 5th.

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District will be held at Wakefield on Saturday, March 21, 1914.

EASTERN DISTRICT.

A meeting of the Eastern District is to be held at Chelmsford on April 18th.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on June 13th.

THE ANNUAL MEETING.

The date for the annual meeting of the Institution of Municipal and County Engineers at Cheltenham has been fixed definitely for June 24th, 25th, 26th and 27th next. It has been decided to make a special feature of town planning and of roads, and, if possible, to arrange for an exhibition of town plans.

EXAMINATION.

The April examination of the institution will be held in London, at the New Examination Hall, Queen's-square, W.C., on April 2nd, 3rd and 4th.

92 Victoria-street, S.W.

THOMAS COLE,
Secretary.

PROPOSED VISIT TO HAMBURG.

Mr. Thomas Cole, the secretary, has circularised the members as follows:—

"An invitation has been received from the presiding burgomaster (Dr. Predöhl) for the institution to visit Hamburg at Whitsuntide next, when it is intended to inspect the municipal works of that city. These will include waterworks, gasworks and sewerage works, also town planning, of which Hamburg presents a striking example.

"It is proposed to leave London on Wednesday, May 27th, and return so as to be in London on Thursday morning, June 4th.

"The cost of the trip, travelling second class on rail, saloon on boat, with hotel, tips, &c., will be about £10. Carriage drives may be extra.

"As considerable pains are being taken by His Majesty's Consul-General, the presiding burgomaster, and other chief officials of the city to make the visit a success, I hope that members will respond in good numbers to the hearty invitation that we have received, and that you will facilitate the arrangements by giving me early intimation as to whether it is your intention to join the party."

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

EASTERN DISTRICT.

A meeting of the Eastern District of the institution will be held at Oundle to-morrow (Saturday).

Arrangements have also been made for the following meetings: February 25th, council meeting, London; June 13th, Tisbury. Meetings are being arranged also for Leeds and Birmingham during March.

39 Victoria-street, S.W.

B. WYAND,
Secretary.

SOCIETY OF ENGINEERS.

At a meeting of the Society of Engineers to be held on Monday, March 2nd, at the Institution of Electrical Engineers, Victoria-embankment, W.C., a paper entitled "Esperanto: An International Language for Engineers," will be read by Mr. T. J. Gueritte, B.Sc., M.SOC.C.E.(FRANCE), M.S.E., the following being a synopsis: Importance of standardisation in general—advantages of a universal language—the use of such a language in connection with (a) the study of science, (b) the carrying out of engineering work, (c) international congresses, (d) the sale of technical books at moderate prices—Is an international language possible?—Conditions that must be fulfilled—In what manner Esperanto fulfils these conditions—Illustrations of the applications of Esperanto.

The chair will be taken at 7.30 p.m.

A. S. E. ACKERMANN,

Secretary.

17 Victoria-street, S.W.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

METROPOLITAN DISTRICT.

Dr. G. McGowen, F.I.C., chemist to the Royal Commission on Sewage Disposal, has kindly consented to give a demonstration of the methods of analysis adopted by the commission, at the lecture hall of St. George's Hall (Y.M.C.A.), Bond-street, Ealing, on Monday, February 23rd, at 7.30 p.m. Nearest railway station, Ealing Broadway.

J. FIELDHOUSE,

Hon. Secretary.

The Value of Reinforced Concrete.—"Reinforced Concrete and its Application to Architectural Building Work" was the subject of a lecture delivered at a meeting of the Sheffield Society of Architects and Surveyors, held at the university last week. The lecturer was Mr. Gilbert Heathcote, B.A., of London. After giving a short outline as to the origin of reinforced concrete, and a short history of its progress up to the present day, Mr. Heathcote gave clear and concise facts to show that it is a material which has come to stay—first, owing to its ever-increasing strength, and secondly, because no annual maintenance charges of any consequence have to be expended upon it. The lecturer strongly deprecated the present methods generally adopted by users throughout the country in dealing with reinforced-concrete designs and estimates. He outlined what he thought to be the best manner in which to undertake work of this nature in the interests of the architect, his client and the contractor, and, as he considered, in the interests of the whole future progress of this form of construction in England.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

CLERK OF WORKS.—February 21st.—Cleckheaton Urban District Council. £3 per week.—The Clerk.

CLERK OF WORKS.—February 21st.—Willesden Urban District Council. £3 3s. per week.—Mr. J. S. Bridges, Education Offices, Dyne-road, Kilburn.

CLERK OF WORKS.—February 21st.—Stettle Rural District Council.—Mr. T. E. Pearson, clerk.

INSPECTOR OF NUISANCES.—February 21st.—Wadebridge Urban District Council. £110—£120 per annum.—Mr. Walter O. Wellington, clerk, Wade-bridge, Cornwall.

INSPECTOR OF ROADS.—February 21st.—Islington Borough Council. £2 10s.—£3 per week.—Mr. J. Patten Barber, borough engineer.

TEMPORARY ASSISTANT.—February 21st.—Corporation of Bedford. £2 10s.—£3 per week.—Mr. N. Greenshields, borough engineer and surveyor.

PAVING AND BUILDING INSPECTOR.—February 23rd.—Corporation of Leigh. £2 10s. per week.—Mr. Tom Hunter, borough engineer.

ARCHITECT.—February 23rd.—Exeter City Council. £220—£250 per annum.—Mr. H. Lloyd Parry, town clerk.

SURVEYOR.—February 24th.—Lisburn Urban District Council. £200 per annum.—Mr. T. M. Wilson, town clerk.

MAINS SUPERINTENDENT.—February 25th.—Hammersmith Borough Council. £150—£175 per annum.—Mr. G. G. Bell, borough electrical engineer, 5 Fulham Palace-road, W.

CEMETERY SUPERINTENDENT.—February 25th.—Sutton (Surrey) Urban District Council. £1 10s. per week, with house and gas.—Mr. H. Bolton, clerk.

ASSISTANT SURVEYOR.—February 25th.—Sutton-in-Ashfield Urban District Council. £80—£110 per annum.—Mr. Walter Burn, surveyor.

CLERK OF WORKS.—February 26th.—The Maldens and Coombe Urban District Council. £3 3s. per week.—Mr. J. W. Johnson, clerk, New Malden.

ENGINEERING ASSISTANT.—February 26th.—Corporation of Wigau. £110 per annum.—Mr. A. T. Gooseman, borough engineer and surveyor.

ASSISTANT COUNTY SURVEYOR.—February 28th.—County Palatine of Chester. £350 per annum.—Mr. Reginald Potts, clerk, County Offices, Chester.

SECRETARY.—February 28th.—Institution of Municipal and County Engineers. £400 per annum.—Mr. Thomas Cole, secretary, 92 Victoria-street, Westminster, S.W.

COUNTY SURVEYORS.—February 28th.—Limerick County Council. £300 per annum.—Mr. John J. Quaid, county secretary, Limerick.

CLERKS OF WORKS (Two).—February 28th.—Windsor Rural District Council. 13 guineas per month.—Mr. J. E. Gale, clerk.

SUPERINTENDENT OF FIRE BRIGADE.—February 28th.—Municipality of Karachi. 200 rupees per month, with free quarters.—Mr. Measham Lea, chief officer and chief engineer.

ROAD FOREMAN.—March 2nd.—Corporation of Birmingham. 40s.—45s. per week.—Mr. Henry E. Stilgoe, city engineer and surveyor.

ENGINEER AND SURVEYOR.—March 2nd.—Scunthorpe Urban District Council. £200 per annum.—Mr. H. M. Hett, clerk.

CLERK OF WORKS.—March 3rd.—Corporation of Southport. £3 per week.—Mr. J. Ernest Jarratt, town clerk.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

ASSISTANT ENGINEER.—For Government Water-works in the Gold Coast. £600—£650.—Messrs. Hunter, Duff & Middleton, 17 Victoria-street, Westminster, S.W.

ASSISTANT ENGINEERS AND DRAUGHTSMEN.—Sierra Leone Government, Public Works Department. Engineers, £300—£400; draughtsmen, £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

CLERK OF WORKS.—Cheshire County Council. £3 3s. per week.—Mr. W. Holland, county surveyor, The Castle, Chester.

TEMPORARY ASSISTANT.—Kington Park Rural District Council.—Mr. Frank Hewitt, engineer and surveyor.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

HENDON.—March 2nd.—Designs for public baths, for the urban district council. Premiums £100, £75, and £50.—The Clerk.

TWRCELYN.—March 9th.—Plans and specifications for a water supply and drainage scheme for Cemaes. Mr. T. H. Hughes, clerk, Fir-grove, Menai Bridge.

BELFAST.—March 20th.—Designs for an art gallery and museum, for the corporation.—Mr. R. Meyer, town clerk.

BURTON-UPON-TRENT.—March 24th.—For children's cottage homes, for the Board of Guardians.—Mr. C. F. Chamberlin, clerk.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

MOULD.—Plans for a fire station and caretaker's house, for the urban district council.—Mr. D. Thomas, surveyor, Town Hall.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

BISHOP AUCKLAND.—February 21st.—For the erection of a bandstand, for the urban district council.—The Surveyor.

COVENTRY.—February 21st.—For the erection of a public convenience, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

BEDWELLTY.—February 23rd.—For the erection of a public convenience, for the urban district council.—Mr. D. H. Price, surveyor.

WEMBLEY.—February 24th.—For the erection of caretaker's lodge, tool house, and conveniences, for the urban district council.—Mr. C. R. W. Chapman, engineer and surveyor.

BISHOP'S STORTFORD.—February 24th.—For supplying and erecting 44-h.p. gas engine and suction gas plant, making repairs to existing machinery, erecting an engine-house at the waterworks, for the urban district council.—Mr. Robert S. Scott, engineer.

CLOMEL.—February 25th.—For the erection of a retort house and coal store, for the council.—Mr. Henry O'Connor, engineer, 1 Drummond-place, Edinburgh.

MANCHESTER.—February 25th.—For the erection of pavilions at sanatorium, for the Sanitary Committee.—City Architect, Town Hall.

WETHERBY.—February 25th.—For the erection of engine-house and watch-tower, for the rural district council.—Mr. H. A. Johnson, engineer, 15 The Exchange, Bradford.

FALMOUTH.—February 25th.—For additions to pavilion, for the corporation.—Mr. J. S. Walton, borough engineer and surveyor.

MORLEY.—February 25th.—For the foundations required for gasworks plant, for the corporation.—Gas Office, Town Hall.

GOOLE.—February 25th.—For the erection of slipper baths, for the urban district council.—The Surveyor.

LUTTERWORTH.—February 26th.—For the erection of twenty-three houses, for the rural district council.—Mr. A. J. Ross, surveyor.

PEMBROKESHIRE.—February 26th.—For additions to a school, for the Education Authority.—Mr. O. T. Thomas, County Education Offices, Haverford-west.

BARTON-UPON-IRWELL.—February 27th.—For the erection of cart shed, office, mortuary, and store-room, for the rural district council.—Mr. A. H. Mountain, surveyor, Union Offices, Green-lane, Patricroft.

CARLISLE.—February 28th.—For the erection of an office and convenience at the cattle market, for the corporation.—Mr. H. C. Marks, engineer and surveyor.

BLOFIELD.—February 28th.—For the erection of four cottages, for the rural district council.—Mr. H. H. Cole, clerk, 12 Bank-street, Norwich.

FEATHERSTONE.—February 28th.—For the erection of 149 working-class dwellings, for the urban district council.—Mr. S. Chesney, architect.

ROMFORD.—February 28th.—For the conversion of buildings into a fire station, for the urban district council.—Mr. H. T. Ridge, acting surveyor.

LEICESTER.—February 28th.—For the erection of a brick chimney shaft, 212 ft. high, for the corporation.—Mr. E. George Mawbey, borough engineer and surveyor.

BECKENHAM.—March 2nd.—For the erection of an iron building, 60 ft. by 25 ft., at the Church Fields-road depot, for the urban district council.—Mr. John A. Angell, surveyor.

STRATFORD-ON-AVON.—March 2nd.—For laying water mains, erection of mechanical filter and pumping-house, and construction of concrete reservoir, for the corporation.—Mr. R. Dixon, borough surveyor.

MARGATE.—March 2nd.—For laying 1,900 yds. of 8-in. water main, for the corporation.—Mr. Stanley, waterworks manager, 13 Grosvenor-place.

PAIGNTON.—March 2nd.—For the erection of a public convenience, for the urban district council.—The Surveyor.

WEST RIDING.—March 6th.—For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

ANTWERP.—March 6th.—For the construction of two metal sheds, for the municipality.—Secrétariat, Hotel de Ville.

BEDFORD.—March 7th.—For the erection of buildings in connection with two pumping stations, and screening chamber, together with the construction of approach roads and areas, formation of site, and other works, for the corporation.—Major Tulloch & Haworth, 28 Victoria-street, Westminster, S.W.

BISHOP'S CASTLE.—March 10th.—For additions and alterations to the Smithfield, for the corporation.—Borough Surveyor.

BURNLEY.—April 4th.—For the completion of the construction of an impounding reservoir, with catchwaters, aqueducts, and meter-houses, for the corporation.—Messrs. James Diggle & Son, engineers, Hind Hide-street, Heywood, Lanes.

KEIGHLEY.—April 11th.—For the construction of a storage reservoir, filter beds, clear water basin, and other appurtenances, for the corporation.—Mr. Ratcliffe Barnett, engineer.

Iron and Steel.

SHIPLEY.—February 24th.—For the supply of steel girder tram rails and fish plates, for the urban district council.—Mr. H. W. Dawson, engineer.

MATLOCK.—February 28th.—For the erection of steel bridges over the river Derwent to carry steel tube sewers, for the urban district council.—Messrs. James Diggle & Son, 14 Victoria-street, Westminster, S.W.

MARGATE.—March 2nd.—For 573 yds. of wrought-iron fencing, with entrance gates, for the corporation.—Mr. E. A. Borg, borough surveyor.

WELLINGTON.—March 3rd.—For the provision of and laying about 5,750 yds. of 3-in. and 2-in. cast-iron water mains, with valves, meters, hydrants, stand-posts, air valves, and other incidental works, for the rural district council.—Messrs. Willcox & Raikes, 63 Temple-row, Birmingham.

NORTH BROMSGROVE.—March 3rd.—For the supply and erection of three sets of gas engines, and three throw pumps, capable of lifting in the aggregate 20,000 gallons per hour, for the urban district council.—Mr. R. Green, 37 Waterloo-street, Birmingham.

BEDFORD.—March 7th.—For the provision and erection of four sets of steam engines and centrifugal pumps, together with all necessary pipe work, for the corporation.—Major Tulloch & Haworth, 28 Victoria-street, Westminster, S.W.

MADRAS.—March 24th.—For the supply of 2,000 cast-iron manhole covers and frames, for the corporation.—Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster.

Roads.

YEADON.—February 21st.—For the supply of materials, for the urban district council.—Mr. N. Houlden, surveyor.

BEDFORDSHIRE. February 21st. For the supply and cartage of road materials, for the county council.—County Surveyor, Shire Hall, Bedford.

HORBURY.—February 23rd.—For the supply of tarmac, granite, whinstone, limestone, dross, flags, kerbs and setts, for the urban district council.—Mr. W. Sugars, engineer and surveyor.

LEIGH.—February 23rd.—For the supply of road materials, for the corporation.—Mr. T. Hunter, borough engineer.

HIGHWORTH.—February 23rd.—For road repair and haulage, for the rural district council. Mr. O. Kimber, surveyor, Kite Hill, Wanborough.

LONDON.—February 23rd.—For the supply of Channel Island granite, granite sittings, red pit sand, screened river sand, cockle shells, screened gravel, pea gravel, Kentish flints and Kentish rag, for H.M. Commissioners of Works.—The Secretary, Storey's-gate, S.W.

BANBURY.—February 23rd.—For the supply of stone, for the corporation.—Borough Surveyor.

FINCHLEY.—February 23rd.—For the supply of grit for tar-painting, for the urban district council.—Mr. C. J. Jenkin, engineer.

FINCHLEY.—February 23rd.—For the supply of 55,000 gallons of tar for road surface treatment, for the urban district council.—Mr. E. H. Lister, clerk.

ROMFORD.—February 23rd.—For the supply of distilled tar, granite chippings, and clean sand, for the urban district council.—The Surveyor.

BEDWELLYTY.—February 23rd.—For making up a street, for the urban district council.

EPSOM.—February 23rd.—For making up Rosebery-road, Cheam, for the rural district council.—Mr. T. E. Ware, surveyor of highways.

WEST LANCASHIRE.—February 23rd.—For the supply of granite, granite setts, tar macadam, and tar mixtures, for the rural district council.—Mr. R. Rosbotham, Town End, Ormskirk.

MERIONETH.—February 23rd. For road rolling and macadamising, for the county council.—Mr. E. Vaughan, county surveyor, Arthog, Dolgelly.

PENARTH.—February 23rd.—For the supply of road materials, for the urban district council.—Mr. E. I. Evans, surveyor.

WOODFORD.—February 24th.—For the supply of small granite, granite chippings, tar, pitch, and creosote oil, for the urban district council.—Mr. W. Farrington, surveyor.

SEATON DELAVAL.—February 24th.—For the supply of tar-macadam, tarred slag, whinstone, and hire of steam roller, for the urban district council.—Mr. A. Dorin, surveyor.

ASHINGTON.—February 24th.—For work of making up, for the urban district council.—Mr. G. Beaty, surveyor.

LITTLEBOROUGH.—February 24th.—For 17,000 super. yds. of granite sett paving and other works, for the urban district council.—The Surveyor.

SOUTHAMPTON.—February 24th.—For private street works, for the corporation.—Borough Engineer.

LONGBENTON.—February 24th.—For the supply of hand-broken whinstone, for the urban district council.—Mr. W. Bean, highway surveyor, Council Offices, Forest Hall.

WEALDSTONE.—February 24th.—For the supply of road materials and cartage, for the urban district council.—Mr. H. Walker, surveyor.

BOGNOR.—February 24th.—For tar-paving the esplanade, for the urban district council.—Mr. A. O. Bridges, surveyor.

FOLESHILL.—February 24th.—For making up certain roads, for the rural district council.—Mr. A. E. Newey, engineer and surveyor.

MILTON.—February 24th.—For the supply of surface-picked flints, fine gravel, broken granite, Kentish rag, and horse labour, for the rural district council.—Mr. E. C. Pearcey, district surveyor, 45 High-street, Sittingbourne.

MALLING.—February 24th.—For the supply of road materials, for the rural district council.—Mr. John Marshall, highways surveyor, Springetts Hill, East Malling.

SOUTHWELL.—February 24th.—For the supply of road material, for the rural district council.—Mr. A. Edwards, Edwinstowe, Newark (north district); Mr. R. Morris, Southwell (south district).

SMALLBURGH.—February 24th.—For the supply of flints, granite, marl, beach stones, clay, and team labour, for the rural district council.—Mr. W. L. Lewis, district surveyor, Stalham, Norfolk.

NEWMARKET.—February 24th.—For the supply of road materials, for the rural district council.—Mr. S. J. Ennion, clerk.

POOLE.—February 24th.—For reconstructing the High-street, for the corporation.—Mr. S. J. Newman, borough surveyor.

HULL.—February 25th.—For the supply of 8,000 tons of stone for macadamising, for the corporation.—Mr. A. E. White, city engineer.

HEMSWORTH.—February 25th.—For widening and improving a certain highway, for the rural district council.—Mr. T. H. Richardson, surveyor.

WOKINGHAM.—February 25th.—For the supply of granite, chips, broken gravel, flints, and path gravel, for the corporation.—Mr. J. H. Elliston Clipson, town clerk.

FLEETWOOD.—February 25th.—For the supply of Haslingden stone kerbs, channels, flags, limestone-macadam, setts, oil, and tar, for the urban district council.—Mr. A. Coitani, clerk.

MIDDLESBROUGH.—February 25th.—For making up certain streets, for the corporation.—Borough Engineer.

ROCHESTER.—February 25th.—For laying creosoted deal paving, for the corporation.—Mr. W. Banks, city surveyor.

LANARK.—February 25th.—For the supply of road metal, for the Lower Ward District.—Mr. J. A. McCallum, 15 West George-street, Glasgow.

GLAMORGAN.—February 25th.—For main road widenings, for the county council.—The Clerk, County Hall, Cardiff.

DENBIGH.—February 25th.—For the supply of roadstone and tar-macadam, for the county council.—Mr. W. Jones, county surveyor, Eastern Division, Wrexham.

HENDON.—February 26th.—For making up certain roads, for the rural district council.—Mr. J. A. Webb, engineer and surveyor, Stanmore.

SLEAFORD.—February 26th.—For the supply of granite, for the urban district council.—Mr. E. Clements, clerk.

CALVERLEY.—February 26th.—For road repairs, for the urban district council.—Messrs. Cowgill & Son, Tanfield Chambers, Piece Hall-yard, Bradford.

EASTBOURNE.—February 26th.—For the supply of stone, flints, Portslade flints, and stone chippings, for the rural district council.—Mr. T. E. V. Kirtlan, clerk.

WETHERBY.—February 26th.—For the supply of tools and stores in the highways department, for the rural district council.—Mr. A. G. Kilner, surveyor.

WHITLEY.—February 26th.—For steam rolling and the supply of granite, for the urban district council.—Mr. J. Sharp, clerk.

HACKNEY.—February 26th.—For making up a new street, for the borough council.—Borough Engineer and Surveyor.

WETHERBY.—February 26th.—For the supply of broken whinstone, limestone, granite, and dross, tar macadam, and cob limestone, for the rural district council.—Mr. A. G. Kilner, surveyor.

MERTON AND MORDEN.—February 27th.—For surfacing 4,000 sq. yds. of carriageway with bituminous macadam or other approved waterproof material, for the urban district council.—Mr. G. Jerram, engineer and surveyor.

LEPTON.—February 27th.—For the supply of granite and steam rolling, for the urban district council.—Mr. G. W. Smith, clerk, 23 John William-street, Huddersfield.

BEDWAS AND MACHEN.—February 27th.—For the supply of broken limestone, and repair of roads, for the urban district council.—Mr. A. S. V. Taylor, surveyor.

CANNOCK.—February 27th.—For kerbing, and making up certain streets, for the urban district council.—Mr. R. Blanchard, surveyor.

ASHINGTON.—February 27th.—For the supply of hand-broken whinstone, for the urban district council.—Mr. G. Beaty, surveyor.

OTLEY.—February 27th.—For the supply of granite macadam, furnace slag dust, kerbs and flags, limestone macadam, tar-macadam, brushes, pitch, and carting road metal, for the urban district council.—Mr. C. F. Hodgson, surveyor.

EGREMONT.—February 27th.—For the supply and laying down of granite kerbs, channelling, setts, and concrete flagging, for the urban district council.—Mr. J. Cowan, surveyor.

DESBOROUGH.—February 27th.—For the supply of granite and slag, for the urban district council.—Mr. G. E. Marlow, surveyor.

WINDSOR.—February 28th.—For the supply of tarred slag and Leicestershire granite, for the corporation.—Borough Surveyor.

MERTHYR TYDFIL.—February 28th.—For private street works, for the corporation.—Borough Surveyor.

TYNEMOUTH.—February 28th.—For constructing a macadam road, for the corporation.—Mr. J. F. Smillic, borough surveyor.

BOLSOVER.—February 28th.—For the supply of broken granite, basalt, slag, limestone, kerbing, channelling, tar and pitch, for the urban district council.—Mr. G. H. Browne, surveyor.

RICCALL.—February 28th.—For the supply of road materials, for the rural district council.—Mr. J. Townend, clerk, 1 Abbey-place, Selby.

EAST RIDING.—February 28th.—For the supply of 7,000 tons of stone for macadamising purposes, for the county council.—Mr. John Bickersteth, clerk, County Hall, Beverley.

HOLBEACH.—February 28th.—For the supply of granite, granite kerbing, slag, and gravel, for the urban district council.—Mr. T. C. Willders, clerk.

BUCKINGHAM.—February 28th.—For the supply of granite, granite chippings, and slag, for the rural district council.—Mr. Frank L. Reynolds, surveyor.

LOUGHTON.—March 2nd.—For the supply of Norway granite kerb, for the urban district council.—Mr. H. White, surveyor.

BLYTH AND CUCKNEY.—March 2nd.—For the supply of best broken slag, for the rural district council.—Mr. F. Hopkinson, surveyor, 66 Bridge-street, Worksop.

TONBRIDGE.—March 2nd.—For making up a street, for the rural district council.—Mr. F. Harris, engineer and surveyor, Broadway, Southborough, Tunbridge Wells.

CHERTSEY.—March 2nd.—For making up and draining certain roads, for the rural district council.—Mr. H. Beeney, surveyor, West Byfleet.

LICHFIELD.—March 2nd.—For the supply of granite, slag, chippings, tools, and oil, for the rural district council.—The Surveyor.

LANCASHIRE.—March 2nd.—For the hire of steam rollers, for the county council.—Mr. W. H. Schofield, county surveyor, Preston.

LANCASHIRE.—March 2nd.—For the supply of granite macadam, limestone macadam, rubble, chip-

pings, and gravel, for the county council.—Mr. W. H. Schofield, county surveyor, Preston.

TILBURY.—March 2nd.—For the supply of broken granite, Kentish ragstone, hoggin, and coal, for the urban district council.—Mr. S. A. Hill-Willis, engineer and surveyor.

WALTON-UPON-THAMES.—March 2nd.—For the supply of broken granite and broken flints, for the urban district council.—Mr. R. Wilds, surveyor.

TILBURY.—March 2nd.—For private street works in Christchurch-road, northern end of Toronto-road, and northern end of Quebec-road, for the urban district council.—Mr. S. A. Hill-Willis, surveyor.

EAST RETFORD.—March 2nd.—For the supply of slag, granite, refined tar, and Tarvia, for the rural district council.—Mr. T. Henry, surveyor.

MANSFIELD.—March 2nd.—For making up certain streets, for the corporation.—Mr. T. P. Collinge, borough engineer and surveyor.

SAWBRIDGEWORTH.—March 2nd.—For street watering, for the urban district council.—Mr. W. Morris, clerk.

ROMSEY.—March 3rd.—For tar paving, for the corporation.—Borough Surveyor.

LEWISHAM.—March 3rd.—For the supply of 3,400 tons of tarred slag macadam, for the borough council.—Borough Surveyor.

MIDDLETON.—March 3rd.—For the supply of macadam, setts, kerbs, flags, cement, pipes, pitch, oil, brooms, and castings, for the corporation.—Mr. Frederick Entwistle, town clerk.

PORTLAND.—March 3rd.—For the supply of 2,700 tons of 1½-in. and 2-in. broken granite or basalt, for the urban district council.—Mr. R. Stevenson Henshaw, engineer and surveyor.

WARE.—March 4th.—For making up certain streets, for the urban district council.—The Surveyor.

SOKE OF PETERBOROUGH.—March 5th.—For the supply of granite, chippings, local stone, general cartage, and team labour, for the county council.—Mr. A. C. Wallingford, county surveyor, 45 Priestgate, Peterborough.

LOUGHBOROUGH.—March 5th.—For the supply of broken granite, for the corporation.—Mr. Albert H. Walker, borough surveyor.

CLOWN.—March 7th.—For the supply of broken slag and granite, for the rural district council.—Mr. J. T. Pears, surveyor, Hollin Hill, Clown, Chesterfield.

SHEPTON MALLET.—March 7th.—For the supply of materials, street watering, and cleansing and maintenance, for the urban district council.—Mr. D. Hinchcliffe, surveyor.

CORNWALL.—March 7th.—For the supply of materials, hauling, and team labour, for the county council.—Assistant County Surveyor, Clinton-road, Redruth.

BELPER.—March 7th.—For the supply of highway materials, for the rural district council.—Mr. R. C. Cordon, engineer and surveyor, Duffield, near Derby.

HAYES (Middlesex).—March 7th.—For making up certain streets, for the urban district council.—Mr. D. C. Fidler, engineer and surveyor.

DRIFFIELD.—March 7th.—For the supply of whinstone and granite, broken slag, sea cobbles, sea gravel, and tarred chippings, for the rural district council.—Mr. T. Casson Beaumont, surveyor.

WING.—March 9th.—For the supply of 1,200 tons of granite, 1,200 tons of slag, sand, and gravel, for the rural district council.—Mr. M. G. Gurney, surveyor, Linlade, Leighton Buzzard.

EASTLEIGH.—March 10th.—For making up certain streets, for the urban district council.—Mr. W. Wallace Gandy, engineer and surveyor.

RYTON.—March 11th.—For making up certain streets, for the urban district council.—Mr. J. P. Dalton, surveyor.

CHESTERTON.—March 12th.—For the supply of 5,000 tons of broken granite, for the rural district council.—Mr. J. Dunn, surveyor, Brunswick House, Cambridge.

DROXFORD.—March 16th.—For the supply of granite or hard stone, for the rural district council.—Mr. A. V. Carter, surveyor.

DARTFORD.—March 16th.—For the supply of road materials, for the rural district council.—Mr. J. Hookins, surveyor, Gartly, Dartford.

KING'S LYNN.—March 23rd.—For tar spraying roads, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

KING'S LYNN.—March 27th.—For the supply of road materials, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

DUMBARTON.—(No date).—For the widening of 4 miles of road, for the county council.—Mr. W. Craig, county clerk, County Buildings, Dumbarton.

Sanitary.

HARBOROUGH.—February 23rd.—For drainage and sewage disposal works, for the Joint Hospital Board.—Mr. T. W. Willard, architect, Market-place, Rugby.

ASHTON-IN-MAKERFIELD.—February 23rd.—For the construction of sewage disposal works, for the urban district council.—Messrs. Banks, Fairclough & Stephen, engineers, Leigh, Lancs.

WOODHOUSE.—February 23rd.—For the removal of nightsoil and refuse, for the urban district council.—Mr. J. E. Alcock, clerk, Mansfield.

LONDON.—February 24th.—For the supply of disinfectants, for the city corporation.—Town Clerk, Guildhall, E.C.

BENTLEY (Yorks).—February 24th.—For the construction of a surface-water drain, for the urban district council.—Mr. R. G. Whitley, surveyor, 264 Bentley-road, Doncaster.

BURY (Lancs).—February 24th.—For constructing sewer and connections, for the rural district council.—Mr. J. H. Hall, 1 Cooper-street, Manchester.

EPSOM.—February 24th.—For the removal of house refuse, for the rural district council.—Mr. W. T. Wooldrige, surveyor.

RHONDDA.—February 24th.—For work of sewerage and road improvement, for the urban district council.—Chairman of the Council.

OYSTERMOUTH.—February 24th.—For laying stoneware pipe sewer, for the urban district council.—Mr. W. P. Puddicombe, surveyor.

SEVENOAKS.—February 24th.—For the execution of storm-water sewerage works, for the urban district council.—Mr. Samuel Towlson, surveyor.

SOUTH SHIELDS.—February 25th.—For a main sewerage scheme, for the rural district council.—Messrs. D. Balfour & Son, 3 St. Nicholas Buildings, Newcastle-on-Tyne.

BURY.—February 25th.—For laying a sewer, for the rural district council.—Mr. E. T. M. Johnson, Bank of England Chambers, The Lane, Cross-street, Manchester.

LEEDS.—February 26th.—For the supply of cement, earthenware drain pipes, sewer ironwork, galvanised dirt boxes, and sewer ventilating columns, for the corporation.—Mr. W. T. Lancashire, city engineer.

BATH.—February 26th.—For sewerage work, for the corporation.—Mr. W. H. Radford, engineer, Albion Chambers, King-street, Nottingham.

ASHINGTON.—February 27th.—For work of sewerage, for the urban district council.—Mr. G. Beaty, surveyor.

HAMPTON WICK.—February 27th.—For scavenging and road watering, for the urban district council.—The Surveyor.

HAYWARD'S HEATH.—February 28th.—For the construction of a sewer and manholes, for the urban district council.—Mr. G. Plummer, surveyor.

GRIMSBY.—February 28th.—For scavenging work, for the rural district council.—Mr. J. H. Evans, sanitary inspector.

BURNISLAND.—February 28th.—For laying pipes for drainage, for the corporation.—Mr. J. A. Waddell, burgh surveyor.

READING.—February 28th.—For works of sewerage and surface-water drainage, for the corporation.—Mr. G. Midgley Taylor, Caxton House, Westminster.

NANTWICH.—March 2nd.—For work of sewer construction, for the urban district council.—Mr. W. F. Newey, surveyor.

SHIPSTON-ON-STOUR.—March 2nd.—For laying 3,632 yds. of 9-in. and 6-in. stoneware pipe sewers, and

about 300 yds. of 5-in. cast-iron rising main, also the construction of manholes, lampholes, flushing chambers, engine-house, and other incidental works, for the rural district council.—Messrs. Willcox & Raikes, 63 Temple-row, Birmingham.

COALVILLE.—March 2nd.—For laying 1 mile of 9-in. sewers and 490 yds. of 18-in. sewer, and 300 yds. of 4-in. cast-iron and steel main, for the urban district council.—Mr. L. L. Baldwin, surveyor.

WALLINGTON.—March 5th.—For the removal of refuse, for the Parochial Committee.—Mr. E. J. Gowan, clerk, Katherine-street, Croydon.

BATH.—March 7th–10th.—For the supply of glazed stoneware sewer pipes and gully traps, for the corporation. Mr. C. R. Fortune, city surveyor.

BATHDON.—March 9th.—For the construction of detritus tanks, alterations to settling tanks, percolating filters and sludge filters, for the urban district council.—Mr. J. N. Nicholson, 19 Tanfield Chambers, Bradford.

SANDERSTEAD. March 10th.—For scavenging work, for the Parochial Committee.—Mr. E. J. Gowan, clerk, Katherine-street, Croydon.

MERTHYR TYDFIL.—March 14th.—For providing, laying and jointing a 30-in. main sewer, comprising about 4½ miles of concrete tubes and 173 yds. of 30-in. steel tubes, for the corporation.—Borough Engineer.

CHESHAM.—March 14th.—For the reconstruction with cast-iron pipes of about 712 lin. yds. of 12-in., 977 yds. of 9-in., and 935 yds. of 6-in. existing stoneware pipe sewers and house connections with manholes and flushing chambers, for the urban district council.—Mr. Percy C. Dormer, engineer and surveyor.

READING.—March 16th.—For the construction of sewerage and manholes, for the corporation.—Mr. J. Bowen, borough engineer and surveyor.

MADRAS.—March 24th.—For the supply and delivery of 2,000 cast-iron manhole covers and frames, for the corporation.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

Stores.

EPSOM.—February 23rd.—For the supply of flints, fine gravel, sand, coal, coke, cement, stoneware pipes, granite kerb, cartage and watering, for the rural district council.—Mr. T. E. Ware, surveyor.

LEIGH.—February 23rd.—For the supply of Barns flags, earthenware pipes, granite macadam, manhole covers, and parapet gutters, for the corporation.—Mr. Tom Hunter, borough engineer.

MANSFIELD.—February 23rd.—For the supply of granite, slag and tar-macadam, natural flags, kerbing, concrete flags, Portland cement, stoneware pipes, junction bends, timber, sewer ironwork, castings, coal, ironmongery, paints, brooms, brushes, disinfectants, and harness, for the corporation.—Mr. Thos. P. Collinge, borough engineer and surveyor.

TWICKENHAM.—February 25th.—For the supply of ballast, shingle, flints, gravel, granite cubes and setts, Portland cement, coal, coke, fodder, oil and colourman's goods, iron castings, street gullies and drain pipes, for the urban district council.—Mr. F. W. Pearce, surveyor.

SOUTHEND-ON-SEA.—February 25th.—For the supply of stoneware pipes, bends, flints, bricks, gravel, sand, timber, ironmongery, paints, oils, colours, cement, lime, chalk, team labour, forage, tar-paving, tar-macadam, iron castings, granite kerb, channel, broken Guernsey granite, broken granite, pitch, creosote oil, harness supplies, brooms, brushes, iron, steel, and disinfectants, for the corporation.—Mr. E. J. Elford, borough surveyor.

HAMPTON.—February 26th.—For the supply of hand-broken granite, granite chippings, broken Kentish brown flints, Derbyshire limestone, marble, tar-paving material, forage, coal and scavengers' bass brooms, for the urban district council.—Mr. Sidney H. Chambers, surveyor.

OTLEY.—February 27th.—For the supply of granite macadam, furnace slag, dust, kerbs, flags, limestone macadam, tar-macadam, brushes, pitch, and carting road material, for the urban district council.—Mr. C. F. Hodgson, surveyor.

WINCHESTER.—February 27th.—For the supply of broken granite, chippings, bass brooms, Portland cement, coal, coke, stoneware drain pipes, and concrete paving slabs, for the corporation.—Mr. Walter V. Anderson, city engineer.

SOUTH SHIELDS.—February 28th.—For the supply of whinstones, granites, slag, granite chippings, flags, Portland cement, cement-concrete flags, cast-iron work, shovels, scavenger brooms, machine brooms, coal, coke, disinfectants, leather hose, sewer boots, jackets, sanitary pipes, paints, paint oils, glass, timber, iron, horseshoe nails, cart axles, springs, tar, pitch, oils, and general stores, for the corporation.—Mr. Leslie Roseveare, borough engineer.

EALING.—March 2nd.—For the supply of limes, pipes, cement, ironmongery, iron castings, paints, oils, granite, disinfectants, refined tar, books, stationery, printing, timber, uniforms, tarred macadam, tar-paving material and work in situ, harness repairs, wood paving repairs, and slab-laying, for the corporation.—Mr. W. R. Hicks, borough surveyor.

BLACKPOOL.—March 2nd.—For the supply of paving setts, kerbs, flags, broken limestone, granite, glazed stoneware socket pipes, prepared tar asphalt, ironmongery, bolts, nuts, washers, iron castings, brushes, oils, paints, pitch, creosote oil, coal, repairs to harness, asphaltting, and Portland cement, for the corporation.—Mr. John S. Brodie, borough surveyor.

EPSOM. March 3rd.—For the supply of sewerage ironwork, gully gratings, shovels, picks, brooms, forks, dust skeys, disinfectants, Portland cement, stoneware pipes, gullies, kerbing, channelling, setts, broken granite, chippings, limestone dust, tar-paving, tarred macadam, coal, coke, bricks, artificial stone paving, Thames ballast, Thames sand, veterinary surgeon's services, tar, pitch, and team labour, for the urban district council.—Mr. Edward R. Capon, surveyor.

BATLEY. March 9th.—For the supply of flagstones, setts, paviers, kerbs, sanitary tubes, pitch, creosote oil, natural pitch or bitumen, cement, broken granite, broken basalt, ironmongery, brushes, and engine oils, for the corporation.—Mr. Oscar J. Kirby, borough engineer.

DERBY.—March 9th.—For the supply of bricks, castings, cement, lime, disinfectants, earthenware, freestone, gritstone, granite, gravel, sand, limestone, pitch, tar and slag, for the corporation.—Mr. John Ward, borough surveyor.

BARNES.—March 9th.—For the supply of broken Guernsey or Alderney granite, broken pit flints and Thames ballast, horse and cart hire, disinfectants, ironmongery, Portland cement, forage, litter, granite kerb, channel, paving slabs, oils, paints, and stoneware pipes, for the urban district council.—Mr. C. Bruce Tomes, engineer and surveyor.

BACUP.—March 14th.—For the supply of road materials and general stores, for the corporation.—Borough Surveyor.

WESTON-SUPER-MARE.—March 14th.—For the supply of ironmongery, tools, castings, iron and steel, paints, brooms, brushes, water fittings, stoneware goods, cement, lime, bricks, disinfectants, and stable utensils, for the urban district council.—Mr. H. A. Brown, engineer and surveyor.

Miscellaneous.

EAST HAM.—February 23rd.—For the supply of petrol-driven motor fire engine and motor fire escape, for the corporation.—Mr. J. Birch, borough engineer.

STOKE NEWINGTON.—February 24th.—For the supply of mason and pavior's work, horsing of water and other vans, cartage, water-post and plumbing work, removal of clinker from destructor, lime, cement, pipes, bends, bricks, brooms, tools, and castings, for the borough council.—The Borough Surveyor.

KENT.—February 28th.—For the supply of six petrol-driven motor lorries, the bodies to be constructed of steel with end tipping gear, and capable of carrying a load of 5 cub. yds., for the county council.—County Surveyor, Maidstone.

BEDFORD.—March 7th.—For the provision and erection of electrically driven centrifugal pumps, comprising four single-phase 2,000-volt electric motors, coupled direct to four centrifugal pumps, together with float actuated automatic starting gear, high-tension and other switchgear, and electrical connections, for the corporation.—Major Tulloch & Haworth, 28 Victoria-street, Westminster, S.W.

BARNES.—March 9th.—Offers are invited for a Merryweather double-cylinder "Greenwich" steam fire engine complete with all fittings.—Mr. G. Bruce Tomes, surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

CROMPTON.—Accepted for a refuse destructor.—Mr. F. F. Gartside, surveyor:—
Dawson & Manfield, Manchester.

HENDON.—For the North End-road, Golders Green-road, and Brent-street improvement, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor:—

W. Muirhead & Co.	£29,258
W. Griffiths & Co.	28,869
J. Mowlem & Co.	28,544
Improved Wood Paving Company	28,531
G. Wimpey & Co.	28,174
Durax Dustless Roads, Limited *	27,568
R. Ballard	27,375
D. R. Paterson, Limited	27,292
H. Farrow	27,177
T. Adams	26,907
G. J. Anderson	26,436
Acme Flooring and Paving Co. (1904), Limited *	25,994
J. W. Pearce & Co., Limited	25,335

HENDON.—Accepted for private street works, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor:—

Hayes-crescent.—D. R. Paterson, Limited, £1,144.
Hallswelle-road.—R. Ballard, £1,814.
Egerton-gardens.—H. Farrow, £1,634.
Babington-road.—H. Farrow, £1,377.
Wroughton-terrace.—H. Farrow, £397.
Llanelly-road.—J. Mowlem & Co., £475.
Ivant-road.—T. Adams, £1,412.

HENDON.—For making up Finchley-road, opposite Ashbourne-parade, Temple Fortune, for the urban district council.—Mr. S. S. Grimley, engineer and surveyor:—

G. Wimpey & Co., Hammersmith	£611
D. R. Paterson, Limited, Camden Town	605
Durax Dustless Roads, Limited, Westminster, S.W.	600
R. Ballard, Limited, Childs Hill	582
W. Muirhead & Co., Westminster, S.W.	579
T. Adams, Wood Green, N.	545
H. Farrow, Buxton	524
G. J. Anderson, Poplar, E.	518
J. Mowlem & Co., Westminster, S.W.	511
Improved Wood Paving Company, Limited, Queen Victoria-street, E.C.	497
J. W. Pearce & Co., Limited, Barrow-in-Furness	497
W. Griffiths & Co., Bishopsgate, E.C.	495
Acme Flooring and Paving Company (1904), Limited, Victoria Park, E.*	480

HOVE.—For additions and alterations to the police station in the town hall, and constructing underground lavatories in Norton-road.—Mr. H. H. Scott, borough surveyor:—
McKellar & Westerman, Hove, £2,097.

For enlarging steam-roller shed at Sackville-road depot:—
A. Chadwell, Hove, £215.

LINTHWAITE.—For work of street construction, for the urban district council.—Mr. Albert Mallinson, surveyor:—

J. R. Crisp, Stalybridge	£1,150
J. W. Pearson & Co., Minsbridge	1,040
A. Graham & Sons, Huddersfield	900
J. Wimpenny & Co., Linthwaite	883
S. Sykes, Golear	805
Kaye Brothers, Huddersfield	973
V. Bamforth, Eland	733
D. Garside, Golear	785
F. Dearnley, Slaithwaite	678
J. Whiteley, Golear	673

MIDDLESBROUGH.—For the new laundry, sanatorium, West-lane, Middlesbrough, for the corporation.—Mr. S. E. Burgess, borough engineer and surveyor:—

Wilkinson & Bowman, Middlesbrough	£3,100
Hudson Brothers, Middlesbrough	3,050
Duchar & Bowers, Middlesbrough	3,050
D. Doughty & Sons, Middlesbrough	3,050
Vinter & Davison, Middlesbrough	2,997
H. McNaughton, Limited, Middlesbrough	2,983
W. A. King & Sons, Limited, Middlesbrough	2,937
J. G. Porteous, Guisborough	2,930
S. Coates, Limited, Middlesbrough*	2,892

NEWARK.—For the supply of 850 tons of granite, 1,900 tons of slag, and 250 tons of tar-macadam, for the rural district council.—Mr. R. Oakden, Junr., Newark:—

Oakes & Co., Derby.—250 tons tar-macadam, 1½-in., 12s. 7d.; 2½-in., 12s. 7d.
Hodson & Son, Nottingham.—400 tons basalt, 1½-in., 10s.; 2½-in., 10s. 6d. 700 tons slag, 1½-in., 4s. 11d.; 2½-in., 4s. 11d.
Salisbury & Wood, Burton-on-Trent.—400 tons granite, 1½-in., 9s. 1d.; 2½-in., 9s. 7d. 600 tons slag, 1½-in., 5s.; 2½-in., 5s.
Carr & Co., Sheffield.—600 tons slag, 1½-in., 4s. 11d.; 2½-in., 5s. 7d.

SOUTHAM.—Recommended for the supply of granite, for the rural district council.—Mr. H. Pickering, surveyor:—

GRANITE.

Judkins, Limited, Nuneaton.—Unbroken, 6s. 6d. to 7s. 11d. per ton; 2½-in. broken, 8s. 10d. to 10s. 2d. per ton. Approximate quantity, 1,300 tons.
C. Abell, Limited, Atherstone.—Unbroken, 5s. 7d. to 7s. 9d. per ton; 2½-in. broken, 7s. 11d. to 10s. per ton. Approximate quantity, 1,300 tons.

SLAG.

C. L. Stiff & Co., Birmingham.—Broken, all sizes, 5s. 2d. to 6s. 8d. per ton. Approximate quantity, 750 tons.

SUTTON-IN-ASHFIELD.—For the supply of tar-macadam and broken slag, for the urban district council.—Mr. W. Burn, surveyor:—
J. Oakes & Co., Alfreton Ironworks

TIPTON.—For making up a street, for the urban district council.—Mr. W. H. Jukes, engineer and surveyor:—

G. Emery & Co., Birmingham	£197
W. F. Gny, Tipton	142
C. Jackson, Tipton †	133

Surveyor's estimate, £155.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

FEBRUARY.

- 20. Institution of Civil Engineers (Students' Meeting): Vernon-Harcourt Lecture on "The Use of Reinforced Concrete in Connection with Dock and other Maritime Work." 8 p.m.
- 20.—Junior Institution of Engineers: Mr. F. F. Evans on "Mechanical Stoking." 8 p.m.
- 20-21.—Institution of Municipal and County Engineers: Meeting at Manchester.
- 21.—Institution of Municipal Engineers: Eastern District Meeting at Oundle.
- 23.—Association of Managers of Sewage Disposal Works: Dr. G. McGowen, F.I.C., on "Methods of Analysis Adopted by the Royal Commission on Sewage Disposal." St. George's Hall, Ealing. 7.30 p.m.
- 23.—Surveyors' Institution: Annual Dinner, Whitehall Rooms. 7 p.m.
- 27.—Institution of Civil Engineers (Students' Meeting): Vernon-Harcourt Lecture on "The Use of Reinforced Concrete in Connection with Dock and other Maritime Work." 8 p.m.
- 28.—Junior Institution of Engineers: Annual Dinner Holborn Restaurant. 6.30 p.m.

MARCH.

- 2.—Society of Engineers: Mr. T. J. Gueritte, M.Soc.C.E. (FRANCE), on "Esperanto: An International Language for Engineers." Institution of Electrical Engineers, 8 p.m.
- 3.—Opening of Eighth Manchester Building Trades Exhibition.
- 4.—Institute of Sanitary Engineers: Mr. J. E. Farmer on "Sewage Disposal and Works Management." 8 p.m.
- 21.—Institution of Municipal and County Engineers: North-Eastern District Meeting at Wakefield.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

APPOINTMENT OF SECRETARY.

The Council invite applications for the post of Secretary to the Institution. The salary will be at the rate of £400 per annum. Preference will be given to candidates possessing a knowledge of Municipal and County Engineering and literary and administrative ability. Age not to exceed 45 years.

Conditions of the appointment may be obtained on application to the Secretary.

Applications, endorsed "Secretaryship," and accompanied by not more than three testimonials of recent date, must be delivered to the Secretary at the Offices of the Institution, No. 92 Victoria-street, Westminster, S.W., not later than noon on Saturday, February 28th.

Canvassing and communicating with Members of the Institution with reference to the appointment, either directly or indirectly, are disqualifications; but 12 copies of the applications and testimonials may be sent to the Secretary.

(By order of the Council)

THOMAS COLE,

Secretary.

92 Victoria-street,
London, S.W.
February 14, 1914. (1,322)

SUTTON-IN-ASHFIELD URBAN DISTRICT COUNCIL.

APPOINTMENT OF ASSISTANT SURVEYOR.

The Sutton-in-Ashfield Urban District Council invite applications for the appointment of Assistant to their Surveyor, at a salary of £80, rising to £110 per annum. Applications, stating age and previous experience, and accompanied by copies of three recent testimonials, must be sent in to me, the undersigned, not later than Wednesday, the 25th day of February, 1914, endorsed, "Assistant Surveyor." Canvassing will disqualify.

WALTER BURN, A.M.I.C.E.,

Surveyor.

Surveyor's Office,
Outram-street,
Sutton-in-Ashfield. (1,300)

COUNTY BOROUGH OF SOUTHPORT.**BIRKDALE AND AINSDALE MAIN SEWERAGE.****CLERK OF WORKS.**

The Corporation invite applications for the position of Clerk of Works on a Section of the above Scheme. Candidates must be experienced in the Construction of Pipe Sewers.

Salary £3 per week.

Applications, marked "Clerk of Works," stating age, previous experience, and enclosing copies of three recent testimonials, to be sent to the undersigned not later than 10 a.m. on Tuesday, the 3rd day of March, 1914.

J. ERNEST JARRATT,

Town Clerk.

Town Hall, Southport.

February 12, 1914.

(1,320)

A GENT ENGINEER required at once for Rail-way Contract; must be a first-class man with thorough knowledge of railway work and cost. Reply, with not more than three recent testimonials, stating salary expected, &c., to J. W. Pearce & Co., Limited, Contractors, Barrow-in-Furness.

SCUNTHORPE URBAN DISTRICT.**APPOINTMENT OF ENGINEER AND SURVEYOR.**

The Scunthorpe Urban District Council invite applications for the position of Engineer and Surveyor to the Council. Salary £200 per annum.

Applicants must have had practical experience in the works usually undertaken by an Urban Authority, including Waterworks (electrically driven), Markets, Slaughter-house, Fire Appliances, &c., Private Street Works, Highways, Sewers, Sewerage Works, and Sanitary Works of every description; and must be competent to prepare Plans, Drawings and Quantities for Municipal Works or Buildings, and perform all the ordinary duties of a Surveyor of Highways.

Applications, in candidate's own handwriting, stating age and experience, and enclosing copies of not more than three testimonials, must be sent to the undersigned not later than Monday, the 2nd day of March, 1914.

Further particulars of duties and terms of engagement supplied on application.

H. M. HETT,

Clerk to the Council.

18A High-street,
Scunthorpe, Lincolnshire.

(1,330)

BOROUGH OF BEDFORD.**TEMPORARY ASSISTANT.**

Applications are invited for the appointment of a Temporary Assistant in the Borough Engineer's Office for a period of not less than six months, to assist in preparing drawings, &c., for new Isolation Hospital Buildings. Salary, 50s. to 60s. per week, according to qualifications.

Applications, in candidate's own handwriting, stating age, together with full particulars of experience (and enclosing copies of not more than three recent testimonials), endorsed "Temporary Assistant," to be delivered to the undersigned not later than Saturday, 21st instant.

Preference will be given to candidates with some Architectural knowledge, and who have had experience in Hospital Work.

Canvassing will disqualify.

N. GREENSHIELDS, ASSOC. M. INST. C.E.,
Borough Engineer and Surveyor.

Town Hall, Bedford.

February 5, 1914.

(1,274)

CHESHIRE COUNTY COUNCIL.

The Main Roads and Bridges Committee require temporarily a Clerk of Works used to the Widening and Reconstruction of Macadam Roads (Waterbound). Salary £3 3s. per week.

Applications, enclosing three recent testimonials, to be sent in to the undersigned.

W. HOLLAND,
Acting County Surveyor.

The Castle,
Chester.

February 10, 1914.

(1,302)

CITY OF BIRMINGHAM.

The Public Works Committee are prepared to receive applications for the Appointment of a thoroughly Competent Road Foreman in the City Surveyor's Department. Wages 40s. per week, rising by annual increments of 2s. 6d. per week to 45s. Candidates must be fully qualified persons, who have had recent practical experience in the Construction, Maintenance and Scavenging of the various classes of Roads and Streets of a large town; also in the management of large bodies of workmen. They must be able to keep clearly their note-books, set out works from plans, measure up works in course of construction, and prepare estimates.

The Candidate appointed will be required to devote the whole of his time to the service of the Corporation; and also to contribute to the Superannuation Scheme, for which purpose he must submit himself to the Corporation Doctor for examination. The appointment will be subject to the Doctor's report being satisfactory. Applications, in candidate's own handwriting, stating age (which should not exceed 40), experience, past and present employment, accompanied by copies of not more than three recent testimonials, and endorsed "Road Foreman," to be sent to the undersigned not later than Monday, 2nd March, 1914.

Canvassing, either directly or indirectly, will be a disqualification.

HENRY E. STILGOE,
City Engineer and Surveyor.

Council House,
Birmingham.

February 16, 1914.

(1,326)

WINDSOR RURAL DISTRICT COUNCIL.**CLERKS OF WORKS.**

The Council require the services of Two Clerks of Works for supervising the Construction of Main Sewers, Rising Main, Buildings and Sewage Disposal Works, at a salary of £13 13s. per calendar month each.

Candidates must have experience in this class of work, also in levelling and measuring up work during progress.

Applications in own handwriting, giving full particulars of qualifications and experience, stating age, and accompanied by copies only of three testimonials from Civil Engineers, to be sent to me, endorsed "Clerk of Works," not later than Saturday, 28th February, 1914.

Canvassing will be a disqualification.

J. E. GALE,

Clerk to the Council.

3 Sheet-street, Windsor.

February 17, 1914.

(1,332)

EX-PUPILS AND JUNIOR ASSISTANTS.**TWO RURAL DISTRICT SURVEYORS.—**

Assistant desires appointment immediately. Excellent testimonials. Moderate salary.—Box 1,380, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,332)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

LANCASHIRE COUNTY COUNCIL.

The County Council invite Tenders for the Hire of Steam Rollers during the year ending March 31st, 1915.

Particulars and Forms of Tender may be obtained on application to the County Surveyor, Mr. W. H. Schofield, County Offices, Preston, to whom sealed and endorsed Tenders must be delivered not later than Monday, March 2nd, 1914.

The County Council do not bind themselves to accept the lowest or any Tender.

(Signed) HARCOURT E. CLARE,

Clerk to the County Council.

County Offices,
Preston.

February 16, 1914.

(1,324)

LANCASHIRE COUNTY COUNCIL.

Tenders are invited for the Supply of the under-mentioned Road Materials to be delivered at various Railway Stations and Canal Wharves in the County:

- Granite Macadam,
- Limestone Macadam,
- Rubble,
- Chippings,
- Gravel, &c., for Binding.

Forms of Tender and particulars can be obtained on application to Mr. W. H. Schofield, County Surveyor, County Offices, Preston, to whom sealed Tenders must be delivered on or before the 2nd March next, endorsed "Tender for Materials," together with a Sample of the Materials.

(Signed) **HARCOURT E. CLARE,**
Clerk to the County Council.

County Offices,
Preston.
February 16, 1914. (1,323)

THE URBAN DISTRICT COUNCIL OF WESTON-SUPER-MARE.

ANNUAL CONTRACTS FOR SUPPLIES 1914-15.

Tenders are invited for the Supply of the following Stores during the twelve months ending 31st March, 1915:—

- Ironmongery, Tools, Castings, Iron and Steel, Paints, Brooms, Brushes, Water Fittings, Stoneware Goods, Cement, Lime, Bricks, Disinfectants, Stable Utensils, &c., &c.

Specifications, Forms of Tender, and all information may be obtained upon application to the undersigned.

Sealed Tenders, endorsed "Tender for Stores," are to be delivered to the Town Clerk, Town Hall, Weston-super-Mare, on or before March 14th, 1914.

The lowest or any Tender will not necessarily be accepted.

H. A. BROWN,
Engineer and Surveyor.

Town Hall,
Weston-super-Mare.
February 13, 1914. (1,327)

COUNTY BOROUGH OF MERTHYR TYDFIL.
30-IN. MAIN SEWER, TROEDYRHIW TO QUAKER'S-YARD.

The Corporation of Merthyr Tydfil hereby invite Tenders from responsible Contractors for the Providing, Laying and Jointing of the above Sewer, within the Borough of Merthyr Tydfil. The Contract will comprise about 4½ miles of 30-in. Concrete Tubes, and 173 yds. of 30-in. Steel Tubes on Masonry Piers, together with the necessary Manholes, Inspection Chambers, Tumbling Bays, Storm-water Overflows, River Walls, Subsidiary Stoneware Sewers and Surface-water Drains, 9-in. Cast-iron Syphon, and other appurtenant Works in connection therewith.

Plans may be seen, and Specification with Form of Tender and Bill of Quantities obtained, on application to the Borough Engineer, Town Hall, Merthyr Tydfil, upon payment of £3 3s., which will be returned on receipt of a *bona-fide* Tender and the return of all documents.

Sealed Tenders, endorsed "30-in. Main Sewer," must reach the undersigned not later than the 14th March.

The Corporation do not bind themselves to accept the lowest or any Tender.

T. ANEURYN REES,
Town Clerk.

Town Hall,
Merthyr Tydfil.
February 16, 1914. (1,318)

BOROUGH OF EALING.

The Town Council of the Borough of Ealing hereby invites Tenders for the Supply and Delivery of Goods and the execution of the Works as follows, for the twelve months ending 31st March, 1915—viz.: (1) Limes, Pipes, &c.; (2) Cement; (3) Ironmongery; (4) Iron Castings; (5) Paints, Oils, &c.; (6) Granite; (7) Disinfectants; (8) Refined Tar; (9) Official Books and Stationery; (10) Printing; (11) Timber; (12) Uniforms; (13) Tarred Macadam; (14) Tar Paving Mate-

rial and Work in situ; (15) Harness Repairs, &c.; (16) Wood Paving Repairs; (17) Slab-laying, &c.

Printed Forms of Tender, Conditions of Contract, and full particulars may be obtained on application to the Borough Surveyor, Mr. W. R. Hicks, Assoc.M. INST.C.E., at his Office, Town Hall, Ealing, W., on or after Monday, the 16th February, 1914.

Tenders (in the envelopes provided) to be delivered at the office of the undersigned not later than 9.30 a.m. on Monday, the 2nd day of March, 1914.

The Council does not bind itself to accept the lowest or any Tender, and any person whose Tender may be accepted must enter into a proper Contract, with, if required, two sureties to be approved by the Council.

The Tenderer whose offer is accepted shall be held to have bound himself to an agreement, and may be compelled to carry out the obligations arising from his Tender, even though he may not have signed a formal Contract.

(By order)
GEO. E. BRYDGES,
Town Clerk.

Town Hall, Ealing, W.
February 13, 1914. (1,394)

METROPOLITAN BOROUGH OF STOKE NEWINGTON.

The Council invites Tenders for the following Works and Supplies—viz.:—

- Mason and Paviers' Work.
- Horsing, &c., of Water and other Vans.
- Cartage of Road Materials.
- Water Post and Plumbing Work.
- Removal of Clinker from Destructor.
- Supply of Lime and Cement.
- Supply of Pipes, Bends, Bricks, &c.
- Supply of Brooms, Tools and Castings.

For particulars and Form of Tender apply to Surveyor, Town Hall, Milton-road, Stoke Newington.

Sealed and endorsed Tenders to be delivered at the Town Hall by four o'clock p.m. on Tuesday, the 24th day of February, 1914.

(1,321) **SIDNEY WHITE,**
Town Clerk.

WING RURAL DISTRICT COUNCIL.
TO GRANITE MERCHANTS AND OTHERS.

Tenders are invited for the Supply and Delivery of 1,200 tons of Granite, and 1,200 tons of Slag, Sand and Gravel, at the various Stations and Wharves in the district (including unloading and wharfage charges), to be delivered as required.

Tender Forms may be obtained from the Surveyor, Mr. M. G. Gurney, Linslade, Leighton Buzzard, and to be forwarded to me not later than Monday, the 9th day of March, endorsed "Tenders for Materials."

No pledge is given to accept any Tender. Samples required, to be sent at the same time to Mr. Gurney, as above.

C. W. B. CALCOTT,
Clerk to the Council.

Leighton Buzzard.
February 13, 1914. (1,331)

CLONMEL CORPORATION.

GAS DEPARTMENT.

TO BUILDING CONTRACTORS.

The Gas Committee of the Corporation invite Tenders for the Erection of Retort House and Coal Store in Concrete, or alternatively in Stone, at their Gas Works in Clonmel.

Specifications, Copies of Drawings, and Form of Tender may be had from the Engineer, Mr. Henry O'Connor, Assoc.M. INST.C.E., 1 Drummond-place, Edinburgh, on payment of £1 1s., which will be returned on receipt of a *bona-fide* Tender.

The Committee do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, on Form supplied by Engineer, endorsed "Retort House Buildings," should be addressed to the Chairman of the Gas Committee, Gasworks, Clonmel, Ireland, to reach there not later than 25th February, 1914. (1,311)

COUNTY OF THE SOKE OF PETERBOROUGH.**MAIN ROADS.**

The Council invite Tenders for the following:—
1. Supply of Granite, Chippings, &c., to Stations.
2. Supply of Local Stone.
3. General Cartage and Team Labour.

Particulars and Form of Tender may be obtained on application to the undersigned on and after Tuesday, February 24th, 1914.

Persons tendering should state which Form they require.

The last date for sending in Tenders will be Thursday, March 5th, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

A. C. WALLINGFORD,
County Surveyor.

45 Priestgate,
Peterborough.
February 14, 1914. (1,328)

BOROUGH OF BEDFORD.**MAIN DRAINAGE SCHEME.—CONTRACT No. 6****STEAM PUMPING PLANT.**

The Corporation of Bedford invite Tenders for the Provision and Erection of Four Sets of Steam Engines and Centrifugal Pumps, together with all necessary Pipework, in connection with the Main Drainage Scheme for the Borough.

Copies of the General Conditions and Specification with Form of Tender may be obtained, and the Drawings inspected, on application to their Engineers, Major Tulloch and Haworth, at their Offices, No. 28 Victoria-street, Westminster, London, S.W., on and after Monday, February 16th, 1914, on payment of Five Pounds, which sum will be returned on receipt of a *bona-fide* Tender.

The Corporation do not bind themselves to accept the lowest or any Tender.

The Tender, accompanied by Drawings of the Proposed Pumping Plant, must be sealed and endorsed "Tender for Steam Pumping Plant," and be delivered to the undersigned not later than 10 a.m. on Saturday, March 7th, 1914.

CHAS. STIMSON,
Town Clerk.

Town Hall,
Bedford.
February, 1914. (1,314)

BOROUGH OF BEDFORD.**MAIN DRAINAGE SCHEME.—CONTRACT No. 7.****ELECTRICALLY DRIVEN CENTRIFUGAL PUMPING PLANT.**

The Corporation of Bedford invite Tenders for the Provision and Erection of certain Electrically Driven Centrifugal Pumps, comprising 4 Single Phase, 2,000 volt Electric Motors coupled direct to 4 Centrifugal Pumps, together with Float Actuated Automatic Starting Gear, High Tension and other Switchgear and Electrical Connections.

Copies of the General Conditions and Specification with Form of Tender may be obtained, and the Drawings inspected, on application to their Engineers, Major Tulloch and Haworth, at their Offices, No. 28 Victoria-street, Westminster, London, S.W., or Mr. R. W. L. Phillips, A.M.I.E.E., Borough Electrical Engineer, Caudwell-road, Bedford, on and after Thursday, February 19th, 1914, on payment of Five Pounds, which sum will be returned on receipt of a *bona-fide* Tender.

The Corporation do not bind themselves to accept the lowest or any Tender.

The Tender, accompanied by Drawings of the Proposed Pumping Plant, must be sealed and endorsed "Tender for Electrically Driven Pumping Plant," and be delivered to the undersigned not later than 10 a.m. on Saturday, March 7th, 1914.

CHAS. STIMSON,
Town Clerk.

Town Hall,
Bedford.
February, 1914. (1,315)

BOROUGH OF BEDFORD.**MAIN DRAINAGE SCHEME.—CONTRACT No. 8.****CONTRACT FOR PUMPING STATION BUILDINGS, SCREENING CHAMBER, &c.**

The Corporation of Bedford invite Tenders from competent Builders and Contractors for the Erection of certain Buildings in connection with two Pumping Stations, Screening Chamber, &c., together with the Construction of Approach Roads and Areas, Formation of Site and other Works.

Copies of the General Conditions, Specification and Bill of Quantities may be obtained, and the Drawings inspected, on application to their Engineers, Major Tulloch and Haworth, at their Offices, No. 28 Victoria-street, Westminster, London, S.W., on and after Thursday, February 19th, 1914, on payment of a deposit of Five Pounds, which sum will be returned on receipt of a *bona-fide* Tender.

The Corporation do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Contract No. 8," must be delivered to the undersigned not later than 10 a.m. on Saturday, March 7th, 1914.

CHAS. STIMSON,
Town Clerk.

Town Hall,
Bedford.
February, 1914. (1,316)

COUNTY BOROUGH OF SOUTH SHIELDS.**TENDERS FOR MATERIALS.**

The Corporation invite Tenders for the Supply of the following Materials for the year ending 31st March, 1915—viz.:—

Northumberland Whinstone, Fifeshire Whinstone, Aberdeen and Norwegian Granite, Slag, Granite Chippings, Caithness Flags, Portland Cement, Cement Concrete Flags, Cast Ironwork, Shovels, Scavenger Brooms and Machine Brooms, Coal, Coke, Disinfectants, Leather Hose, Sewer Boots, Jackets, &c., Sanitary Pipes, Paints, Paint Oils, Glass, Timber, Iron, Horseshoe Nails, Cart Axles, Springs, &c., Tar, Pitch, Oils and General Stores.

Specifications and Forms of Tender may be obtained on application to Leslie Roseveare, ASSOC. M. INST. C.E., Borough Engineer, Municipal Buildings, South Shields.

Tenders, endorsed "Tender for Materials," to be delivered at the Borough Engineer's Office, Municipal Buildings, South Shields, not later than 12 noon on Saturday, 28th February, 1914.

J. MOORE HAYTON,
Town Clerk.

Municipal Buildings,
South Shields. (1,325)

BECKENHAM URBAN DISTRICT COUNCIL.**TO CONTRACTORS.**

The Beckenham Urban District Council invite Tenders for the erection of an Iron Building (60 ft. by 25 ft.) at the Church Fields-road Depot, Beckenham.

Plans and Sections may be seen, and Specifications and Forms of Tender obtained, on application to Mr. John A. Angell, Surveyor, on and after 20th February, on the production of a receipt from the Collector for a deposit of £1, which will be returned on the receipt of a *bona-fide* Tender.

A clause will be inserted in the Contract providing that the Contractor shall (1) pay to the employees the wages generally accepted as current for workmen engaged on similar work in the Town where the work is executed, and (2), to the extent of 75 per cent at least of the staff required in the execution of such works, give preference to and engage such competent workmen of the class required as may be *bona-fide* residents in the Parish of Beckenham, and may offer themselves for employment.

Tenders, duly sealed and endorsed "Tenders for Shed," to reach undersigned not later than 4 p.m., Monday, March 2nd, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

F. STEVENS,
Clerk of the Council. (1,329)

The Event of 1914.

GREAT MANCHESTER BUILDING TRADES EXHIBITION

City Exhibition Hall, Manchester.

March 3rd to March 14th.

WORKING EXHIBITS and all the latest Inventions and Appliances for the Building Trade.

SPECIAL DAYS (March 5 and March 11, between 11 a.m. and 4 p.m.) have been set apart for Architects, - Borough Surveyors, Borough Engineers, &c. -

The Public will be excluded on these days.

A Visit Would Well Repay You

Managers: WALTER CAWOOD, Ltd., 196 Deansgate, Manchester.

NORTH BROMSGROVE URBAN DISTRICT COUNCIL.

RUBERY SEWERAGE.

GAS ENGINES AND THREE THROW PUMPS.

The above Council invite Tenders, from Manufacturers only, for the Supply, Erection, and Maintenance for twelve months of Three Sets of Gas Engines and Three Throw Pumps, capable of lifting in the aggregate 20,000 gallons per hour.

Tenders will not be entertained from Agents or Merchants.

Copies of the Specification, Form of Tender, and Plan can be obtained at the Offices of the Council's Consulting Engineer (Mr. Robert Green, M. INST. C.E., 37 Waterloo-street, Birmingham), on and after Friday next, the 20th inst., upon the deposit of £5, which will be returned on the receipt of a *bona-fide* Tender, not afterwards withdrawn.

The Council do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, marked "Rübery Pumping Plant," must reach the undersigned not later than 10 a.m. on Tuesday, the 3rd March, 1914.

FRANCIS T. LEVENS,
Clerk to the Council.

110 High-street,
Bromsgrove.
February 14, 1914. (1,317)

THE CORPORATION OF MIDDLETON invite Tenders for Macadam, Setts, Kerbs, Flags, Cement, Pipes, Pitch and Oil, Brooms, and Castings required in the Surveyor's Department for the year ended 31st March, 1915.

Tenders, addressed to the Chairman of the Surveyor's Committee, must be delivered in official envelopes at my Office not later than the 3rd March next.

The Corporation do not bind themselves to accept the lowest or any Tender.

Further particulars and Form of Tender may be obtained from Mr. W. Welburn, Borough Surveyor, Town Hall, Middleton.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall,
Middleton.
February, 1914. (1,313)

COUNTY BOROUGH OF BLACKPOOL. HIGHWAY DEPARTMENT.

Tenders are invited for the Supply and Delivery of the undermentioned Articles for the year ending March 31st, 1915, in accordance with Specifications and Forms of Tender, which can be obtained from the undersigned—viz:—

1. Paving Setts and Kerbs.
2. Flags.
3. Broken Limestone and Granite.
4. Glazed Stoneware Socket Pipes, &c.
5. Prepared Tar Asphalt.
6. Wrought Iron and Steel.
7. Ironmongery, Bolts, Nuts and Washers.
8. Iron Castings.
9. Brushes, &c.
10. Oils and Paints.
11. Pitch and Creosote Oil.
12. Coal.
13. Repairs to Cart Harness.
14. Asphaltting of Footpaths.
15. Portland Cement.

Sealed Tenders, endorsed "Tender for Annual Stores," addressed to the Chairman of the Highway Committee, care of the undersigned, must be delivered not later than 10 a.m. on Monday, March 2nd 1914.

JOHN S. BRODIE,
Borough Surveyor.

Municipal Building,
Blackpool.
February 16, 1914 (1,319)

RANSOME

CONTINUOUS

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FOR

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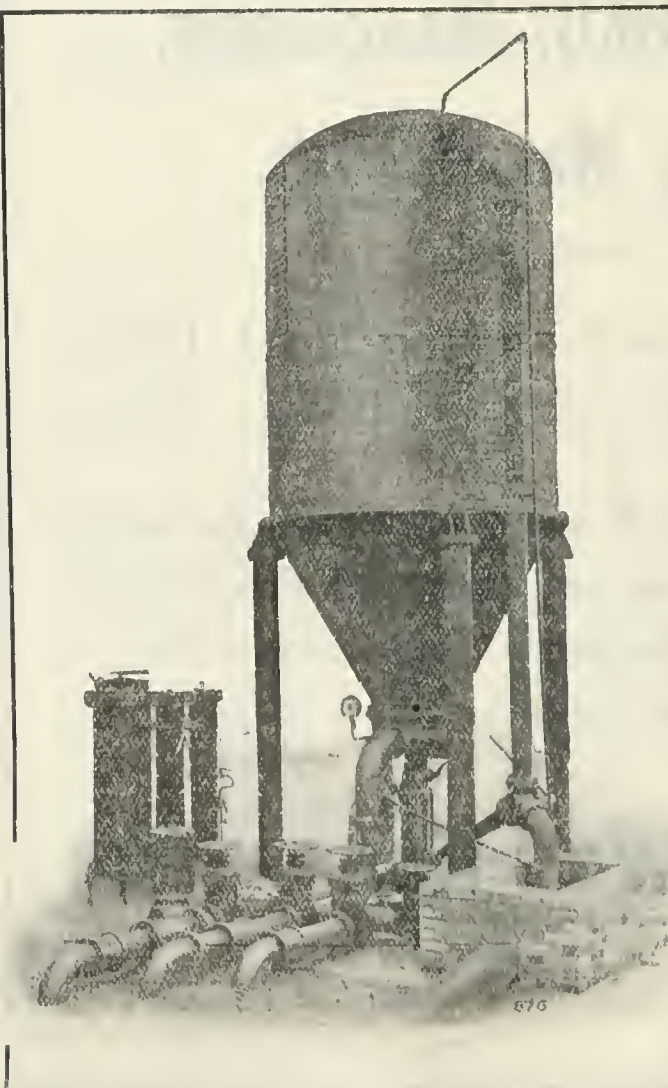
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The Surveyor

And Municipal and County Engineer.

Vol. XLV.

FEBRUARY 27, 1914.

No. 1,154.

Minutes of Proceedings.

The Manchester Meeting.

The meeting of the Institution of Municipal and County Engineers which took place at Manchester last week was undoubtedly one of the most successful gatherings held in connection with that body for many years past. Not only was the attendance very satisfactory, but the meeting was favoured throughout by excellent weather, while the hospitality of the corporation and the admirable arrangements alike contributed to the enjoyment of those who were present. The feature of the meeting was, undoubtedly, the remarkable paper presented by Mr. de Courey Meade, the able and popular city surveyor. This is reproduced in full in the form of a supplement to our present issue, and in it the author describes some of the more important undertakings with which he has been concerned during his long connection with the city. The first of the great works with which he deals is the scheme of main drainage and flood prevention. This was originally designed by Mr. John Allison, Mr. Meade's predecessor in office, and the same engineer was responsible for carrying out the first part of the work. Its completion, however, devolved upon Mr. Meade, and the difficulties which were then encountered have resulted in the adoption of an excellent system for supervising and keeping control of works subsequently executed.

That part of the paper having reference to the gangings of sewers and kindred matters was listened to with special interest at Friday's meeting. As was pointed out, the study of rainfall and the resulting floods is one of great interest to municipal engineers, and, bearing this in mind, Mr. Meade dealt with the subject at considerable length with a view specially to helping the younger members of the institution. Having described the new drainage scheme prepared by him and approved by Parliament in 1911, he proceeded to draw attention to several of the works inspected in the course of the meeting. These are of a very diverse character, including most of the matters which usually come within the ken of a municipal engineer, and some others. Special mention may perhaps be made of the agreement which the corporation entered into with the National Telephone Company, by which the danger and unsightly appearance of overhead telephone wires is obviated by providing pipes in the public streets for the conveyance of cables.

Again, in connection with the electricity undertaking there is a cable subway nearly $\frac{1}{2}$ mile in length in which the cables are carried on iron brackets. The same subway contains the sewer, which consists of iron pipes supported on concrete. Mr. Meade also dealt at some length with housing and town planning, and with a variety of other matters. He concluded with an apology for the disjointed character of the notes, but every municipal engineer will realise that this was far from necessary. The discussion which followed the reading of the paper contained many compliments to the author, and the general feeling was expressed by Mr. Boulnois when he said that the paper bristled with information of a novel kind, and that if it had been presented to the Institution of Civil Engineers it might well have earned a Telford medal. A fitting supplement to Mr. Meade's contribution was the paper by Councillor Swarbrick, dealing with the future government of great cities. The meeting terminated with a luncheon, at which Mr. Hayward voiced the opinion of all present by expressing their indebtedness to the city surveyor for the magnificent paper which, in spite of the many important works engaging his attention, he had managed to prepare, and for the excellent arrangements that had been made on their behalf. There can be no doubt that the large attendance was amply justified by the character of the proceedings.

*

"Once a Sewer Always a Sewer" (?) The maxim "Once a sewer always a sewer," established by the leading case of *Vestry of St. Leonard, Shoreditch v. Phelan* (1896, 1 Q.B., 533), can no longer be regarded as a hard-and-fast rule if the decision in the recent case of *Kershaw v. Alfred John Smith & Co., Limited* (1913, 2 K.B., 455) remains unchallenged. It will be remembered that in the *Shoreditch* case two houses in the metropolitan area were drained by a combined system, which (not having been constructed with the sanction of commissioners or under the order of a vestry or district board) was a "sewer" under the *Metropolis Management Acts*. Subsequently, the owner of one of the houses disconnected his drain, so that the "sewer" only drained the remaining house; but it was decided that, there being no provision in the statutes for divesting sewers,

or for relieving the local authority from the duty of maintaining them, the conduit—though only draining one building—continued to be a sewer vested in and repairable by the authority.

The facts in the recent case above referred to were not quite so simple. In 1884 a builder submitted to the Hampstead local authority a plan for draining twelve houses in the High-road, Kilburn, by combined drainage. According to the plan the houses were to be drained in two groups by two combined drains—one group, comprising five houses, discharging into the public sewer in the High-road, Kilburn, and the other group, comprising seven houses, discharging into the public sewer in Eresby-road. The plan was approved, and an order was made by the local authority for the scheme to be carried out. In executing the work, however, the builder departed from the plan in several particulars. He connected the drains of two of the houses of the second group with the combined drain of the first group, and he also connected with that drain the drain from a workshop at the rear of one of the houses and the gullies from an adjoining passage. There were also some minor deviations from the plan. Thus, by the builder's wrongful act, this combined drain became a "sewer." In 1912, the council having discovered the true state of affairs, gave the builder notice, under sec. 83 of the Metropolis Management Act, 1855, to alter the combined drain so as to make it conform to the approved plan, and on his default they themselves made the alterations. In the meantime the house under which the combined drain ran had been sold to a purchaser who had had no notice of the builder's wrongful acts. A nuisance having arisen in the drain, the question arose whether, notwithstanding the alterations, it was still a "sewer" vested in the council, or whether it had, on the completion of the alterations, become a "drain" so as to render the owner liable to remedy the nuisance. The Divisional Court, by a majority, decided in favour of the latter view. Mr. Justice Pickford, the dissenting Judge, was unable to distinguish the case, in principle, from the Shoreditch case, and pointed out that, although the authority of that case had been weakened by subsequent decisions and judicial dicta, it had never been overruled. The other learned Judges, however, laid stress upon the fact that the Shoreditch decision was based, to a large extent, upon the absence of any statutory provision for divesting a sewer after it has once become vested in the local authority—a consideration the force of which has been somewhat lessened by subsequent cases—and upon the further fact that sec. 83 of the Metropolis Management Act, 1855, was not brought to the notice of the Court in the Shoreditch case. Therefore, while not in terms dissenting from the Shoreditch decision, they considered that it had no application to the present case.

Whatever may be said for or against the conclusion from a strictly legal standpoint, municipal engineers will not, we think, be disposed to quarrel with it, but will rather welcome it as a step in the right direction.

* * *

**Aëration
as an Aid in
Sewage
Purification.**

In dealing with this subject last year (THE SURVEYOR, July 18, 1913, p. 87), we referred to some experiments which had been carried out at the Lawrence Experiment Station of the Massachusetts State Board of Health, and pointed out that it was very desirable to have some information with regard to the cost of aëration on the lines adopted in the experiments. Further details have now been published in a recent issue of *Engineering Record*, from which it appears that the cost for power alone for five hours' aëration is estimated at about 8s. 4d. per 1,000,000 gallons of sewage, or about £150 per annum. From the results obtained with experimental filters it was found that the aërated

sewage could be treated satisfactorily at five times the rate of sewage which was not aërated—an important difference. The sewage was aërated in a tank fitted with vertical slate slabs arranged 1 in. apart. As the result of the aëration a growth formed on the slabs, and, when the clarified sewage was drawn off, this growth, largely consisting of suspended matters, and the sludge was easily separated from the liquid at the bottom of the tank. In addition to the increase in the volume of sewage which was treated upon filters when aërated, it is stated that the sludge was practically odourless, and had lost all offensive characteristics common to sewage sludge.

The process which takes place when sewage is aërated in the manner described is apparently the same as that which occurs when sewage is discharged untreated into well-oxygenated river water, with the important difference that in the case of the river the suspended solids are deposited on the bed of the river, and not removed as in the case of the aërating tanks. Further, the dissolved oxygen taken up by the sewage in the river water is only replaced at a very slow rate by natural process from the air, while in the case of the tanks it is replaced artificially at a rapid rate, and the extra quantity of oxygen required for the deposits of sludge on the bed of the river is not required in the artificial process, in which the sludge is regularly removed. For these reasons it is hardly correct to describe it as a "new method" of sewage treatment, as suggested by our contemporary, *Engineering Record*. It is more in the nature of a scientific application of a natural method; but it certainly deserves careful consideration, and should now be tried on a larger scale under ordinary working conditions, careful observations being made as to the cost of operation, and particularly as to whether the very large increase in the possible rates of filtration, which were observed in the experiments, can be maintained in actual practice. In any case great credit is due to the staff of the Massachusetts State Board of Health for the results which have been obtained so far, and particularly for taking up the difficult problem of artificial aëration as an aid in sewage purification on lines which appear to afford much greater prospects of success than any of the attempts which have been made in the past.

* * *

**The Metropolitan
Paving
Committee's
Report.**

Although there was no general change of importance in the nature of the pavings used in London during the twelve months covered by the eleventh annual report of the Metropolitan Paving Committee, the developments recorded are of much interest, and the kinds of pavements used in the various boroughs indicate in a very definite manner the relations between the nature of the traffic and the character of the pavings best suited to the different conditions. Creosoted softwood continues to be the material chiefly employed in the repaving of important thoroughfares, and the extension of the use of tar-bound and asphalt-bound crusts is mainly confined to roads carrying traffic ranging from "light" to "considerable." Among other points of general importance, the savings effected by the tar-spraying of water-bound, broken-stone crusts especially demand attention, and the advantage of increasing the thicknesses of concrete foundations is a matter which is still engaging the attention of the committee. Individual boroughs continue to afford examples of new paving work carried out with materials the use of which is now definitely associated with particular areas. Hardwood blocks have been put down in Hampstead (Kilburn) and in Holborn, sectional jarrah

blocks being employed in both cases. Compressed asphalt has been laid in the areas in which it has already been largely used; the area of this material put down in the City during the year being about equal to that paved with creosoted deal. In St. Marylebone, on the other hand, the only material used was creosoted yellow deal, and creosoted Archangel deal similarly held the field in Wandsworth. In Holborn a considerable area has been paved with 5-in. by 4-in. granite setts, laid in pitch grout, while in Hammersmith bituminous macadam has been employed in thoroughfares with considerable traffic. Fuller information will be found on another page, and a study of the information there given will disclose many interesting and important facts. It may be remarked that as regards really important traffic routes the granite sett pavement in its modern form is the only important competitor for a place in the first rank with creosoted softwood and compressed asphalt; but asphalt-bound macadam is also worth watching in this connection.

* * *

The Press and Municipal Engineering.

In giving evidence before the Dominions Royal Commission on the subject of postal and telegraphic communication, Mr. William Francis Lathlain, president of the Perth Chamber of Commerce, protested against what he considered the lack of discrimination displayed in the selection of the news items cabled from this country to the Commonwealth. He instanced a cable from London stating that a famous jockey had a sore throat, another to say that he had recovered, while later a cable was despatched telling of the death of a dog, with a further message stating that it had been poisoned and was worth some £2,000. Unfortunately, this penchant of the Press towards the circulation of news of no importance is not confined to cabled items. Municipal engineering is a case in point. The columns of the great dailies may be searched in vain for any mention of municipal engineering activities, unless a lord or a lord mayor, or some such dignitary, attends a function and says a few words. What really matters seems to have no concern for the Press. The fact that some millions of pounds are expended annually in works of utility for the welfare of the nation dwindles to unimportance when considered side by side with, say, a boy scouts' rally, a contest at the National Sporting Club, an unsavoury trial at the Law Courts, or a sordid murder. Then the Press is glutted with detail, the wires hum incessantly, and the tape-machines unwind their rolls at top speed. It is a wondrous anomaly.

* * *

The Weybridge Surveyor's Plain Talk.

Public authorities, in common with individuals, are generally sensitive about their reputation, and candid speech is little to their liking. All the same, outspoken criticism has its merits, and not the least of these merits is the consciousness it arouses in the minds of councillors that when it is prompted by a sense of duty its very candour leans to virtue's side. Even a municipal officer may upon occasion overstep the strict line of etiquette and do a good stroke of business for the public by a little plain speaking. Recently the members of the Weybridge Urban District Council were somewhat taken aback when, it having been reported that negotiations for the leasing of a house belonging to them had fallen through, the surveyor, Mr. J. S. Crawshaw, bluntly told them he considered it a scandal for the council, as property owners, to keep the place in such a condition. "We

have condemned property," he proceeded to say, "that is in better form than this. That is the only way to speak to the council. I am quite in agreement with these people who advocate throwing the place up. It is not fair to submit it to be let in such a condition." It will be seen that Mr. Crawshaw did not mince matters. It is pretty certain, however, that his blunt intervention will do good in the long run, and he is to be congratulated upon having the courage of his convictions by giving it to the council "hot," as one of the members expressed it. The ideals of ordinary councillors in the matter of housing are notoriously open to a good deal of improvement, and this will be promoted—not hindered—by the conviction that their officers will refuse to follow them slavishly when the law is strained to breaking point.

* * *

The Study of Foreign Works.

The difficulty which confronts the English engineer in studying the works and scientific progress in foreign countries is considerable. It is true that those who are sufficiently learned may possibly be able to study the engineering literature of such countries as France, Germany, Italy, or Spain; but, speaking generally, there are few engineers who have knowledge of all these languages, while there are many who would find it very difficult to understand scientific writings in any one of them. But when we come to countries such as Hungary, Russia, China, Japan and others as far afield, it is practically impossible for any satisfactory communication to be established, except by means of an interpreter. Thus, if it were possible to find a language which could be learned easily within a short time and used universally, the advantages would be very great. It would, in particular, affect manufacturers and the technical Press, while the ordinary engineer would have a chance of studying the writings of foreign workers. Whether this is practically possible or not will be discussed at a meeting of the Society of Engineers to be held at the Institution of Electrical Engineers next Monday evening, when the author of a paper entitled "Esperanto—an International Language for Engineers" will produce a number of facts showing the great importance of his subject.

* * *

Town Planning Regulations.

In another column will be found a summary of the new Town Planning Procedure Regulations recently issued by the Local Government Board. A perusal of the changes which have been effected shows that many of the criticisms which have been made with regard to the former regulations were justified. Four years' working of the Act has sufficed to convince the board that some simplification of procedure was necessary—particularly in regard to matters to be done prior to an application for authority to prepare the scheme. It must be observed that the new regulations refer only to the preparation of schemes by local authorities, but there are foreshadowed additional regulations which will apply to the adoption by local authorities of schemes proposed by owners. The alterations which will be most appreciated are probably those which go to reduce the work which has hitherto been necessary in the preparation of maps. We concur in the view expressed by the board in their circular letter that the regulations, as altered, will suffice to retain all necessary safeguards, while reducing to a considerable extent the work imposed on local authorities and their officers by the earlier regulations, and that they will go far to remove some of the difficulties that have hitherto been experienced.

Why Tar-Slag Binds Well.

By REGINALD RYVES, M. CONS. L., ASSOC. M. INST. C. E.

Two samples of tarred slag, and a letter signed "Cretaceous," reproduced below, have been submitted to the writer as the basis of a note on the question why slag of a suitable quality makes better tar-bound road crusts than do certain other kinds of road metal.

LETTER BY "CRETACEOUS."

"Much has been written during the past few years about slag. The views generally given agree with the following paragraphs taken from an article published in 1905 by a well-known authority:—

"Good slag should be hard and close-grained, free from honeycomb or vitreous matter. . . ."

"Dealing with tar-macadam, the writer proceeds as follows:—

"Granite and syenite do not answer, because tar will not soak into them. . . ."

"The first thing to be done is to find a material which is hard enough to stand the wear and tear of traffic, but not too hard to absorb tar. Furnace slag has already been suggested as a useful material for road making, and it will also be found reliable in combination with tar if carefully picked by hand from ironworks, making a good class of residual slag."

"I feel sure I am right in stating that we all agree that slag is superior to granites, syenites, limestones, &c., when laid as tar-macadam."

"Having broken scores of pieces of tarred slag with a hammer and chisel, I have failed to find that the material is capable of absorbing tar. I therefore venture to suggest that we should reconsider our theories in connection with slag and endeavour to find the actual properties which enable the material successfully to combine with tar."

"For ordinary purposes slag should be free from honeycomb, but for tar-macadam I have found that a 'pitted' slag, if hard, gives excellent results."

CHEMICAL COMBINATION.

There are possibly some obscure reasons for the relatively good adhesion of the film of tar to the surface of the piece of slag, and it seems likely that one of these is that a slight chemical reaction takes place between constituents of the tar and the materials at the surface of the slag, this action resulting in the formation of a cementing material, the presence of which prevents the formation of smooth surfaces of separation between the tar and the slag. Further consideration of this point may be left to the chemist and the petrologist; but it may be pointed out that slag is a freshly-formed material, whereas the rocks from which other road metal is made are very old, and the materials of which they are formed are usually less ready to enter into chemical combinations. It may further be suggested that oxidation of iron compounds is often taking place to some extent on the surfaces of pieces of slag, and that, even if there be no reaction with the tar, the surface of the slag is thereby rendered somewhat more likely to provide a good grip for the sticky film. Chemists might also be asked to give an opinion as to whether a continuance of slight chemical change within the piece of slag would result in the absorption of gases, oxygen, for instance, and the resulting formation of a partial vacuum. Should such action take place within an air-tight film, that film would be held to the slag by atmospheric pressure.

SOME PLAINER REASONS.

There are four reasons why, from the known and visible properties of the slag used with success in road crusts, this material should be better for the purpose than certain other materials, such as granite, syenite, and limestone, mentioned by "Cretaceous." As regards limestone, it seems that the binding properties of tar-limestone crusts are very good, and the material has been used with success. Tar-sandstone crusts have also given satisfaction, and the superiority of slag in tar-bound crusts is, in comparison with these stones, mainly, if not wholly, due to its better wearing qualities. What properties, then, are shared by slags, limestones, and sandstones, and likely to tend to the binding of the tar with the metal? Inspection of pieces of these materials, broken for road

metal, shows that each possesses a kind of surface roughness which is not characteristic of pieces of road metal from the volcanic and plutonic rocks. A comparison of limestone with sandstone suggests, though of course it does not prove, that the small-scale roughness is an important factor. Many sandstones have a small-scale roughness which, it may well be believed, is likely to provide the tar film with a better grip than that afforded by more deeply indented surfaces, the projections of which consist of crystals with very smooth faces. The smaller the scale of the roughness down to some reasonable limit, the more likely is it that the surface tenacity of the tar will not be broken by an individual projection, and that, on cooling, the film of tar will have a continuous grip of the stone.

In view of what appears above under the heading "Chemical Combination," it may also be remarked that many sandstones are ferruginous. Some limestones present a fracture with a fairly large-scale roughness, but when they belong to the class called "compact," as distinguished from "crystalline" limestones, the surfaces of the projections and hollows are usually slightly rough, compared with the corresponding surfaces of igneous rocks; and it is the "compact" limestones which make the best tar-limestone crusts. The slag used for road crusts has usually a very consistent small-scale roughness.

Small-scale roughness is, then, one of the factors which may account for the superior bond in limestone, sandstone, and slag crusts with tar binders, when these materials are compared with granites, syenites, and other hard stones.

THE PROPORTION OF CLAY.

It is now known that clay forms an emulsion or pasty material in combination with tar and water.

In districts where little or no clay comes on to the roads from the land, the proportion of clay in the mud upon the road depends mainly or wholly upon its proportion in the road metal and binder, or, in the case of a tar-bound road, upon its proportion in the metal and such major binder as may have been used. Even in districts where a good deal of clay is brought on to the roads by the traffic, the effect of the clay which is ground up in the process of size diminution of surface stones of the road crust is likely to be more prejudicial to the crust than is the clay which makes a batter with the tar on the surface. Aided by the penetration of surface water, the closely mixed clay and tar of the top layer will disintegrate the crust much more effectively than will the batter on the surface, which batter does not penetrate much, except when it is quite wet. But when it is stiffening to plastic mud, the clay and tar below it may still be quite damp.

Now, it does not seem that clayey limestones have made good tar-bound crusts, though if such crusts have given satisfaction the fact should be recorded. Compact limestone is often very nearly pure carbonate of lime, the proportion of clayey matter being very small. Sandstones usually contain very little clayey matter. The cementing material is sometimes carbonates, and often oxides of iron, and even when clayey matter is present it may be the case that in the presence of a fair proportion of oxides of iron the tendency to form a batter with tar is much reduced. This point could be cleared up in a few days in a laboratory. As regards slag, the usual composition, with a high percentage of lime, is not such as tends to the production of characteristically clayey matter in the process of relatively rapid disintegration. It seems, then, that the absence of any considerable proportion of clayey matter in the detritus is a factor partly accounting for the successful use of these three materials in tar-bound crusts.

MINUTE PITTING OF THE SURFACE.

In his letter "Cretaceous" states that pitted slag, if hard, gives good results. Well-defined pitting may easily be believed to provide anchorage for the tar film, and it may be suggested that very minute pitting serves the same purpose if the materials are mixed at a sufficiently high temperature so that the tar may penetrate the small pores. In this respect

limestones are by no means all alike, but many "compact" limestones have surfaces in which the bottoms of the depressions are fairly deep, and the tar film may thus be rooted in the stone. The same is true of some sandstones, in the surfaces of which the hollows terminate in minute crevices. These are not of the nature of pores, in the usual sense of that term, but they may act in the same way. Reference has already been made to small-scale roughness, the further idea now introduced being that additional grip is provided when the sides of the depressions are steep, and especially when the tendency to pitting or to the development of crevices is dominant, and the development of slanting surfaces is suppressed. These slanting, and often very smooth, surfaces are sometimes a marked feature of the fractures of igneous rocks. These remarks apply only to the nature of the surface, not to the shape of the stone itself, though it may be noted in passing that diversity of size and shape of the pieces of road metal with which the crusts are made is a factor of some importance, and not without its bearing upon the results obtained with slag. Surface pitting, or steep-sided depressions may therefore be regarded as the third factor.

Having considered the effects of clayey matter in the detritus, and the qualities tending to provide surface grip which will prevent slithering action, we have next to consider whether there is any external force, the application of which to the film tends to hold it firmly to the stone.

ATMOSPHERIC PRESSURE.

It is here suggested that atmospheric pressure is exerted to hold the tar film to the stone, either permanently, or temporarily during the first part of the life of the crust. It is further suggested that this pressure is greater in the case of materials such as slag, sandstone, and limestone than it is when the road metal consists of hard, igneous rocks. The question whether, in the case of slag, such pressure may be exerted as a result of chemical action has been raised, and has been set aside for the consideration of chemists and petrologists. There are, however, other ways in which such a pressure may conceivably be caused, and there is some reason to suppose that, if the action takes place in the manner now to be suggested, it is stronger in the case of tar-coated slag, limestone, and sandstone than it is when igneous rocks are similarly coated.

The tarry matrix of a well-made tar-bound road crust is probably airtight up to some limit of pressure, and for the sake of argument we will assume that it is. If, therefore, the pressure of the air inside the stone be less than that of the air outside the stone, the difference in pressure helps to hold the film against the stone. Let us consider whether this difference of pressure is likely to be greater in the case of slag, limestone and sandstone than it is when hard igneous road metal or dense quartzite is employed.

Taking up the first table of absorption tests that comes to hand (United States Office of Public Roads), we look up, first, the maximum absorption in each class, averages not being given, and the maximum in each case being a figure of some significance, since the porous kinds of road metal are often deliberately chosen, each from its class, for the making of tar-macadam road crusts. The following are the maximum absorptions of water in pounds per cubic foot, the number of specimens tested being given in brackets:—

Sandstone (340)	11.60
Dolomite (183)	9.40
Slag (55)	4.40
Syenite (27)	4.21
Quartzite (90)	2.95
Granite (219)	2.77
Diabase (217)	2.73
Marble (37)	2.19
Gneiss (152)	1.24
Diorite (72)	1.08

The order of the materials in this table is not far from the order of merit as regards the making of tar-bound crusts, assuming that the sandstone crust is for light traffic, and the limestone and slag crusts for medium and heavy traffic respectively. The following figures (Greenwell and Elsdon) may also be cited: Basalts absorb, on the average, about 0.3 per cent of their weight; granites from 0.1 to 0.8; sandstones vary from 2.7 to 8.5; limestones vary from 4.0 to 12.0. The average absorption of sandstone is about 5 per cent. In this connection attention may again be directed to

the point made by "Cretaceous" as to the value of pitted slag, since a pitted or honeycombed surface in a broken piece points to a large proportion of voids within it.

Now, road metal before being tarred is usually heated, and, assuming that the tar film is impervious to air, at any rate up to some limit of pressure, let us consider what air pressure will be developed as the result of the cooling of the air within the stone. For the purpose of the argument any temperature may be taken as that of the stone—say, 180 deg. Cent. In the road crust the temperature on a hot day will not exceed about 50 deg. Cent. (122 deg. Fahr.), and, the volume being constant, we have:—

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$$\text{or } P_2 = \frac{P_1 T_2}{T_1}$$

The absolute temperature, $T_1 = 273 + 180 = 453^\circ$

The absolute temperature, $T_2 = 273 + 5 = 323^\circ$

$P_1 = 14.7$ lb. per sq. in.

and $P_2 = \frac{14.7 \times 323}{453} = 10.5$ lb. per sq. in.

There is therefore a theoretical preliminary load of 12 lb. per square inch, whatever be the volume of the voids in the stone, and experience suggests that the effect is likely to be greater with the larger volume of voids than it is with the smaller volume.

May it not be the case that when the volume of voids is small, air, or oxygen, may pass through the film while it is cooling, and to an extent sufficient to bring the pressure nearly up to that of the atmosphere, while, when the volume of voids is large, in proportion, the passage of air through the film ceases, while the pressure inside the stone is still considerably below that of the atmosphere? A stone with a large proportion of voids will be one with a relatively porous surface; but if it is the tar film which is the chief obstacle to the passage of the air the total resistance before the film sets will be nearly the same in both cases. The greater porosity of the surface of the stone with a large proportion of voids might, on the other hand, be a favourable factor, allowing of the more rapid escape of the heated air, and a consequent greater reduction of pressure on cooling. This, as a factor against the use of the denser kinds of stone, would point to an advantage in extending the period of heating these, and in allowing the stone to remain for some time at its maximum temperature before mixing it with the tar.

As regards possible effects due to the penetration of the stone by vapours given off by the tar, no direct ultimate decrease of pressure can, it would seem, be attributed to this; but it may be suggested that by temporarily increasing the pressure near the surface of the less porous stone, these vapours might hold back the tar film until it had set too hard to get an effective grip of the stone. This consideration is possibly of much importance.

TEMPORARY EFFECTS OF ATMOSPHERIC PRESSURE.

Let us now suppose that it can be shown that a tar film cannot permanently, or for any considerable period, prevent the air pressure inside the stone from becoming equal to that outside it. It by no means follows that the effects which have been suggested as possibly taking place would be without value. If it be granted that the facts point to the development of a temporary suck towards the inside of the stone, it must be admitted that this would tend to give the tar film a good grip of the surface. While still hot the tar would tend to flow into the pores or crevices, and if the pressure were maintained long enough, the stiffer but still plastic film would be pressed down firmly into the roots so formed and against the projections. It is here definitely contended that such effects do take place, and that they are very important, and it is further suggested that this points to the advisability of heating the stone to as high a temperature as may be reached without injury to it, or to the quality of the tar. When the latter limit is the lower, it might be advantageous to make the stone a little hotter, spread it on cooling plates kept at the lower temperature, and apply the tar as soon as the temperature had fallen to the safe limit. This would give the maximum safe difference in pressure as the stone cooled. The best rate of cooling could only be found by direct experiments, and these experiments would show whether it is better to lay the materials hot or to let them cool first.

As regards the depth to which the tar film pene-

trates, it is obvious that a rooting effect would not always be visible to the naked eye. A microscopical examination of suitably prepared specimens would, however, show whether the film penetrates more deeply when the stone is heated, and coated when hot, and the microscope would also show whether the penetration stopped short at the bottom of pits and crevices or whether it went beyond into well-defined pores or into cavities reached by pores of smaller diameter in each case than the cavity itself. In the case of slag specimens it is important to remember that there is sometimes discoloration near the surface due to the formation of red oxide of iron, and this must not be confused with discoloration caused by the penetration of the tar or of some of its lighter constituents.

The writer has put forward in this article considerations of three classes. First, there are certain indisputable facts, important deductions from which are made with confidence; secondly, certain other facts can be less definitely applied, but form the basis for what is, it is submitted, sound theory; and, thirdly, there are considerations, possibly of much significance, the application of which can only be made subject to the opinions of petrologists, chemists and physicists. Criticism is invited; but if critics do not agree with the writer as to the results of any of the conditions referred to they should, it may be suggested, say what in their opinion actually does happen as the result of those conditions. If, on the other hand, it be contended that any of the writer's conclusions as to the manner in which the effects take place have already been accepted, or stated in a definite manner, he would be glad to be given the references to the publication of such statements. It is understood, of course, that the statement that slag absorbs the tar, or "oil of tar," has often been made, and the present article is to some extent an attempt to indicate the relation of this idea to the facts.

ROADS IMPROVEMENT ASSOCIATION.

Mr. Robert Todd occupied the chair at the February meeting of the council of the Roads Improvement Association. Correspondence concerning the association's campaign for facilities to be provided for the special training of highway engineers was received, and it was reported that Mr. H. Percy Boulnois (vice-chairman) had been invited by the president of the Institution of Municipal and County Engineers to read a paper on this subject at the conference of the institution at Cheltenham in July next, at which it is understood Sir George Gibb will deliver the opening address.

Mr. H. Percy Boulnois, Captain H. H. P. Deasy and Mr. W. H. Thompson were appointed to represent the Roads Improvement Association at the sectional conferences convened by the Local Government Board upon arterial road communication in the Metropolis.

Further consideration was given to clause 23 in the Middlesex County Council (Great West Road) Bill, in which power is sought to levy a special tax upon public service traffic using the new road, and a resolution protesting most emphatically against the introduction of this principle was passed. It was resolved that the clause be opposed, and that witnesses on behalf of the association attend before the Parliamentary Committees to support the association's objections.

Sewage Pumping Plant.—The Bingley (Yorks) Urban District Council have placed their order for pumping plant, including two pneumatic ejectors, for lifting sludge, with Messrs. Jones & Attwood, Limited, of Stourbridge.

Motor Vehicles and Damage to Roads.—In reply to questions in the House of Commons recently Mr. Herbert Samuel, the president of the Local Government Board, stated that the length of motor cars was not restricted by any statute or regulation. The weight of a motor car was, by virtue of the Motor Car Acts and the Heavy Motor Car Order, 1904, limited to 5 tons unladen. The weight of a loaded car must not exceed 8 tons on any axle, or a total of 12 tons on all the axles. The width of a motor car weighing, unladen, 3 tons or more was, by the same Order, limited to 7 ft. 6 in.; other motor cars must not exceed in width 7 ft. 2 in. Complaints had been made to the Local Government Board as to the damage to roads caused by heavy motor-car traffic, and the subject was at present engaging their attention.

TOWN PLANNING PROCEDURE.

LOCAL GOVERNMENT BOARD REGULATIONS AMENDED.

The Town Planning Procedure Regulations prescribed by the Local Government Board under sec. 56 of the Housing, Town Planning, &c., Act, 1909, have now been in force nearly four years, and the experience gained in that period has led the board to the conclusion that the regulations may properly be modified in certain respects so as to simplify, to some extent, the procedure required to be followed, especially in regard to the procedure prior to an application to the board for authority to prepare a town planning scheme. In connection with the matter, the board have given careful consideration to the representations which have been made to them on the subject by local authorities and other bodies.

The amended regulations which have been issued apply only to the preparation of schemes by local authorities, and the existing regulations will, for the present, remain in force in regard to the adoption by local authorities of schemes proposed by owners. The board propose at an early date to prescribe an amended code in regard to the latter class of schemes.

The principal alterations that have been made are as follows:—

(1) The reduction from two months to four weeks of the period required to elapse between the service of notices of intention to prepare a scheme and the making of an application to the board for authority to prepare the scheme.

(2) The omission of all requirements as to service of notices on occupiers of lands.

(3) A variation of the requirement that, where land outside the district of the promoting local authority is proposed to be included in a scheme, a complete copy of map No. 1, on the scale of 25'34" in. to the mile, shall be supplied to the outside local authority. A map on the 6-in. scale is substituted, coupled with a right of the outside local authority to ask also for a map on the larger scale confined to the land in their district.

(4) An alternative to the meeting of owners and other persons interested at the first stage of the procedure is provided for by allowing the local authority to make a formal offer to confer with such persons if they so desire.

(5) It is made clear that map No. 1 may be utilised for the purposes of map No. 2, without the dispensation of the board which is at present required. Thus, map No. 1 can be converted into map No. 2 by the addition of certain further particulars indicated in the regulations.

(6) The requirement that map No. 2 shall show the lines and widths of principal roads that may be contemplated, the proposed open spaces and certain other particulars, is omitted.

(7) Maps Nos. 3 and 6 required by the present regulations will no longer be required to be supplied by the local authority.

(8) Notice of authority having been given to prepare a scheme may be given by advertisement only.

(9) An option is given in regard to the form in which maps Nos. 1 and 2 are to be submitted to the board.

The regulations as altered will, the board think, suffice to retain all necessary safeguards, while reducing to a considerable extent the work imposed on local authorities and their officers by the earlier regulations, and should go far to remove any difficulties that have hitherto been experienced.

Pudlo for School Buildings.—It is especially essential that accommodation for children should be damp and rain proof. Many architects, to ensure dry schools, are specifying a waterproofing compound for use in the cement work, which is particularly liable to let the damp through. We learn that the Bilton council schools are being built with Pudlo incorporated in the cement work.

Cheap Rural Cottages.—At a meeting at Crewe recently of the North-western Centre of the Sanitary Inspectors' Association, Mr. Storey, of Nantwich, said that on Sir Delves Broughton's estate at Doddington the rural housing problem had been solved from the agricultural labourer's point of view. They had cottages there with three good bedrooms, a large living-room, with well-ventilated and well-lighted pantry, and large scullery with boiler, and the rent was £7 10s. per annum, plus rates. That did not meet the cost, and the landlord had to stand something and the tenant farmer something.

Institution of Municipal and County Engineers.

THE MANCHESTER MEETING.



THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS AT MANCHESTER.

(Group photographed on the steps of the town hall.)

Members of the Institution of Municipal and County Engineers spent a pleasant and what was generally acknowledged to be an entirely profitable time at Manchester on Friday and Saturday last. Even for a district embracing many of the greatest cities and towns in the country the gathering was something of a record one; that it was to prove a success was evident from the moment when the members received the customary official welcome. A North-Western District meeting, in the course of which complaint was made of the infrequency of annual meetings in the North of England and the Paignton resolution with respect to the Journal came in for some debate, was first held, the institution meeting following. This opened with a description, by Mr. T. de Courcy Meade, the city surveyor, of some of the municipal works of Manchester, Councillor Swarbrick afterwards reading a paper on the subject of the future government of great cities. Interest naturally centred on Mr. Meade's valuable contribution to the proceedings, and the ensuing discussion, as will be seen from the report which follows, had reference chiefly to the mass of information he presented with regard to the extensive scheme of main drainage which he is at present engaged in carrying out. Of the hospitality accorded to the members during their two-days' stay in Manchester too much cannot be said; it was, needless to say, generous in its character, and the arrangements in every other respect were all that could be desired. The list of acceptances included Messrs. O. P. Abbott (Hindley), G. H. Bayley (Manchester), J. S. Brodie (Blackpool), W. E. Beacham (Leek), Wm. Bentley (Bolton), E. W. Booth (Manchester), H. Percy Boulnois (London), F. L. Boydell (Leigh), A. W. Bradley (St. Helens), S. B. Edwards (Liverpool), H. E. Brown (Altrincham), C. Brownridge (Birkenhead), S. E. Burgess (Middlesbrough), W. Burn (Sutton-in-Ashfield), T. Burrows (Lathom), R. Burslam (Congleton), A. H. Campbell (Edinburgh), J. Cartwright (Bury), A. O. Cole (Nelson), I. Cunliffe (West Didsbury), T. A. Clare (Leigh), W. Clough (Audenshaw), F. W. Dean (West Didsbury), J. W. Cockrill (Great Yarmouth), president, H. Collins (Norwich), F. J. K. Conway (Liverpool), A. E. Coupe (Fulwood), W. Debney (Birkenhead), J. H. Drew (Wath-upon-Dearne), D. J. Driver (Marple), F. I. Dixon (Ashton-under-Lyne), A. Dodgeon (Clayton-le-Moors), R. H. Dorman (Armagh), W. H. Else (Bacup), J. England (Wrexham), H. Entwistle (Swinton), J. P. Evans (Wrexham), J. W. Foster (Bradford), J. M. Fowler (Manchester), D. Furness (Manchester), F. R. Gibbins (Manchester), H. Goodfellow (Southport), A. T. Gooseman (Wigan), A. D. Greatorex (West Bromwich), J. Gregson (Padiham), W. G. Harbottle (Manchester), N. Hardie (Eccles), G. A. Hart (Leeds), T. H. Hartley (Colne), T. W. A. Hayward (Battersea), T. Henry (Retford), J. W. Hipwood (Morecambe), E. Hodgkiss (Walkden), R. B. Holden (Oldham),

H. T. Hughes (Stockport), F. Hutton (Ashton-upon-Mersey), P. Holt (Rawtenstall), W. Holt (Sale), J. Johnson (Rawtenstall), R. R. Jones (Milnrow), W. Jones (Colwyn Bay), R. W. Johnson (Birkenhead), J. D. Kennedy (Retford), C. G. Kent (Didsbury), L. Kenyon (Tottington), G. Kershaw (Old Trafford), W. T. Lancashire (Leeds), C. Lund (Cleckheaton), F. Massie (Wakefield), E. L. Morgan (Bolton), H. Mattinson (Manchester), B. Milnes (Birkenhead), J. Mitchell (Birkdale), W. Moss (West Didsbury), S. H. Morgan (Prestwich), A. H. Mountain (Patricroft), J. D. Nuttall (Heywood), F. W. Mozley (Nelson), J. Openshaw (Salford), P. H. Palmer (Hastings), S. S. Platt (Rochdale), M. A. Piercy (Warrington), E. Parker (Old Trafford), E. Picker (Beverley), T. S. Picton (Eccles), E. Pilling (Lytham), Wilfred Platt (Manchester), E. Prescott (Leigh), A. J. Price (Lytham), A. J. Price (Eccles), W. H. Price (Leeds), W. T. Redford (Manchester), J. L. Redfern (Gillingham), C. V. Richards (Manchester), C. Rivers (Harrigate), A. Rothera (Liversedge), J. Rowbottom (Ashton-under-Lyne), M. Sellars (Dundalk), J. A. Settle (Bury), J. S. Shaw (Wrexham), H. Shillington (Lurgan), J. S. Sinclair (Widnes), A. P. Statham (Salford), W. Stubbs (Blackburn), H. C. Swindells (West Didsbury), J. H. Walters (Congleton), C. Watson (Ambleside), J. P. Wakeford (Wakefield), W. Welburn (Middleton), S. Whitehead (Nelson), E. Wickenden (Manchester), C. F. Wike (Sheffield), G. H. Wild (Littleborough), J. Wilding (Runcorn), F. Wilkinson (Prestatyn), J. P. Wilkinson (Manchester), M. H. Wilkinson (Leyland), J. W. Wile (Manchester), J. Wilson (Bacup), W. E. Wood (Curch), H. Wood (Norwich), R. H. Winterbottom (Irlam), E. Worrall (Old Trafford), H. Yelland (Bury) and T. Cole (secretary). Among the visitors were Alderman Thompson (Patricroft), Messrs. G. S. Coleman (Didsbury), J. Cooke (Manchester), J. Coppock (Wakefield), Davies (Eccles), D. Denton (Manchester), R. Evans (Eccles), T. Henderson (Manchester), W. Hill (Eccles), H. T. Hughes (Chapel-en-le-Frith), J. Leith (Chiswick), F. J. A. Matthews (Eccles), W. Pickstone (Bury), W. Pritchard (Liverpool), J. T. Royle (Irlam), M. J. Swarbrick (Manchester), T. Lee Syms (Tyldesley), A. E. Wheatley (Manchester), W. Whitehead (Altrincham), G. F. Wild (Smithy Bridge), J. Wilkinson (Manchester), H. C. Williams (Wrexham), R. Wormell (Bury), and E. W. B. Wright (Manchester).

In the absence of the Lord Mayor (Alderman McCabe), the members were welcomed on behalf of the corporation by Alderman HARROP, chairman of the Parks Committee, who expressed a cordial hope that the gathering would result beneficially, both to Manchester and to the cities and towns which the visitors represented.

A short acknowledgment was made by the PRESIDENT (Mr. J. W. Cockrill).

In the course of a North-Western District meeting.

which followed, Mr. W. STUBBS (Blackburn) drew attention to the fact that an annual meeting had not been held in that district since 1898, and suggested that, in fairness to their part of the country, one of the members of the North-Western District should have been nominated for election as a vice-president instead of another Southern member. A speaker, after pointing out that population justified the idea which had been put forward, expressed the view that the annual meetings should be held alternately in the North and South.

The PRESIDENT said that, unfortunately, the proceedings in the matter referred to had proceeded too far to permit of any alteration now being made, and the matter dropped.

THE JOURNAL.

Some applause greeted the reading by the hon. district secretary of the resolution with reference to



MR. T. DE COURCY MEADE, M.INST.C.E.,
City Surveyor of Manchester.

[Mr. Meade is an Irishman, was born in November, 1853, educated at the Bandon Grammar School, and was afterwards articled to the county surveyor of Cork. Subsequently he was engaged under the late W. H. Dorman, M.INST.C.E., in the construction of the Cork and Skibbereen Railway, and then went to the Guildhall, London, where he was under the late Colonel Haywood, engineer to the City Corporation. After five or six years he was elected engineer to the then Hornsey Local Board. He established the Highgate Museum of Sanitary Appliances, which was opened by the then Lord Mayor, Sir Stuart Knill, Bart. A feature of that institution was the practical testing of materials used by the municipal engineer. He designed the machine still in use for testing road material. The appointment at Hornsey he held for 13 years. He was allowed private practice whilst at Hornsey, and was consulted by many of the large towns in England, Scotland, the South of France, Italy, Switzerland, and elsewhere. He was appointed city surveyor of Manchester in September, 1894. Mr. Meade is a member of the Institution of Civil Engineers, the Institution of Mechanical Engineers, and the Concrete Institute, and a Past President of the Institution of Municipal and County Engineers.]

the Journal which was passed at the recent meeting at Paignton.

Mr. A. J. PRICE (Lytham) recalled that at the annual meeting at Great Yarmouth he spoke somewhat strongly against the "Proceedings" being altered, and even now he could not say he was in love with the present production. But, having gone so far, his feeling was that they ought to continue with it, at any rate until the next annual meeting, when the whole matter, he proposed, should be considered.

Mr. T. S. PICTON seconded.

Mr. H. PERCY BOULNOIS (Westminster) asked how the question would be brought up at the annual meeting, and whether it would not be necessary to give notice to rescind the resolution of the Yarmouth meeting. He might be somewhat conservative in his views, but he was filled with regret when he heard of the proposed change, and his feelings were in no wise changed when he saw the first issue of the Journal. His desire was to give expression to his views on the matter, and so long as he had the president's word that that would be made possible at Cheltenham in June next it would be quite sufficient for him.

The PRESIDENT suggested that when the members saw the new volume they would be better able to judge.

Mr. BOULNOIS said it appeared to him that the council rather feared a referendum.

The PRESIDENT said that was not the case.

After some further discussion it was decided that the postcard poll proposed by the Paignton resolution should not be taken, but that the question be deferred to the next annual meeting, as suggested by Mr. Price.

MANCHESTER'S MUNICIPAL WORKS.

The institution meeting which followed the proceedings reported above opened with the presentation by Mr. T. de Courcy Meade, the city surveyor, of a paper which we reproduce fully with this issue in the form of a supplement—descriptive of some of the more important undertakings with which he has been concerned during his connection with Manchester. A number of excellent lantern views added to the interest of the address, which was listened to with the closest attention by all present.

FUTURE GOVERNMENT OF GREAT CITIES.

In a paper on this subject, Councillor J. Swarbrick, M.INST.C.E., a member of the institution, dealt with the manner in which large towns extend their boundaries. We should, no doubt, he said, see provincial cities become larger and more populous than even "Greater Birmingham." But the system of local government which would, in his opinion, be adopted ultimately could not be one of centralisation like that of Birmingham, Glasgow, Liverpool, Manchester, or Leeds, nor was it likely to be a dual system, such as that of London. In the case of cities having a population of more than 500,000, and an area of more than 20 square miles, it would be desirable, whenever future extensions were probable, to constitute one central council for the whole area to deal with certain functions, and district councils to deal with all strictly local matters.

Two schemes of extension were open to Manchester. But no progress whatever could be made until there had been a perfectly frank and candid exchange of opinion between the whole of the parties concerned. The first scheme would include the whole of Salford, Eccles, bounded on the east side by the Mersey; on the west Barton, Worsley, and Prestwich, and the other intervening districts of Failsworth, Droylsden, Audenshaw, and Denton. This would cover an area of 87 square miles against 68 in the case of Greater Birmingham, while the people would approach 1,250,000. This would result in making a Greater Manchester, what he would call the Manchester of Commerce, and would bring under one central council a considerable portion of South-East Lancashire and that part of Cheshire which was largely in touch with Manchester trade and commerce.

The second scheme would comprise the whole of the municipal boroughs within a radius of 8 or 9 miles of Manchester and intervening districts, with the jurisdiction of minor authorities, and an area of 250 square miles, with a population of upwards of 2,000,000, and a rateable value exceeding £10,000,000.

DISCUSSION OF PAPERS.

The PRESIDENT said he would like to congratulate Mr. Meade on carrying out the important engineering works described in the paper, and the Manchester Corporation on having such an officer as Mr. Meade. He moved a vote of thanks to Mr. Meade and Mr. Swarbrick for their papers.

Mr. J. S. BRODIE (Blackpool) seconded the vote of thanks to Mr. Meade for the interesting paper he had prepared. He was rather interested in the diagram showing the interior of storm-water sewers, and had then turned back to the diagram showing the workmen in attitudes of penance for the defective work which was going on. Perhaps Mr. Meade had given the workmen in attitudes of due contrition for the work they were engaged upon. It was stated that proceedings were instituted against some of the contractors, and others who had made default endeavoured to remedy their deficient work. The result, however, was not satisfactory. He would like to ask Mr. Meade if there was anything short of capital punishment at Strangeways inflicted upon these contractors, because otherwise there was a serious miscarriage of justice. Nothing short of capital punishment would adequately meet their offence. The tables in regard to rainfall were most interesting. He had been studying this question for a good number of years, and he had seen nothing so clear as these excellent tables put forward. Surveyors were responsible for the adequate sewerage of their districts. Few of them had the courage to provide sewers of adequate size to cope with the whole of the conditions. Any-

thing which threw light on this subject of localised rainfall, anything which kept them on safe ground, was worthy of their heartiest thanks. The tables of flow of sewage were also very interesting; a large amount of original information was given to them in those tables. They had to thank Mr. Meade very sincerely for his great trouble and courtesy in giving that information; also the Manchester Corporation for their courtesy in putting these facts before them, and keeping them abreast of the information which they had found out themselves. The whole paper seemed to be very suggestive, very informative, and, as might be expected from Mr. Meade, very thorough and straight to the point. These great aggregations of population such as Mr. Swarbrick had referred to had created problems of sanitation which they would easily understand required the very greatest ingenuity in order to deal with them adequately. Great towns such as London, Manchester, Liverpool, Leeds, and towns approaching their size, had created a position of things, where they had great aggregations of population, which taxed to the highest degree the ability and ingenuity of the sanitary engineers. He thought it was not too much to say that, in the twenty years Mr. Meade had been responsible for that great city, Manchester had more than met those difficulties, and solved them in a way which stamped him as a sanitary engineer of the very highest ability. Two things struck one in this paper—viz., the sufficiency of the means taken to meet certain problems, and, secondly, the efficient economy of those means. Anyone could spend money and make a first-class job, and in doing so spend money recklessly. At any rate, many of their ratepayers told them they did spend money recklessly; but there were evidences in this case that the works, while they had been highly efficient, had also been just sufficient economically to accomplish the end in view, and that, after all, was the great point they had to consider as engineers. They had to show their ratepayers that their money was worthily spent; that they got 20s. worth of work for every sovereign, and if they did that there was no grumbling, and everything went satisfactorily. If they made an excellent job at too high a price the result was not satisfactory, and if they made a poor job at an ordinary price the result was even less satisfactory. He complimented Mr. Meade publicly on the mark which he had made in Manchester, and especially he complimented him on those monumental works he was now carrying out—the main drainage of Manchester—which would indeed be a lasting memorial to his work in that great city.

Mr. T. S. PICTON (Eccles), in supporting the vote of thanks, said a careful study of these two papers would repay the members. They were full of very useful information indeed. Many of them must be very indignant to read and hear of the very inadequate work that was done in that city before Mr. Meade was appointed. Surely if a corporation paid for the work that they required done it was only common honesty for the contractors to give the best work required by the specifications and quantities, and he considered that no punishment of them could be adequate. He thought the automatic sampler was a very ingenious idea; also Mr. Meade's method of measuring the depths of the manholes. He was thankful to be privileged to take part in the meeting, because the Eccles Corporation had before the Local Government Board a large drainage scheme which was to cost £60,000, and what he would see in Manchester would be advantageous to the Eccles Corporation in connection with the reconstruction of their main culvert.

Mr. E. L. MORGAN (Bolton) said he thought the city of Manchester was to be congratulated on the good work which Mr. Meade was carrying out with so much energy. With respect to Mr. Swarbrick's paper, the last of the diagrams of probable future extensions of the city of Manchester which he had used to illustrate his remarks got very near to Bolton, and a friend who was near him remarked, "Your number is up." He noticed in Mr. Meade's specification that he gave the absorption test as for the engineering bricks 3 per cent, common bricks 10 per cent, blue bricks 3 per cent. He would like to know if he was able to get bricks to conform to this specification. He knew that brickmakers would like to get 90 per cent of water. He had been able to get common bricks with less moisture than 10 per cent. The difficulty which arose with bricks was the quantity of lime contained in the brick. Another question which they had to meet was the local influence of members of council who were connected with

brickmakers. His experience was that influences had been brought to bear to get engineers to accept bricks which did not conform to the specification. From whispers which had reached him something of that kind had taken place not very far from Manchester. He would like to refer to Mr. Meade's statement showing the ratio of impervious surface to population, and the apparent relation between density of population and death-rate. He noticed in the first five districts down to Moss Side the whole of the water, rainfall and sewage seemed to be carried away; yet the death-rate was higher than in the other districts. That rather shattered the idea which prevailed in his district. In Bolton they had a clay subsoil, and it had been argued that it was unnecessary to have any town planning scheme, because it was better to have the area built upon and the water carried away immediately. But in Manchester, where the water was carried away immediately, they had the highest death-rate. Whether that was due to the area being entirely built upon, or to the lower condition of the residents of those districts, he did not know, but it certainly seemed to him a reason for town planning and limiting the number of houses per acre.

Mr. H. PERCY BOULNOIS (Westminster) said he could not refrain from expressing his appreciation of the admirable paper of his old friend. What astonished him was that he should have presented such a contribution to them instead of giving it to the Institution of Civil Engineers, for, elaborated and read before the latter body, it might have earned for the author the Telford Medal. The paper frankly began by describing failures for which it had been necessary to find remedies, but they learned more from the accounts of failures than they did from successes—at any rate, he did. The paper bristled with information of a novel kind. There were many tables in it that were practically new to him, and the one showing the duration and intensity of storms in South Lancashire was one which illustrated the care and precision with which Mr. Meade arrived at his results. His observations in regard to the area affected by rainfalls of great intensity were especially important, and were something new to him (the speaker). Not content, too, with the information provided by the text-books, Mr. Meade had conducted investigations for himself as to the self-cleansing of sewers, and a table in the paper showed the results of his experiments. From that they would see he had found that cinders would move at 73 ft. per second, the figure for sandstone chippings being 219. It was curious in that connection to find from what they had heard that their old friend 225, as being the minimum velocity of flow, was not far wrong. Then, again, in the table of the actual measured flow of a certain diameter of sewer into the tank they found that their old friend Santo Crimp had come out well, results having proved up to the hilt the accuracy of his investigations. A particularly useful table in the paper was the one giving the number of bricks required per lineal yard in sewers of various diameters—from 4 ft. 6 in. up to 13 ft. 6 in. He had had the advantage that morning of seeing at Stretford a large section of the outfall sewer in course of construction, and he saw that three or four different kinds of bricks were being used in the various rings, Accrington or engineering bricks, as Mr. Meade called them, being employed for the inner ring. Better bricks he had never seen used on any job. The importance of good brickwork could not be over-estimated; it was essential in a job of that kind, and had good bricks been used in earlier work some of the terrible failures of which they had heard that day would not have occurred. The employment of air pressure without an air lock was interesting, and, personally, he had never heard of a case where it had been found practicable to keep back water without an air lock. No doubt the air in some way got into the pores of the soil, and thus retained the water. It saved a great deal of trouble and expense, but how Mr. Meade dared to do it he did not know. Perhaps he would elaborate that part of his paper a little. Concluding his remarks, Mr. Boulnois spoke in congratulatory terms of the photographic views accompanying the paper. Having regard to the difficulties that presented themselves, the way in which these had been taken reflected the highest credit on all concerned.

Mr. E. WITTON BOOTH (Manchester), referring to Diagram E, said he noticed from that that there was a decided increase between the years 1905 and 1910 in the conversion of pail-closets into water-closets, and he would like to ask whether that was due to any local Act at the time. He rather differed from

Mr. Boulnois in regard to Fig. M. As he (the speaker) read the paper, Kutter's was the only formula which agreed with the actual measurements taken by Dr. Fowler. As to Mr. Swarbrick's paper, he was sorry that in that the author had not dealt with one point of interest to members of the institution. What would be the position of the borough engineers in these large towns if all these schemes of amalgamation were carried through? It seemed to him that too much departmentising was not for the benefit of the members.

Mr. A. J. PRICE (Eccles) remarked that the difference between Kutter's, Crimp's, Eytelwein's, and Beardmore's formulae, as shown in diagram M, appeared to be that Crimp's gave a discharge about 20 per cent higher than Kutter's; while Beardmore's gave one about 20 per cent lower. As Kutter's formula had been verified by Dr. Fowler's tank measurements, would it not be advisable to scrap Crimp's and Beardmore's formulae? It seemed to him that if Kutter's formula was correct, all sewerage schemes should be designed on that formula. It was stated in Mr. Meade's very interesting paper that the contractors' prices included the cost of any timber left in and of strengthening foundations as might be required. Did that mean that the contractor had to include in his contract price per lineal yard of sewer for any timber left in? If it were so, unless adequate information of the strata was given, it would hardly be fair to the contractor, as there would be too great an element of risk. Instead of giving a reasonable price, would not the contractor put a large one in his tender to cover himself from loss? There was also the question as to who was to decide what timber was to be left in—the engineer or the contractor? Was the two years' maintenance relied upon to reveal any cracks or subsidences taking place in the sewer or road before the contractor's liability was ended? Another point was the clause which required the contractor to furnish a return of extra work done every week, and if no weekly return was sent in it was deemed to be an admission that no extra work was done during that week. That was a very good clause which was often used, and he thought it should be included in every sewerage contract. There was a table given in the paper of the minimum transporting velocities in sewers. He would be glad to know the sizes of the sewers in which they were taken. It seemed to him that it depended more on the percentage of the depth of flow than the depth of flow itself.

Mr. S. S. PLATT (Rochdale) said there was one question he would like Mr. Meade to answer in reference to the grouting of this retaining wall. Could Mr. Meade remember at what air pressure the grouting was injected?

Mr. P. C. COWAN (Local Government Board, Ireland) said he had a very special interest in that meeting because by coming to it he had got a new view of his old friend Mr. Meade, who, as a rule, could not be induced to talk about his achievements. He had known him now for a quarter of a century—first at Hornsey—and throughout his career he had proved himself a leader. Personally, he had always found him ready to give of his best; he was a model professional man in that respect. Like other Government servants, he (Mr. Cowan) received the greatest kindness from the leading engineers of the British Isles, and when in difficulties was able to obtain from the engineers of Manchester, Liverpool, and London the latest and best information. Mr. Meade's paper was practically a small text-book, up to date, and they might rely with perfect confidence on anything that they found in it. With regard to the question of bricks, bad bricks put into an important sewerage work would probably serve the purpose very well for a number of years, but it was inevitable that, in course of time, they would go. About twenty years ago a culvert of large size was provided to convey the whole of the sewage of Belfast, and he had lately seen a section taken up in order that the bad bricks of which the arch was constructed could be replaced. There ought to be no question about it; only the very best materials should be put in these important works. In one matter they were ahead of England. At Cork they were in communication with Queen's University in the laboratory of which all the bricks used in the city were tested very carefully. The last test had reference to Pudlo in Portland cement. In conclusion, Mr. Cowan expressed his gratification to the Corporation of Manchester for giving the members of the institution an opportunity of seeing their municipal works. He thought that in Manchester

they could see much of the best of British life, and he wished the town prosperity and progress.

Mr. T. W. A. HAYWARD (Battersea) asked that Mr. Meade might be kind enough to reply to any queries that might suggest themselves to the younger members after they had had an opportunity of reading his paper. Mr. Meade no doubt had some fuller information on the subject of sewer ventilation, and if he could supplement the paragraph on that matter he was sure it would be most acceptable to the members and add to the value of their "Proceedings."

The vote of thanks was passed.

Mr. DE COURCY MEADE said he hardly knew how to return thanks for the extremely kind and flattering expressions which had fallen from some of the members. He had first to thank the president, and their district chairman, Mr. Brodie, for the references they had made to himself, and he also desired to acknowledge what had fallen from other speakers. It had been a great pleasure to him to produce his paper, and the only difficulties with which he had been confronted had been limitations of time and a superabundance of matter. After dealing with a number of points raised in the course of the discussion, Mr. Meade announced that he proposed to communicate a formal reply in writing. This we have since received, and is as follows: "In reply to Mr. Morgan, it is, of course, unnecessary to explain to engineers the reasons for the failure of bricks made from surface clays and containing coarse grains and lumps of lime, but as this reply may be read by some who are not experts, I will, for their information, say that lime acts as a flux and lessens contraction, but coarse grains of lime are likely to weaken the brick when it is used in wet or damp situations, and frequently result in its destruction. If lumps of lime are present under such conditions, the failure of the brick is certain. It is merely a question of time; when the moisture reaches the lime the latter slakes and bursts the brick. Bricks containing lumps or coarse grains of lime are therefore quite unsuitable for use in sewers. It is remarkable that a practical man like my predecessor, with numerous examples of the failure of this class of brick around him, could have been persuaded by the brickmakers that they had so improved the manufacture of the surface-clay brick that they could produce a sound and lasting brick from such materials. Naturally, one's wish is to support all branches of local industry, but an official's first duty is to his employers—in this case the Manchester Corporation and the ratepayers of the city. The common bricks now being used in the new sewer-are made from shale, and cost little, if any, more than the surface-clay bricks. The shale bricks are made in the city of Manchester and other parts of South Lancashire. I agree with Mr. Morgan that the absorption of 10 per cent by weight of water in common bricks is a large allowance. We can obtain common shale bricks with a maximum absorption of less than 7 per cent. The red engineering bricks absorb about 1½ per cent of water. With reference to the remarks of Mr. Price, junr., on the diagram showing the discharging capacity of the outfall sewer by various formulae, an explanation will be found at the top of p. 11.* Santo Crimp's formula is:—

$$V = 60 \times 124^3 \sqrt{R^2 \sqrt{S}}$$

Where V = Velocity in feet per minute

$$R = \text{Hydraulic radius in feet} \frac{\text{area of sewer}}{\text{wetted perimeter}}$$

$$S = \frac{\text{head}}{\text{length}}$$

It will be seen that he does not give a variable coefficient for friction.

Kutter's formula is—

$$V = 60 \left[\frac{41.6 + \frac{1.487}{n} + \frac{0.0281}{S}}{1 + \left(\frac{41.6 + \frac{0.0281}{S}}{n} \right) \sqrt{RS}} \right] \sqrt{RS}$$

Where V = Velocity in feet per minute

R = Hydraulic radius in feet

$\frac{\text{area of sewer}}{\text{wetted perimeter}}$

$\frac{\text{Diameter}}{4}$ for circular sewers running full

S = $\frac{\text{head}}{\text{length}}$

n = 0.015.

The value of the coefficient n can be varied by this formula to suit any degree of roughness or smoothness in the sewer. In reply to Mr. Platt, the grouting

* See p. 9 of Supplement accompanying this issue.—ED. SURVEYOR.

machine is worked at pressures varying from 30 lb. to 60 lb., according to the character of the work. In reply to Mr. Boulnois as to the work under compressed air without the use of a shield, no difficulty has been experienced in this respect. The water is kept back by a pressure varying from 6 lb. to 9 lb., and the work is carried on in the ordinary way by excavation, timbering, and brickwork in cement. The materials are brought in and the spoil taken out through the air lock, which is built into the sewer near to the base of the working shaft. Mr. Hayward asked if inquiries on any points in connection with the paper might be sent to me later; of course, I will be glad to answer any queries that may reach me. Mr. Hayward also referred to the question of ventilation of sewers, and suggested that I should supplement the information given on that subject. I would refer him to a paper read by me on the occasion of the visit of the Royal Institute of Public Health to Berlin in 1912, a report of which appeared in *THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER* dated September 27th of that year, and in other professional papers published about that time. In answer to Mr. Booth, the conversion of pail-closets to water-closets was expedited by the Sanitary Committee during the years 1909 and 1910 on the advice of the medical officer."

Mr. SWARBRICK also made a short reply.

DINNER.

In the evening the members were entertained to dinner at the town hall, Alderman Harrop presiding.

The toast of "The Institution of Municipal and County Engineers" was proposed by Alderman Frowde, chairman of the Rivers Committee, who mentioned, in the course of his remarks, that the Manchester Corporation dealt annually with some 214,000,000 gallons of sewage. There was one fault which he always had to find with corporations, and that was that they did not look far enough ahead. Accordingly, he sympathised with municipal engineers who when they put forward a scheme for adoption a suggestion was made that a cheaper one—which in the end was likely to prove more costly—should be carried out.

The PRESIDENT, in response, observed that municipal engineers were, in many cases, doing their best under difficult circumstances.

"The City of Manchester" was proposed by Mr. H. PERCY BOULNOIS. Manchester, he said, was made by, and its prosperity was due to, the great energy of their ancestors, who had, however, left behind them a legacy of evil in the shape of slums. But Manchester was not to be beaten, and the city had tackled the problem in an admirable manner. With infinite pains they had examined every single one of the houses, and converted the bulk of them into habitable dwellings. It would, of course, have been much easier to have swept them all away, but in doing what they did they avoided dispossessing the people, merely pulling down a few houses where necessary. The paper which Mr. de Courcy Meade had read to them that day was a monolith of engineering work, added Mr. Boulnois. It only showed what a man, backed up by a corporation, could do in such matters.

Alderman HARROP, in reply, said that if the city fathers of the past had been more ready to take the advice of their officials, many of the blunders which had occurred would have been avoided. He thought municipal engineers would welcome the Town Planning Act, which would result in a more beautiful England in a few years. All that was wanted was to form strong committees, backed by the experience of those who knew best. Manchester, he hoped, in a few years would startle them with the grand projects it had in hand.

SATURDAY'S PROCEEDINGS.

The meeting terminated on Saturday, when parties of the members inspected some of the works which have been recently completed or are being carried out by the corporation. These parties went to Platt Fields, the intercepting sewers at West Didsbury and at East Didsbury, the outfall sewers at Stretford and Davyhulme, to the tramcar depot in Hyde-road, the subway at Stuart-street, the Smithfield Market, and the Elm-street cold stores.

Speaking at a luncheon given at the Grand Hotel by the Tramways and Improvement Committees, Alderman BOWES, chairman of the former body, in proposing the toast of "The Institution," said he was convinced that it was quite impossible for any body of men such as municipal engineers to meet in conference as they had been doing during the past two days without going back to their different towns with more knowledge than when they left them. That

morning they had been inspecting some of the work done by their respected city engineer, Mr. Meade. They felt proud of their city engineer, who had done noble work for Manchester, although he was afraid they had not compensated him adequately for the services he had rendered them. He was one of those who believed in paying their staff well, and having the best.

The PRESIDENT, in reply, said he felt that the institution, after an existence of some forty years, had, in some measure at any rate, justified its existence.

"The Tramways Committee of the Corporation of Manchester" was proposed by Mr. J. A. BRODIE (Liverpool). Mr. Brodie said he thought it would ill become them to leave Manchester without expressing in some form their acknowledgments of the admirable treatment meted out to them during their stay in the city. No one could see the works they had been shown without forming a very high opinion of the abilities of those responsible for their carrying out. He was glad to have an opportunity of saying something about tramways, for there was no doubt they were on the eve of very important improvements in connection with the different forms of conveyance between the centres and outskirts of our great cities. Whether it was by tramways or motor vehicles, the people in the large towns must be transported much more quickly than at present from one point to another. Having been a resident of Manchester many years ago, he could bear testimony to the improvements in the methods of transport which had taken place since those days.

The CHAIRMAN, in reply, said the present satisfactory position of the tramway undertaking was due to the general manager, Mr. J. M. McElroy. The Manchester tramways, he observed, paid a higher percentage on the capital invested than any other undertaking of the kind in the country. They contributed to the rates £100,000, which was about the equivalent of a 6d. rate.

The health of Mr. de Courcy Meade was proposed by Mr. T. W. A. HAYWARD (Battersea) in a speech expressive of the institution's indebtedness to the city surveyor for the magnificent paper which, in spite of the many important works engaging his attention, he had managed to prepare for their meeting, and for the excellent arrangements made on their behalf. They had been full of admiration of the way in which everything had been carried out during their stay in Manchester. Mr. de Courcy Meade had thrown himself heart and soul into their visits, and they would go away feeling that they had had a real good time. He desired to couple with his toast the name of the tramway manager, Mr. McElroy.

Mr. DE COURCY MEADE, in returning thanks, said that whatever measure of success had attended the meeting was due to the able staff over which he had the honour of presiding. When it was known the institution were going to Manchester, they immediately expressed their willingness to help in every way possible, and with their assistance and the help he had received from the admirable hon. district secretary, Mr. Bradley, he, personally, had very little difficulty in making the arrangements.

Mr. McELROY also replied. In Manchester, he said, they were always glad to welcome their brother officers from other parts of the country. Touching on the question of future means of transport in great cities, Mr. McElroy added that that was a matter which would have to be gone into with the help of municipal engineers.

Inspection of Motor Vehicles.—In the House of Commons on Friday last the President of the Local Government Board was asked by whom the inspection of motor vehicles was carried out for the purpose of ascertaining whether these vehicles complied with the regulations as to weight and width; and whether, in view of the large dimensions of these vehicles as at present constructed, proper facilities existed for ascertaining their weight, laden and unladen. Mr. Herbert Samuel said that on every application to a registering authority for the registration of a heavy motor car, certain particulars, including the weight of the car, laden and unladen, were, under the Heavy Motor Car Order, 1904, required to be furnished by the owner. The same Order made provision (i.) for the ascertainment of these weights by or in the presence of an officer of the registering authority, if the authority so direct, and (ii.) for bringing any car upon a highway to a weighing machine for the purpose of ascertaining whether the registered axle-weight was exceeded. He was not aware that the facilities referred to were inadequate.

LOAN PERIODS FOR FERRO-CONCRETE.

[The following interesting article is quoted from the February issue of *Ferro-Concrete*.]

On the present occasion we do not intend to add anything to previous criticism of the Local Government Board policy in regard to ferro-concrete, but simply to show how benefit may actually be derived from the relatively short loan periods usually fixed by the board for work of this description.

With this object we take three examples from recent practice, and to them invite the attention of local authorities and their professional advisers. In each case the amount of the annual repayments is based on interest at the rate of 3½ per cent per annum.

EXAMPLE I.

£ s. d.	£ s. d.
<i>Ferro-concrete Bridge</i> —	<i>Masonry Bridge</i> —
First cost ... £6,000	First cost £10,000
Loan period 10 years.	Loan period 30 yrs
Total repayments:	Total repayments:
£71 8s. 9d. for 10	£343 15s. for 30
years 7,214 7 6	years 15,312 10 0
Total saving effected	
by Ferro-concrete. 9,098 2 6	
<u>£16,312 10 0</u>	<u>£16,312 10 0</u>

The saving here evidenced is rather startling and deserves a little careful investigation. The difference of first cost in favour of ferro-concrete was £4,000, and the saving in interest consequent on the smaller outlay and the shorter loan period was £6,312 10s.—£1,214 7s. 6d.—£5,098 2s. 6d., the two items making up a total of nearly £10,000 to the good.

Possibly some members of municipal and other councils may echo the well-known Irish bull of Sir Boyle Roche: "Why should we legislate for posterity? What has posterity ever done for us?" and imbued with this sentiment may not hesitate to cast a heavy and wasteful burden of expenditure upon their constituents, with the object of lightening the annual amount of repayments.

But those who wisely look to the future will naturally view with dismay the continuance of useless payments through a long vista of years.

The true wisdom of a far-sighted policy is clearly denoted by the following comparison:—

REPAYMENTS DURING THE FIRST TEN YEARS: EXAMPLE I.

Year.	Total amounts of payments at various periods.	
	Ferro-concrete.	Masonry.
First	£ s. d. 721 8 9	£ s. d. 542 15 0
Second	1,412 17 6	1,087 10 0
Third... .. .	2,104 6 3	1,631 5 0
Fourth... .. .	2,885 15 0	2,175 0 0
Fifth... .. .	3,607 3 9	2,718 15 0
Sixth... .. .	4,328 12 6	3,262 10 0
Seventh... .. .	5,050 1 3	3,806 5 0
Eighth... .. .	5,771 10 0	4,350 0 0
Ninth... .. .	6,492 18 9	4,893 15 0
Tenth... .. .	7,214 7 0	5,437 10 0
	Bridge entirely paid for.	£10,875 more to pay.

It will be seen that at the end of the tenth year the total cost of the ferro-concrete bridge, including payments in respect of interest, will be only about 72 per cent of the bare cost of the masonry bridge originally contemplated, and that at the same date there would have remained for payment no less than £10,875, or £543 15s. a year for twenty more years if the alternative form of construction had been adopted.

Let us now see what would have been the position if the Local Government Board had sanctioned, and the local authorities had accepted, the loan period of thirty years for the ferro-concrete bridge.

In that event the repayments would have been £326 5s. a year, and the total cost of the bridge would have worked out at £9,787 10s., or £2,573 2s. 6d. more than the cost with a loan period of ten years. Thus it is evident that short loan periods are really beneficial, a fact which will undoubtedly weigh with all municipal and county councillors who have at heart the true welfare of their constituents.

In order to make things clear at a glance, we have prepared the diagram reproduced as Fig. 1, showing

graphically the effect of different loan periods on the annual repayments and total cost of the ferro-concrete and masonry bridges. It will be noticed that by the time £7,214 7s. 6d. had been paid as the entire cost of the ferro-concrete bridge, payments for seventeen years more would still be due on the masonry bridge, and for nine years for ferro-concrete with a thirty years' loan.

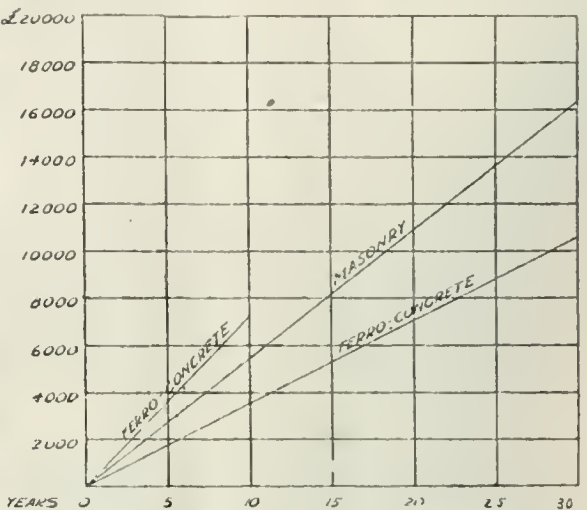


FIG. 1.—DIAGRAM ILLUSTRATING EXAMPLE I.

(The first line represents the relative amount of annual repayments and the total cost for the ferro-concrete bridge, with a loan period of 10 years; the second line denotes similar values for a masonry bridge with a loan period of 30 years; and the third line indicates what would have been the effect of a 30-year loan period for the ferro-concrete bridge)

EXAMPLE II.

£ s. d.	£ s. d.
<i>Ferro-concrete Bridge</i> —	<i>Steel or Masonry Bridge</i> —
First cost £50,000	First cost £80,000
Loan period 30 yrs.	Loan period 50 yrs.
Total repayments:	Total repayments:
£2,718 15s for 30	£3,410 16s. 8d. for
years 81,562 10 0	50 years 170,541 13 4
Total saving effected by Ferro-concrete 88,979 3 4	
<u>£170,541 13 4</u>	<u>£170,541 13 4</u>

In this case it will be noticed that, despite the extra twenty years offered for repayment, the annual payments on account of the ferro-concrete bridge are actually £692 1s. 8d. less than they would have been for a steel or a masonry bridge. The saving at the end of ten years will amount to nearly £7,000, while at the end of thirty years, when the ferro-concrete

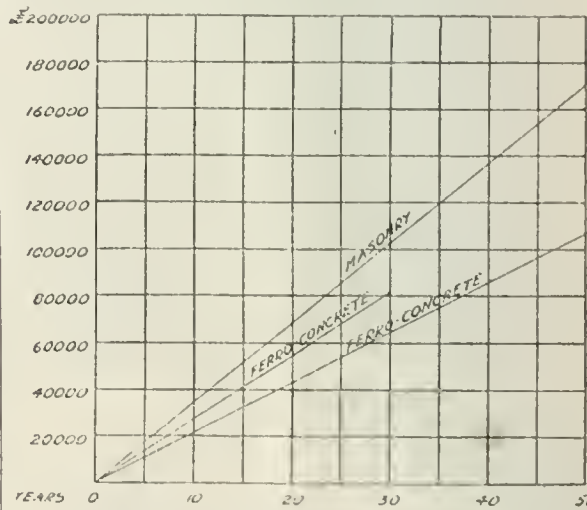


FIG. 2.—DIAGRAM ILLUSTRATING EXAMPLE II.

(The first line shows the relative amount of annual repayments and the total cost for a steel or masonry bridge, with a loan period of 50 years; the second line represents similar values for the ferro-concrete bridge with a loan period of 30 years; and the third line denotes the higher total cost that would be entailed by a 50-year loan period for ferro-concrete.)

bridge will be completely paid for, the payments on account of a steel or masonry bridge would have come to no less than £102,325, or £20,762 10s. more than the entire cost of the ferro-concrete bridge, including interest. That is not all, for during the suc-

ceeding twenty years the ratepayers would have been mulcted to the additional extent of £68,216 13s. 4d., making up the huge excess payment of £88,979 3s. 4d. for nothing at all.

Therefore the choice of ferro-concrete was a very happy one for the community; but, strange to say, there were some misguided people who wished to incur largely increased annual payments for a long additional period of years.

It will be observed that we have put nothing down for maintenance of the steel or masonry bridge. In either case this would be a considerable item, and if steel were adopted the amount would be a very heavy one by the time the bridge had attained the age of fifty years. Moreover, the structure would have seriously depreciated long before it was paid for, while ferro-concrete would entail no outlay for maintenance and would go on increasing in strength year after year.

Again, if the loan period for the ferro-concrete bridge had been extended to fifty years, the repayments would have been £2,131 15s. 5d. per annum, making the total outlay £106,588 10s. 10d., or £25,026 0s. 10d. more than that involved by the period of thirty years. Hence the apparently tempting bait represented by a reduction of £587 in the yearly payments is a very flimsy disguise of the cruel hook attached to the line of extended pecuniary liability.

EXAMPLE III.

Ferro-concrete Reservoir —		Concrete and Masonry Reservoir:—	
£ s. d.		£ s. d.	
First cost ..	£1,200	First cost ..	£2,900
Loan period 10 years.		Loan period 30 years.	
Total repayments:		Total repayments:	
£156 6s. 3d. for 10		£157 13s. 9d. for 30	
years ..	1,563 2 6	years ..	4,730 12 6
Total saving effected			
by ferro-concrete ..	3,167 10 0		
	<u>£4,730 12 6</u>		<u>£4,730 12 6</u>

In this instance the marked economy of ferro-concrete and the shorter loan period result in a saving of £3,167 10s., which is nearly 10 per cent more than the first cost of a reservoir constructed in the ordinary manner.

The reader should note that while the payments for ferro-concrete only continue for ten years, the amount per year is less than that for ordinary construction, and if the latter had been adopted the ratepayers would have been compelled to go on wasting their money for twenty additional years. If a loan period of thirty years had been arranged for the ferro-concrete reservoir the result would have

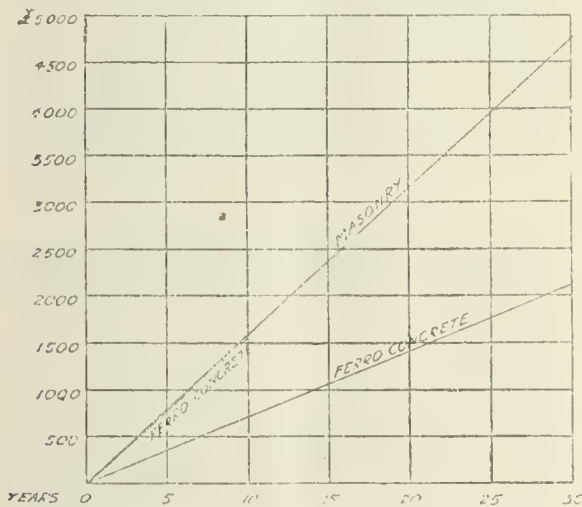


FIG. 3.—DIAGRAM ILLUSTRATING EXAMPLE III.

(The first line denotes the relative amount of annual repayments and the total cost for a concrete and masonry reservoir; the second line shows the slightly smaller repayments and the much lower total cost for ferro-concrete; and the third line represents the actual extravagance of a longer loan period for ferro-concrete.)

been a total expenditure of £2,120 12s. 6d., involving the ratepayers in a loss of £2,120 12s. 6d.—£1,563 2s. 6d.—£557 10s., although the annual repayments would have fallen from £156 6s. 3d. to £70 13s. 9d.

The figures adduced in this article are absolutely convincing as to the advantage of short loan periods in conjunction with ferro-concrete construction, and if county and municipal councils throughout the kingdom will accept the suggestions here brought forward, their constituents will have reason to bless the restrictive policy of the Local Government Board in respect of loan periods for ferro-concrete.

What with increasing expenditure on drainage,

water supply and other necessary works, to say nothing of luxuries now generally provided for the working classes, local rates are quite high enough without useless and avoidable outlay.

RAIL CORRUGATION AND ITS CAUSES.

PAPER AT THE INSTITUTION OF CIVIL ENGINEERS.

Discussing, in a paper which he read before the Institution of Civil Engineers on Tuesday evening, the causes of rail corrugation, Mr. Stephen Sellon, M.INST.C.E., gave it as his opinion that the rail steel now used for rails was not hard enough or tough enough for its work. Possibly modern methods of steel and rail making were at fault in this direction. The use of wheels of small diameter was evidently severe on the rails, but the conditions of tramway working made alteration impracticable, and it therefore became necessary to find a material which would not yield to the wheel actions which were the immediate cause of corrugation.

Mr. Sellon said he believed that hard rails—i.e., with a high proportion of carbon—were essential, and gave some evidence from his own and others' experience that such high-carbon rails resisted the corrugating actions of the wheels, as well as ordinary wear. The British Standard Specifications were established before corrugation was realised as a serious possibility, and the range of carbon content permitted, besides being rather wide, only approached the hard side for Bessemer steel, while it was on the soft side for open-hearth steel.

The general character of corrugation was described by Mr. Sellon, and he laid stress upon the facts that the "crests" had the appearance of planished or cold-rolled steel, and were relatively hard and refractory to acid, while the "hollows" were dull, showed some lateral detrusion and pitting, and were only slightly harder than the body of the steel. The conclusion he drew was that the "crests" were cold-rolled, and the "hollows" were surface which had been crushed, due to the vertical loads imposed by the wheels oscillating about the elastic compressive limit of the steel. How the oscillatory character of the load was brought about was not considered, but it was pointed out that at ordinary speeds the usual pitch of the corrugations on tramway rails corresponded with a frequency of the order of 100 per second.

The possibility of the rails receiving initial corrugations in the processes of rolling and cooling was briefly discussed, but it was pointed out that such initial corrugation, if it ever existed, was uncommon. Differences of surface hardness or internal stresses received during manufacture were suggested as possibilities.

Leaving these suggestions, the fact remained that corrugation was due to the failure of the rail-table under the stresses imposed upon it. The surface was alternately cold-rolled and disintegrated. In measurements of static pressure made by Mr. Worby Beaumont, and set out in the paper he presented to the British Association in 1911, were shown to prove that pressures of such magnitude as to produce destructive effects occurred, but that it was probable that the compressive elastic limit of rail-steel was not generally exceeded. The evidence, therefore, seemed to show that a comparatively small increase in the compressive strength of the steel would prevent the particular kind of wear under consideration.

Mr. Sellon suggested that the essential points to be specified were mechanical properties corresponding with the working stresses imposed upon the rails, and first compressive strength. The British Standard specification prescribed an ultimate tensile strength of 40 tons per square inch. The compressive strength was probably about the same as the tensile, but the actual wear of tramway rails suggested that it was somewhat in excess of 40 tons per square inch. Probably steel with an ultimate tensile strength of 50 to 60 tons per square inch would be hard enough to resist the destructive stresses, but it was essential that it should not have a high degree of ductility. The minimum pressure needed to produce surface crushing and flowing should be determined. It is suggested that a Brinell test might give all the information needed. The tup test might have to be modified, but rails laid on a continuous concrete sub-structure had a large margin of safety against breakage from vertical shocks, and a less severe tup test should suffice. The whole specification of the rail in respect to its mechanical qualities should bear a direct relation to the stresses which it would be called upon to resist.

INSTITUTION OF MUNICIPAL ENGINEERS.

EASTERN DISTRICT MEETING AT OUNDLE.

The meeting which was held at Oundle on Saturday last included in its programme a most enjoyable and interesting round of visits. Those present as members of the institution were Messrs. W. T. Unwin, chairman of the district, J. Bailey (Spalding), W. R. Bailey (Holbeach), G. F. Bearn (Wellingborough), A. W. Broker (North Witchford), G. Belson (Chilvers (Oundle), N. Dixon (Oundle), O. Gillson (Peterborough), J. W. Lloyd (Rushden), C. Mayfield (Godmanchester), G. A. Penwill (Peterborough), and B. Wyand, secretary of the institution. Among the visitors were Messrs. J. W. Walshaw, city surveyor, Peterborough; S. Broadbent, sanitary surveyor, Oundle Rural District Council; Geo. W. Chilvers, consulting engineer and surveyor, London; M. Fox, Oundle; O. P. Drevor, contractor to the North Bridge widening; J. Hanson, general foreman, North Bridge; M. Dye, general foreman at Grocers' Company Schools, New Science Block; R. Ashworth, school engineer; and J. T. Dewey, Peterborough. The following members of the urban district council also were present: Messrs. Jos. Rippiner (vice-chairman), Jno. Hayes (chairman of the Public Health Committee), Jno. M. Siddons, Colonel C. Percy Lees, W. B. Wood and Robt. Knight (clerk of the council).

A start was made with an inspection of the works in progress in the widening of the North Bridge, under the direction of Mr. O. P. Drevor, the contractor, and Mr. J. Hanson; Mr. J. H. Dyson, the clerk of the works, was unfortunately unable to be present owing to illness. The inspection proved of great interest to the party, and warm praise was bestowed on both the appearance and stability of the structure. The bridge is said to be one of the longest in the county. A hearty vote of thanks was accorded Mr. Drevor, with whose name was coupled that of Mr. Hanson, for their kindness in explaining the works.

The party then proceeded, under the direction of Mr. Ashworth, to inspect the buildings in connection with the Grocers' Company's schools. A visit was also made to the new science block in course of erection, where Mr. Dyer, general foreman to Messrs. Thompson Brothers, the contractors, ably explained the work.

An adjournment was afterwards made to the council's offices where a short business meeting was held, Mr. Unwin, the district chairman, presiding.

Mr. John Hayes, chairman of the Oundle Urban District Council Public Health Committee, said that, on behalf of the members of the council and the town generally, he wished to offer a word of welcome to the members of the institution present. Mr. Unwin returned thanks for the welcome, and stated that it had given him and fellow-members the greatest pleasure to visit the town, the North Bridge, the school, and the other buildings they had seen that day. He (Mr. Unwin) had now completed three years' service as chairman of the district, and he thought a change would be better and give an added interest in district matters. It was thereupon proposed, and carried unanimously, that Mr. Chas. F. Mayfield, the borough surveyor of Godmanchester, be chairman for the ensuing year.

Mr. P. S. Bennett, the hon. district secretary, having intimated his desire to resign his position, it was proposed, and carried unanimously, that Mr. G. Belson (Chilvers, surveyor to the Oundle Urban District Council, be the secretary for the ensuing year.

It was resolved that for present working purposes, the Eastern and North-Eastern Districts be combined.

Arrangements were made for holding future meetings at Finedon in May next, and at Hunstanton in July next.

A paper, entitled "The Municipal Undertakings of Oundle," was then read by Mr. Chilvers, the surveyor and water engineer to the council, and will be found reproduced on another page of this issue.

After a brief but interesting discussion the members adjourned to tea at the Talbot Hotel.

NORTHERN DISTRICT MEETING.

At a meeting of the Northern District of the institution, held in the Town Hall, Newcastle-on-Tyne, on February 14th, there were present Messrs. W. Finch, chairman of the district, John Davison (Morpeeth), Joseph Halstead (Harrogate), J. R. MacMillan (Earsdon), C. W. Hall (Felling), R. E. Riddle (Bellingham), Thos. Young (Sunderland), Jas. Jameson (Ponteland), Wm. Wallin (Newcastle-on-Tyne), Geo.

W. Ayton (Chester-le-Street), Robt. Appleby (New-Egginton-by-the-Sea), W. Bean (Loughborough), J. H. Mole (Chester-le-Street), F. N. Taylor (Newcastle-on-Tyne), Thos. Knox (Benfield-side), W. J. Coulson (Cramlington), M. Turnbull (Shildon) and John Robinson, hon. district secretary (Darlington).

Forthcoming Meetings.—The report of the sub-committee, fixing dates for meetings during 1914, was confirmed, the following being the meetings arranged: March, Leeds (day to be arranged); April 18th, Darlington; May 2nd, Hexham; May 16th, Hull; June 13th, Cumberland; July 11th, Alnwick; August 15th, Cumberland or Westmorland; September 12th, Harrogate; October 10th, Sunderland; November 7th, Newcastle; December 12th, Newcastle.

Superannuation. On the motion of Mr. John Davison, seconded by Mr. M. Turnbull, the following resolution was unanimously carried, and the secretary was requested to send a copy to Mr. L. Hill, secretary to the N.A.L.G.O., and to Mr. Wyand: "That all local authorities be asked to pass a resolution in support of the proposed Bill providing superannuation for officers and servants of all municipal and local authorities, and that the clerk to each authority be asked to reply to the secretary stating the decision of his authority." Mr. Turnbull proposed, Mr. John Davison seconded, that, provided Mr. L. Hill, secretary to the N.A.L.G.O., agrees to carry out suggestions given in Mr. John Davison's resolution, a copy of the resolution be then sent to every member of the Northern Division asking them to approach members of their councils with a view to obtaining as much support as possible in order to get resolutions passed in favour of same. The secretary was requested to ask Mr. Wyand for a full report of what the council of the institution are doing in the matter, and to submit same to next meeting.

Federation with the N.A.L.G.O.—The secretary was asked to forward form of application to Mr. Hill, with cheque for £2 2s.

Suggested Fund for Northern Division.—Mr. J. Davison gave notice that at the next meeting he would move that a local fund be formed by obtaining annual subscriptions of 2s. 6d. each from members of the Northern District, such fund to be used entirely for local purposes.

Discussion of Papers read in London, November 7th, 1913. Mr. Turnbull proposed, Mr. Halstead seconded, that the three papers "Electricity as a By-product," by R. J. Spencer Phillips; "Temporary Buildings in Relation to By-laws," by T. C. Barralet; "The Need for Standardisation in Drainage Details," by Arthur Palmer—having been circulated, be taken as read. Very interesting discussions upon the papers then followed, most of the members present taking part. The chairman proposed, and Mr. Coulson seconded, that the secretary write Mr. Wyand and thank him for giving the members of the Northern District an opportunity of discussing the papers, and asking him to convey to the writers of the papers their thanks and appreciation of same. The resolution was unanimously carried.

Election of Council.—The chairman suggested that, prior to the next election of members for the council of the institution, a meeting of the Northern District should be held to nominate the names of the members they propose supporting, in order to ensure proper representation.

A vote of thanks was passed to the Lord Mayor of Newcastle for the use of the Committee Room.

THE EASTBOURNE-HASTINGS COASTAL ROAD.

With reference to the above scheme, noticed in last week's Surveyor, it should be explained that Mr. G. Ball, Assoc. M.A.S.T.C.E., borough engineer and surveyor of Bexhill, prepared the plans of route so far as the proposed road will pass through that borough. The scheme is, in fact, one for which Mr. A. E. Prescott, borough surveyor of Eastbourne, and Mr. Ball are jointly responsible, and the preliminary plan was prepared in consultation. Mr. Ball has attended each conference held at Eastbourne, and at the last conference a vote of thanks was unanimously passed to both borough surveyors for their services.

Town Planning Institute.—At a general meeting of this body to be held on Friday, March 13th, at 92 Victoria-street, Westminster, a paper on "The Town Planning Proposals of the Urban Land Report" will be read by Mr. Raymond Unwin, F.R.I.B.V. The chair will be taken at 8.30 p.m.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

HIGHWAY: DEDICATION: OLD BRIDLEWAY AND FOOT-PATH.—The decision of the Court of Appeal in *Cababé v. Walton-upon-Thames District Council* (noted in Vol. XLIII., p. 256) has been affirmed by the House of Lords. The question in this case was whether an old private bridleway and footpath, known as Cottimore-lane, was a highway repairable by the inhabitants at large. The way was set out in 1804 under an Inclosure Award for the use of the occupiers of certain allotments. In course of time these occupiers used it as a cartway also, and by 1864 it had become a public highway for vehicles; but it had never been formally dedicated or adopted under the Highway Act, 1835, or otherwise, and the evidence showed that it had not become a public highway until after 1835. In 1910 the council resolved to make it up under the Private Street Works Act, 1892. The appellant, Mrs. Cababé, objected to the provisional apportionment on the ground that the road was a highway repairable by the inhabitants at large. In support of this objection it was contended that the conditions of sec. 23 of the Highway Act, 1835, must be presumed to have been complied with, or, alternatively, that they did not apply to this road, but only to highways which had been intentionally dedicated as such. The objection was overruled by the magistrates, whose decision was affirmed both by the King's Bench Division and by the Court of Appeal. The appeal to the House of Lords was (as already stated) equally unsuccessful. In the course of his judgment in that House Lord Loreburn said that it was common ground that Cottimore-lane had been a highway since 1864, but Quarter Sessions found that it was not a public highway in 1835, and two other courts had agreed with that view. On the evidence it seemed fairly certain that the road became a highway at some date after the Highway Act, 1835, came into operation. The question then arose, Was it repairable by the inhabitants at large? It would have become so had it not been for sec. 23 of that Act; but in his lordship's opinion the effect of that section was to prevent that result. It might be a hard case on the appellant. He was afraid the law was against her, and accordingly he moved that the appeal should be dismissed, with costs. Lords Dunedin, Kinnear, and Atkinson concurred.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words, as *noms de plume*. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

FIRE ENGINE: CHARGE FOR ATTENDING FIRE: DISTRICT COUNCILLOR: DISQUALIFICATION.—"Urban" writes: (1) My council have a motor fire engine and brigade. The practice in the past has been to charge for attendance at fires in the district, but no charge has been made for the water used. It has been pointed out that the council cannot legally make any charge whatever for attendance at a fire within the urban district, although the insurance companies have hitherto paid without demur, it being to their advantage to have the fire put out as quickly as possible. Can the council make any charge, and, if so, under what statute? The custom in many districts is to charge for attendance at fires, although it may be that such charges could not be upheld if contested. (2) Several large contracts will shortly be let in this district. Can a member of the council legally supply bricks or other material to the general contractor who carries out the works for the council? My opinion is that a member of the council cannot do so, as it is trading with the council indirectly.

(1) No. Sec. 33 of the Towns Police Clauses Act empowers them to charge for attendance at fires without the district, and it has been held that this clause impliedly negatives any right to charge for engines and apparatus when employed within the district (*Bridlington Local Board v. Bower*, 38 J.P., 73). (2) In my opinion a councillor who supplied bricks to a contractor, to be used by the latter

in carrying out works for the council under his contracts, would be disqualified under sec. 46, sub-sec. (1), clause (e), of the Local Government Act, 1891, and would be liable under sub-sec. (8) of the same section to a fine not exceeding £20 every time he acted as councillor.

SEWER LAID IN STREAM.—"MORUM" writes: Some three years ago a sewerage scheme was completed in this district. A stream of water, being the back-water from a mill, passes under the public road by means of a large brick culvert, across which and on the bed of the stream a 9-in. iron sewer pipe was laid. No complaint had been received from the mill owners until quite recently, when a new turbine (being a more powerful one) was fixed. On working this it was found that it did not develop the full horse-power. This, they contend, is caused by the pipe obstructing the flow of water from the turbine, besides causing silt to collect, and they have requested my council to have the pipe removed. I would point out that the bed of the stream is very flat, and that the water from the pond below this mill "backs up" nearly level with the top of the pipe in question. My council are of opinion that the bed of the stream being very flat is the cause of the trouble, and I shall be glad of your opinion as to whether the mill owners can compel my council to remove the pipe, seeing no objection was raised until a new turbine of greater horse-power had been fixed.

The bed of the stream presumably belongs to the riparian owners on either side, each being entitled to half the width. If the sewer was laid without notice to these owners (or to the occupiers of their lands) they could probably obtain an injunction for its removal. See *New River Company v. Ware Union R.S.A.* (1883, L.J., No. of Cas., p. 20), unless the owners consented, and thus waived formal notice. See *Long v. Fulham Vestry* (47 W.R., 56). In any case the mill-owners would be entitled to compensation, under sec. 306, for any damage sustained by reason of the exercise of the council's statutory powers.

BUILDING BY-LAWS: "HABITABLE" ROOM.—"Billiards" writes: A large cellar, entered on a plan deposited with the council as a store, has been fitted up for use as a billiard-room. The room measures about 28 ft. by 18 ft., and is 7 ft. 5 in. high, and has a fireplace. The window area is 13 super. ft. I should be glad to know whether such a room is a "habitable" room. According to the council's by-laws, habitable rooms should be at least 9 ft. high, and have a window area equal to at least one-tenth of the floor space. The house is practically completed, but the habitation certificate has not yet been issued. How would you deal with such a case? Copy of our by-laws forwarded.

By-laws 53 and 63 appear to be those referred to. By-law 53 provides that every person who shall erect a new building, and shall construct any room therein so that it may be used for human habitation, shall comply with certain specified requirements. These requirements prescribe a height of 9 ft., except for an attic or a room wholly or partly in the roof and intended to be used as a sleeping-room. In my opinion a billiard-room "may be used for human habitation" within the meaning of this by-law. By-law 63 provides that every person who shall erect a new building shall construct in every habitable room of such building one window at least, as therein prescribed. In my opinion a billiard-room is a "habitable room" within the meaning of this by-law.

PRIVATE STREETS CLOSED BY GALES.—"Semper Idem" writes: In my district I have several private streets in each of which there are a number of houses built. These streets have gates across at the entrances, some of which are, presumably, closed once a year, and others are always kept closed. The streets are considerably out of repair, and no works have been recently carried out by the owners. Would you let me know (1) if the council have power to make up these streets under the Private Street Works Act, 1892 (which has been adopted)? (2) Is there anything to prevent them being taken over as highways repairable by the inhabitants at large, under sec. 19 of the Act of 1892 after the street works have been completed? (3) If the council have power, when carrying out the street works, to remove the gates?

(1) Yes, assuming that they are not repairable by the inhabitants at large. (2) Nothing whatever. (3) Not until they have been taken over.

London Street Pavings.

METROPOLITAN COMMITTEE'S ELEVENTH ANNUAL REPORT.

The Metropolitan Paving Committee have issued their eleventh annual report relative to the paving works carried out in the County of London by various road authorities, compiled from information furnished by the engineers to the various authorities concerned. The committee was formed as the result of a conference of representatives of the metropolitan borough councils held at the Westminster City Hall on January 8, 1903, for the purpose of considering the general question of materials and means of paving the streets of London. The information furnished in the returns on which this report is based relates to practically all the best-known descriptions of paving, the method of laying, the period the paving has lasted, cost of laying, saving on tar-sprayed roads, and other details.

The chief features of this year's return may be very briefly summarised as follows:—

Principal Kind of Paving Laid.—Softwood has been principally used during the year. In Holborn it is noticeable that a considerable area of granite setts has been laid down on foundations varying from 6 in. to 14½ in. in place of asphalt, in consequence, it is presumed, of the altered traffic conditions. Bituminous macadam has been adopted in a number of districts in place of ordinary water-bound macadam, and large areas of macadam roads have been tar-sprayed.

Foundation.—Various thicknesses of concrete foundation, ranging mostly from 6 in. to 9 in., have been adopted—in some cases 12 in., and in one (Holborn) as much as 12 in. to 14½ in. It appears to be recognised that the altered conditions of traffic demand a greater thickness of concrete foundation than has hitherto been adopted for the paving of London streets.

Saving on Tar-sprayed Roads.—The adoption of the system of tar-spraying macadam roads has been continued and extended in several districts, and an appreciable saving in the cost of scavenging and watering has resulted. It is, moreover, generally admitted that a great improvement in the road is the result.

Tar Slag Macadam.—The committee's attention has been drawn to the use of this material in several streets in the borough of St. Marylebone, and to the trial experiments made by the Road Board at Sidcup and Wandsworth. In St. Marylebone the material was laid in two coats and rolled, the surface being covered with fine granite chippings, and the total thickness when finished being 4½ in. The price varied from 1s. to 4s. 8d. per yard super, and the paving is said to be wearing well. The New Eltham and Sidcup road . . . trial length . . . was laid down in July, 1911, by the Kent County Council by arrangement with the Road Board. The material used was blast furnace slag ranging from 2½ in. down to ¾ in. When laid in one coat of mixed gauges, the proportions are about 60 per cent, ranging from 2½ in. down to 1½ in., 30 per cent from 1½ in. down to ¾ in., 10 per cent from ¾ in. down to ½ in. The binder used is distilled tar, without any admixture of other material, and after first setting it is not affected by normal changes of temperature. The cost per yard super, was 3s. 3d. as paid to contractors, and the paving has stood well and is said to be satisfactory. Another section, 794½ super. yds., on the same road, laid with the same material, is also satisfactorily reported upon. The Road Board say (the committee point out): "This section is quite good, and shows comparatively little wear. The roadway on both sides of this section is properly kerbed and channelled, and has properly constructed footpaths. These abutments give considerable support to the material forming the carriageway, preventing lateral thrust, and enabling better initial consolidation." In the borough of Wandsworth, on the Portsmouth road, trial lengths were laid for the express purpose of making comparison between the rates of wear of previously treated tarred granite when compared with similarly treated tarred slag macadam. A section of the latter—1,629·16 super. yds.—was completed in August, 1911, coated slag being spread in two layers, first layer graded from 2½ in. down to 1½ in., second layer from 1½ in. to ¾ in., surface finished with fine chippings. The cost per yard super, was 4s. The condition of this section is said to be good, and the surface wearing uniformly.

The returns sent in during the past year have been put in tabulated form, and are briefly summarised by the committee as follows:—

FULHAM.

The returns from this borough deal with four streets, in all of which the traffic is considerable. They were laid with 8-in. by 5-in. by 3-in. creosoted deal blocks, close jointed and grouted in with pitch and cement on an existing concrete foundation. The work was done by the borough council at a cost of 8s. 7d. to 8s. 8d. per yard super., without foundation, and the paving which this replaced had been down some sixteen years.

The surveyor, Mr. Francis Wood, states that about 40 miles of road surface has been tar-sprayed in Fulham during the year under review at a cost of, approximately, ½d. per super. yard. He also states that the annual cost of maintenance of softwood roads is about 3·63d. per super. yard, i.e., if certain repairs have been made in a road, the cost of these repairs is spread over the total paved surface of the road. If the cost was spread over the total wood-paved area of the roads, the cost per square yard would be about 2·89d. per super. yard. In Fulham the cost of maintenance for the past two years has increased over that of previous years. This is due to the heavier and self-propelled traffic, which very rapidly discovers the weak parts of the paving, and which, if allowed to continue unrepaired, would develop into serious depressions, and at the same time be a serious factor in causing damage to the foundation. The policy in Fulham is to carry out these small repairs as soon as they appear, which involves extra cost; but this increased cost is more than compensated for, as a record of the wear of the timber indicates that the life of the paving is extended at least 20 per cent to 25 per cent. This increased life is possibly accounted for by the growing use of rubber tyres that is of a softer material than the timber forming the road surface, and the reduction of horse traffic.

The tar-spraying of the roads and the adoption of the method of asphalt macadam construction show a considerable saving in the scavenging work of the borough. The amount of street refuse in 1906-7 was 11,189 tons, at a cost of about 2s. 6d. for collection and cartage per ton, and 1s. 6d. per ton for the shoot. The results shown have been very satisfactory, as this year the amount of refuse collected was only 8,275 tons—a decrease of 5,914 tons, or a reduction of about 40 per cent from 1906-7, equal to over £1,100 per annum. As this saving has every appearance of being permanent, the capital value it represents is at least £27,500. The saving is actually much greater than is shown by the above figures, as this year the cost of the shoot has risen from 1s. 6d. to 2s. 11d. per ton. The council has abandoned ordinary water-bound macadam construction, and adopted bituminous macadam (Trinidad Lake bitumen). The advantages resulting in this change will be gathered from the above comment. The scavenging of each road in the borough is done once per day at no greater annual cost than before.

GREENWICH.

In this borough 5 miles 7 furlongs, or an area of 94,073 yds., have been tar-sprayed, and the surveyor, Mr. E. J. Heward, states that the cost of cleansing and scavenging (including watering) for the year ending March 31, 1913, was £9,546, which is less by £286 than the average for the three years ended March 31, 1910, previous to which date little or no tar-spraying was done.

HAMMERSMITH.

Creosoted deal and bituminous macadam were laid in this borough during the year. The 8-in. by 5-in. by 3-in. creosoted deal blocks were laid with close joints run in with a mixture of boiling pitch and creosote oil, grouted with Portland cement and coated with a layer of ½-in. pea gravel on 8 in. of new Portland cement concrete in one case and on an existing foundation in other cases, at a cost per yard super, of 11s. 10d. with and from 7s. 2d. to 7s. 8d. without foundation. In Wells-road, a thoroughfare carrying considerable traffic, bituminous macadam was laid, consisting of 4 in. of granite in two coats grouted with Plascom, laid on a foundation of old macadam. The Plascom was laid

by the contractor, the road being scarified, the foundation prepared, and the granite laid by the borough council. The cost was 5s. 11d. per yard super. A larger quantity than usual of Plascom was laid as this road is a motor omnibus route. In another thoroughfare the bituminous macadam laid consisted of 3 in. of granite in two coats grouted with Keysite on a similar foundation to the foregoing, and laid in a similar manner, the cost being 1s. 6½d. per yard super.

In Waterloo-street 3 in. of granite was laid in two coats grouted with Plascom. One coat of the granite used was new, and the other old macadam. The excavation in this case was small, entailing only the taking up of asphalt blocks, the material being laid on a foundation of old asphalt blocks. The Plascom in this case was laid by the contractor, the road being excavated and the granite laid by the borough council. The cost of this work was 3s. 5d. per yard super.

The surveyor (Mr. H. Mair) states that 213,662 yards super. have been tar-sprayed in Hammersmith at a cost of £693, including labour in spraying.

HAMPSTEAD.

Both hard and soft wood were laid in this borough. The former laid in High-road, Kilburn, a road carrying considerable traffic, consisted of 9-in. by 3-in. by 3½-in. sectional Jarrah, the blocks being divided by in. thick, and the joints run with pitch and $\frac{1}{10}$ fillets creosote oil, grouted with Portland cement and sand. The paving was laid on an existing concrete foundation, which was made good and the whole surface rendered with Portland cement and river sand. The cost per yard super. was 13s. 6d. with foundation, and the Jarrah paving which this paving replaces had been down from nine to ten years.

The creosoted deal 9-in. by 3-in. by 4½-in. blocks were put down in Belsize-road, a road with considerable traffic. They were laid with close joints run in with pitch and creosote oil, and grouted with Portland cement and sand on a 9-in. foundation, at a cost of 6s. 2d. per yard super., without foundation. Similar paving was put down in West End-lane, 9-in. by 3-in. by 4-in. blocks being utilised, at a cost per yard super. of 6s. 10d., which included the cost of making good an existing foundation and floating the whole surface with Portland cement and river sand.

Tar-macadam, 4½ in. deep, was also laid, the work being carried out by the council at a cost of 3s. 6d. per yard super. with foundation, and a small area of Durax paving 3½ in. deep, laid on ¾ in. of tarred chippings, and grouted in with tar, at a cost of 8s. 11d. with foundation.

HOLBORN.

The only wood paving put down in this borough consisted of some 2,000 super. yds. of 3-in. Acme sectional Jarrah wood blocks 8½ in. by 3 in. by 3 in., laid in Woburn-square on an existing concrete foundation repaired and laid by a contractor at a cost of 13s. 6d. per yard super. with foundation and 11s. without foundation, the contract providing for three years' free maintenance. The Karri wood blocks which this paving replaces are stated by the surveyor (Mr. E. F. Spurrell) to have been down fourteen years. The traffic in this thoroughfare is limited, the annual cost of maintenance being 6d. per yard super.

The other paving laid in this borough consisted of compressed rock asphalt and granite setts. The asphalt was laid 2 in. thick, compressed with heated pelons, the foundation of Portland cement concrete varying from 6 in. to 12 in., according to the nature of the traffic carried by the street.

The cost of this asphalt was from 9s. 3d. to 9s. 6d. without foundation, and 11s. 9d. to 15s. 6d. with foundation. In the case of the higher figure, the Portland cement concrete foundation is 12 in. thick, and two years' free maintenance is provided.

A considerable quantity of granite setts have been laid, the size being generally 5 in. by 4 in., laid in pitch grout on a foundation varying with the nature of the street from 6 in. to as much as 14½ in. in High Holborn, where the traffic is particularly heavy. The cost of this paving per yard super. varies from 13s. 4d. to 13s. 5d. without foundation, and 10s. 10d. to 18s. with foundation, and in some cases redressed granite setts were used.

The asphalt which this paving replaced had been down from ten years (in Holborn) to twenty-nine years (in Hart-street).

ROYAL BOROUGH OF KENSINGTON.

The greater part of the new paving laid down in this borough consisted of creosoted wood blocks, 8 in.

in length, 3 in. in width, and varying in depth from 4 in. to 5 in. These were laid and grouted with tar pitch and cement on a Portland cement concrete foundation 6 in. to 9 in. in thickness. The cost of laying per yard super. varied from 6s. 3¼d. to 7s. 6d. without foundation, and from 9s. 3¼d. to 11s. 9¼d. with foundation. The thoroughfares previously paved with wood have lasted from ten to eighteen years; with cork asphalt, two years. A quantity of Kensington asphalt clinker blocks were laid in high-class residential thoroughfares, but the cost of these is not given.

Asphalt macadam was also put down in a residential thoroughfare to a depth of 3 in., at a cost of 4s. per yard super. without foundation.

CITY OF LONDON.

Approximately equal quantities of creosoted deal blocks and natural rock asphalt were laid in the City.

The thickness of the natural rock asphalt varied from 1½ in. to 2½ in., and the Portland cement concrete foundation from 4 in. to 9 in. The asphalt was compressed in situ, the cost per yard super. of the 1½-in. on a 4-in. foundation being 8s. 3d. with foundation and 5s. 10d. without foundation, and the annual cost for maintenance 4d. per yard super. The cost per yard super. of the 2-in. asphalt, which was laid on a 6-in. foundation, was 13s. 6d. with and 9s. without foundation, a credit of 9d. per yard being allowed for old asphalt, while the cost per yard super. of the 2½-in. asphalt, which was laid on a 9-in. foundation, was 14s. 6d. with and 9s. without foundation, 1s. per yard being allowed for old asphalt. The cost of maintenance per super. yard per annum being 1s. for the 2-in. and 1s. 3d. for the 2½-in. asphalt. The paving, presumably asphalt, which this paving replaced had lasted from twenty-two to twenty-six years.

Creosoted deal blocks, 3 in. by 7 in. by 5 in., were also laid, the joints being filled in with a boiling mixture of pitch and oil on a 9-in. Portland cement concrete foundation, at a cost per yard super. of 11s. 2d. with foundation, and 7s. 8d. without foundation, the cost of maintenance being 8½d. per yard super. per annum. On St. Andrew's Hill, a thoroughfare with a gradient of 1 in 19, the 3-in. by 9-in. by 5-in. creosoted deal blocks were laid with 1½-in. pitch pine strips inserted in every fourth course to improve the foothold on a 7-in. foundation, at a cost per yard super. of 13s. 9d. with and 9s. 1d. without foundation, the cost of maintenance per yard super. per annum being 9d.

LONDON COUNTY COUNCIL.

The return from the county council deals with paving laid in six boroughs, deal, Jarrah, sectional Jarrah and natural asphalt being the materials used. The work in each case was done by a contractor, and the foundations varied from 8 in. to 12 in. in thickness. The cost per yard super. of the softwood varied from 6s. 10d. to 9s. 2d. without foundation, and from 9s. 2d. to 13s. with foundation, while the hardwood cost 13s. 4d. without and 17s. 2d. with foundation.

ST. MARYLEBONE.

Only one description of wood paving has been used in this borough, both for renewals and new paving—namely, creosoted yellow deal blocks, 5 in. by 3 in. by 9 in., laid close, jointed and grouted with pitch and creosote oil. The new paving was laid on a 9-in. cement concrete foundation, at a cost of from 12s. 9d. to 14s. 2½d. per yard super. with foundation. As regards renewals, a new concrete foundation of from 9 in. to 12 in. in thickness was generally laid to replace the foundation previously existing, the cost per yard super. of the paving being from 8s. 4½d. to 9s. 11½d. without foundation, and from 10s. 11d. to 16s. 2½d. with foundation.

The annual cost of maintenance of this softwood paving is from 4½d. to 6d. per yard super., and the paving which this paving replaces had been down for from eleven to seventeen years.

An area of 101,092 super. yds. have been tar-sprayed at a cost of £737 12s. 7d.

Compressed asphalt, 2 in. deep, laid in a 6-in. cement concrete foundation, has been laid at a cost of from 11s. to 13s. per yard super. with foundation.

A considerable quantity of tar slag macadam was laid, the macadam being excavated to approved depths, and the surface consolidated and levelled, tarred slag being laid in two coats and rolled, the total thickness when finished being 4½ in., bottom coat 2½-in. gauge, top coat 1½-in. gauge, the surface

being covered with fine granite chippings. The price at this work, without foundation, when carried out by contract, was 4s. 8d. per yard super., and when carried out by the council with direct labour from 4s. 0½d. to 4s. 4½d.

WANDSWORTH.

In this borough only one description of new paving has been laid—namely, creosoted softwood (Archangel thirds) blocks, 8 in. by 3 in. by 5 in. These were laid dipped in a mixture of tar and pitch, and grouted with Portland cement mortar on a 9-in. Portland cement concrete foundation.

The work was carried out by a contractor on a lump sum contract, which included other works, but the price in the schedule attached to the contract was 13s. 9d. per super. yard for extra work with foundation. The creosoted deal blocks which some of this paving replaced had been down twelve years.

CITY OF WESTMINSTER.

Softwood and asphalt, and on steep gradients "combined strip" paving, were laid in the city of Westminster. The softwood consisted of 5-in. creosoted pine blocks laid close jointed, grouted with a mixture of boiling pitch and creosote oil, and after with cement grout, top dressed with 3-in. ballast on an 8-in. Portland cement concrete foundation, at a cost per yard super. of from 7s. 5d. to 8s. 3d. without foundation, and from 9s. to 13s. 2d. with foundation.

The asphalt was laid 2 in. thick on an 8-in. foundation, at a cost per yard super. of from 7s. 9d. to 8s. 6d. without foundation, and from 12s. 8d. to 14s. 4d. with foundation. The cost per yard super. of the "combined strip" paving was 10s. 6d. without, and 15s. 5d. with, foundation.

RETURN OF MILEAGE OF DIFFERENT KINDS OF PAVING AND MATERIALS USED AS EXISTING IN THE YEARS 1910-1912.

The committee append to their report a return ("A") compiled from information supplied to them by the officers of the City of London and fourteen metropolitan boroughs giving the mileage of the different kinds of paving and materials used, &c., as existing in the years 1910, 1911 and 1912. This return, it is anticipated, will be of interest if only as showing a considerable diminution in the quantity of slop removed in those boroughs where a marked increase has taken place in the mileage of tar-painted macadam roads as existing in the year 1912 as compared with the year 1910. In the Royal Borough of Kensington, for example, where, in 1912, 24½ miles of macadam had been tar-painted, the quantity of slop removed in that year was 19,130 tons as compared with 24,694 tons in the year 1910, when no tar-painting had been undertaken. In the borough of Wandsworth also the mileage of tar-painted macadam roads increased from 37 miles 3 furlongs 50 yds. in 1910 to 68 miles 2 furlongs 129 yds. in 1912, while the number and loads of slop, &c., removed was only 34,564 in 1912, as compared with 55,810 in 1910. It must, however, be remembered that the reduction in horse traffic must have an appreciable effect on the amount of slop.

RETURN OF COST OF MAINTENANCE, &c., OF ROADS IN THE CITY OF LONDON AND VARIOUS METROPOLITAN BOROUGHES.

The committee also append to their report a return ("B") showing the cost of maintenance, &c., of the roads in the City of London and various metropolitan boroughs. The expenditure under the first item—(a) maintenance (including new paving works), repair and improvement—of course, varies from year to year according to the number and importance of the streets repaved. Generally speaking, there has been a slight increase in the amount expended under this head, although in some cases the expenditure in 1912 was less than in 1910, and in others practically the same.

The expenditure for 1912 in respect of (b) cleansing and scavenging, including watering, with one or two exceptions shows an increase as compared with 1910, the principal exception being Wandsworth, where the expenditure under this head fell from £37,566 in 1910 to £30,888 in 1912, other reductions being noticeable in Fulham, Kensington and Paddington.

The appreciable saving effected under this item in certain boroughs is stated to be almost entirely due to the effect of tar-spray on macadam roads and asphalt construction.

An increase in the cost of scavenging in the borough of Holborn from £12,842 in 1910 to £17,177 in 1912, although less slop was removed in the latter year, is accounted for by an increase in the amount of the

scavenging contract, scavengers' and street orderlies' wages, increased cost of night flushing, including water, provision of additional hydrants, &c. The drop in the tonnage of slop is explained by the extension of cleansing by flushing in the place of other means, which naturally reduces the quantity of solid matter for removal.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2.

SEWAGE DISPOSAL BY DILUTION.

To the Editor of THE SURVEYOR.

SIR, I have read Mr. Kershaw's letter in your last issue with some regret. Written by an official of the Royal Commission on Sewage Disposal, it will presumably be read as stating the official views of the Royal Commission. The paragraph on p. 7 of the Eighth Report which Mr. Kershaw quotes is par. 24, and relates to specially stringent standards and only to extreme cases. My previous letter referred to relaxation of the general standard, and not to increased stringency.

I am fully acquainted with his other quotations. Par. 16 refers to quality of water as a factor in a graduated scale of standards, and says "variations in the quality of the water should not be taken into account in fixing standards."

The important word appears to be "variations." As water of a certain defined quality has been assumed in fixing the general standard, and is specifically mentioned in par. 5, p. 7, as one of the conditions on which "a claim for a relaxed standard may be entertained," it is difficult to follow the suggestion that quality of the water is not to be considered.

Par. 55, p. 15, states "the scheme on which our suggested standards are based does not take directly into account variations in the quality of the diluting water." I agree. If variations were directly taken into account, then the formula on p. 4 would answer all purposes. A system of standards based on this formula is not recommended by the Royal Commission on three grounds (see pars. 14 and 15, p. 4)—(a) difficulty of administration, (b) unequal distribution of burden of purification, (c) unnecessary differentiation—and is followed by "we do not therefore recommend a system by which the degree of purification required for each separate discharge is determined automatically by the quality and the relative quantity of the water receiving it. Quality and quantity of river water are, however, highly important local conditions of which account should be taken in framing systems of standards."

If Mr. Kershaw's interpretation of the Royal Commission view is correct, I fear that little progress will be made in purifying the rivers in an industrial watershed. In the watershed in which I am interested—the Mersey and Irwell watershed—I have no doubt that the efficiency of sewage purification has reached a point when it can be said that the deficiency in dissolved oxygen in the main rivers in dry weather is chiefly due to pollution by trades waste.

Existing Rivers Pollution Acts only allow proceedings to be taken in the case of manufacturing pollution, after proof that there are reasonably practicable and available means for rendering harmless the polluting liquid. Even when all matters in suspension are removed, there remains a large amount of soluble pollution capable of vigorously destroying dissolved oxygen. The Royal Commission have been investigating for some considerable time the question of the treatment of trades waste, but no report has been issued. Is it at all likely that they will suggest, in any proposed standard, that it is practicable to remove these soluble oxygen-absorbing constituents?

Mr. Kershaw, from the last paragraph in his letter, seems to base his remarks on rivers which are polluted by sewage only. When he takes into consideration the great area of industrial rivers in Lancashire, Yorkshire, Derbyshire and Cheshire, he will surely not contend that relaxed standards based on volume only can possibly be entertained, and I venture to hope that no such suggestion is contained in the Royal Commission's Eighth Report.

If Mr. Kershaw is right in his interpretation, then I feel sure that strenuous opposition will be offered by rivers boards having jurisdiction over rivers in industrial areas to any legislation proposing relaxation of standards based on volume only.

I must apologise for the length of this letter, my

excuse being the importance of the points raised.—
Yours, &c.,

HUGH STOWELL, M.INST.C.E.,
Chief Inspector,
Mersey and Irwell Watershed.

41 Mosley-street,
Manchester.

February 21, 1914.

P.S. All italics are my own.—H. S.

TRAFFIC STATISTICS: SEVERITY FACTORS.

To the Editor of THE SURVEYOR.

SIR, Accept my compliments on the splendid issue of THE SURVEYOR for January 30th. It is an excellent summary of the work of the past year in municipal engineering.

I was particularly interested in your very pertinent remarks on pp. 156 and 157 under the heading of "Traffic Generally," and perhaps this interest was intensified by my noting contemporaneously in the issue of the *Municipal Journal* of New York for February 5th a reprint on p. 168 of the paper of Colonel Wm. D. Sohler, presented before the American Road Builders' Association, on "The Need of Traffic Records." Colonel Sohler, the recently appointed chairman of the Massachusetts Highway Commission, states in his paper that "some uniform method of taking traffic counts and uniform formulae that will fairly represent the weight or damage done by different kinds of traffic based upon the weight per yard weight per year, or per day," is needed, "so that we can compare results," and this statement seems to accord, in general, with those made by you.

You printed on March 10, 1911, on pp. 364 and 365, an article by me in this connection, editorially emphasising, on pp. 358 and 359 of the same issue of THE SURVEYOR, the importance of certain points I suggested, and, I thought, endorsed them, as I infer you do now, the suggestion that it was most desirable to have general agreement on "severity factors" for use in connection with actual counts of traffic, so that comparisons between them could then be simply and readily made.

I do not think that the importance of an early agreement as immediately above suggested can be over-estimated, or that such general agreement concerning "severity factors" can be had at too early a date. Massachusetts and many other of our States are rapidly accumulating traffic data, some of which, at least, if put in proper shape, would be of the utmost value immediately as well as in the future; but if these accumulations and the progress from them are allowed to drift along, or to proceed on lines that are not co-ordinated, there will unquestionably be considerable loss and delay result when the inevitable general agreement shall finally have been made.

Many American engineers naturally look to the conclusions of the British Road Board for information of the greatest value. Colonel Sohler says that "the English Road Board has adopted an assumed weight for various vehicles, and many traffic statistics based upon this formula have been made, and are now available in various reports. We could well adopt the same formula based upon American tons, so that we could compare our results with others upon a uniform basis."

I feel that the British Road Board is in an advantageous position for doing highway engineers an enormous amount of good in this matter. As a national body of the first importance, if they would consider this matter of "severity factors" in connection with traffic censuses, and lay down a rational schedule of that sort, I believe their conclusions would be readily followed at least by many American engineers (of course, with such modifications as different conditions or customs made necessary), and that a veritable mine of information concerning the value of methods and materials for road crusts and pavements would be opened up. Unless they do it fairly promptly, it seems to me that the opportunity will be lost, or at least that it cannot be again presented to anyone with as few encumbrances in the shape of accumulations of records or of misdirected efforts.

Will you not therefore continue to use your influence to bring about general agreement on some rational method by which a comparison of traffic censuses may be had?—Yours, &c.,

W. W. Crosby.

Baltimore, Maryland.
February 10, 1914.

[We are much gratified by Major Crosby's good opinion of our Annual Issue. His letter is, we con-

sider, a very weighty communication on this important subject, and we shall refer to it in our next issue.—Ed. SURVEYOR.]

BROKEN GRANITE: THE BRITISH STANDARD SPECIFICATION.

To the Editor of THE SURVEYOR.

SIR, In revising specifications for broken granite, I naturally thought that a specification which is over twelve years old might be out of date when matters in connection with roads are supposed to progress in proportion with the talent brought to bear upon them by the eminent authorities one sees on the Standards Committee on Road Material. It was therefore my intention to adopt the British Standard Specification for sizes of broken granite. The size I use is 1½-in. gauge, the standard specification for which reads as follows:—

Broken stone specified a 1½-in. gauge shall all pass through a 1½-in. ring, and shall consist of the following percentages by weight:—

Not more than 15 per cent passing through a 1-in. ring in every direction.

Not less than 65 per cent over 1 in., and not exceeding 2 in., in greatest length by measurement.

Not more than 20 per cent over 2 in. in greatest length by measurement.

On reading it through for the first time on Thursday, I could hardly believe my eyes. Fifteen per cent allowed to pass through an inch ring; this, so far as the specification is concerned, might be dust. Of the 65 per cent over 1 in., and not exceeding 2 in., in greatest length by measurement, no minimum thickness is given, so that the whole of this 65 per cent might consist of flat, thin pieces which would offer little or no resistance to the crushing effect of traffic, while the remaining 20 per cent might be over 2 in. in greatest length; in fact, were it possible to manufacture such material, it might be 3 in. in length.

The same wording is practically used in specifying for other sizes.

I thought it only right to call the attention of surveyors to the faulty nature of this specification, as I understand many have adopted it. Woe befall them if they fall into the hands of contractors who take advantage of the specification in question! Yours, &c.,

C. H. COOPER, M.INST.C.E.,
Borough Engineer and Surveyor,
Wimbledon.

February 20, 1914.

THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

To the Editor of THE SURVEYOR.

SIR,—I was very pleased indeed to see in your last issue the letter from "Member of the Institution," which deserves the deepest study of the younger members. In my humble opinion, the institution will be sadly left behind unless something is done, and that quickly, to improve the present wretched outlook of the younger members.

I think the example of the Surveyors' Institution might well be followed, and about four young members—who know and feel the hardships existing—elected to the council. These members should not be over 35 years of age, hold the testamur, should not hold a chief appointment or be engaged in the same office as another member of the council, and their travelling expenses should be paid from the funds.

Why should not the testamur of the institution be accepted throughout the country as the highest and best, and the *only* qualification desirable for municipal appointments? The present heavy fees and expenses of joining several institutions are a serious drag on ambitious young men.

The existence of two rival institutions is nothing short of a disgrace to the municipal engineering profession. What are members of a public body to think of members of a profession who cannot agree among themselves? Young members should pause to think how the rivalry has come about.

I think amalgamation with the Institution of Municipal Engineers, and making the holding of the testamur absolutely necessary for admittance to the institution, are very desirable. I do not think any real and lasting progress will be made unless these reforms are carried out.

What the institution needs are young fighting men who will not pander to any institution, but who will exercise their powers to the utmost to do something practical to improve the present state of affairs.

What *can* be done is shown by the magnificent

example recently set by the National Union of Teachers, whose profession is not a "closed" one.—Yours, &c.

ANOTHER MEMBER.

February 24, 1914.

THE SUPERANNUATION BILL.

To the Editor of THE SURVEYOR.

SIR, May I be permitted the use of your columns to call attention to the proposed superannuation scheme as approved at a recent meeting of the National Council of Local Government Officers?

As the Bill is now drafted, it would appear that all municipal officers who have attained sixty years of age when the scheme becomes operative are to be excluded from its benefits; and, further, that on an officer attaining the age of sixty-five years the local authority in whose service he is may retain his service for a further period not exceeding three years, when his retirement is to be compulsory.

The ranks of municipal officers contain many good and capable men who have, or who will have by the time the Bill becomes operative, attained the age of sixty years. It is due to the strenuous and life-long exertions of these during many weary years of office that superannuation of local government officials generally is at length in sight, and by the irony of things it is now proposed that they shall be debarred from participating in it.

It is to be hoped that the Parliamentary Committee of the Institution of Municipal and County Engineers will keep a wary eye on this Bill, and see that none of its members are to be treated in the manner proposed, and that local authorities who wish to retain the services of experienced and trusted officers, whom they consider capable of satisfactorily discharging their duties, are not to be compelled to dismiss them and turn them adrift at an age when they may be expected to be unfitted to take up other work.—Yours, &c.,

M. INST. M. AND C. Y. E.

February 21, 1914.

Torquay Meeting Arrangements.—We received yesterday particulars of the arrangements made in connection with the South-Western District meeting of the Institution of Municipal and County Engineers which is to be held at Torquay on March 21st. The proceedings will open at the town hall at noon, when the question of nominations for district officers for the ensuing year will be discussed. A visit to the recently completed pavilion will follow, and after lunch an inspection of the new town hall and municipal buildings will be made. Mr. H. A. Garrett, the borough surveyor, will give a description of the pavilion buildings in the course of the meeting.

Bradford's Sewage By-products.—The income derived from the grease and the sludge, together with the rents paid by the tenants of the Esholt Hall estate, kept the cost of sewage disposal in Bradford last year down to a 4⁵d. rate. Last year the total cost was £89,000, towards which the grease alone contributed no less than £48,000. The call upon the rates was only £31,000, which is £2,000 less than is required to pay the interest and sinking fund charges on the undertaking. These charges will, of course, eliminate themselves in course of time. Apart from the capital charges, the Bradford sewage works have the unique distinction of being self-supporting. The grease produced at the works finds a ready market among grease distillers, who get from it oleine, stearine, and pitch. The prices obtained vary with the state of the market between £8 and £11 per ton, and between 100 and 120 tons are produced every week of the year. After leaving the presses the sludge is broken up, and a great deal of it is pressed into oval lumps, each about the size of a man's fist. This is done to suit the convenience of foreign customers, who prefer to receive the manure in this form, packed in sacks. From 7s. to 11s. a ton is paid for the manure, and about 600 tons are dealt with each day. Large quantities have been sent to fertilise the vineyards and sugar-beet fields of France, the market gardens of Belgium, and the cotton fields of Florida. Its fame, however, appears to be spreading farther than this, for recently, in response to a request, says the *Yorkshire Post*, a sample was sent out to a tea garden in India on the slopes of the Himalayas. English manure manufacturers and merchants are using it, too, in increasing quantities, and Bradford is able to get rid of all it produces.

THE MUNICIPAL UNDERTAKINGS OF OUNDLE.*

By G. BILSON CHELVERS, M.I.M.S.E., M.R.S.A.N.E.,
Engineer and Surveyor to the Urban District Council.

The town of Oundle is of a picturesque and old-world appearance, and most of the buildings are of stone covered with Collyweston stone slab roofing. The population of the urban district is nearly 3,000 persons, with an area of 2,076 acres. It has a rateable value of over £13,000. The town is the centre of an agricultural district, and its only industry is a brewery; although at one time it was a recognised market centre for farmers and others, this business undoubtedly has gradually become less, although the establishment of a cattle market by a private company in the year 1910 has, I understand, stimulated it somewhat, and the business transacted has increased each year. At Christmas last the first fat stock show was held with great success.

The principal feature of the town is, without doubt, the school and buildings of the Grocers' Company, and these give it much importance. The company are almost yearly erecting new buildings to provide better educational facilities, and at present have in course of erection a large building to be used as a science and engineering block. Very few of the large public schools have buildings to compare with them, and generally the facilities afforded for education compare favourably with such public schools as Repton, Rugby, Cppingham, Bedford and Marlborough.

The town is efficiently sewered and drained, and it also owns the waterworks; the present schemes of water and sewerage were carried out in 1892, although several alterations have been made since then. We endeavour, as far as possible, to keep up to date, and generally, I believe, the town will compare favourably with any other about the same size. I will now briefly describe the undertakings of the council.

WATER SUPPLY.

The town water supplies nearly all premises in the district; it is of a satisfactory character, except that it is somewhat hard, being of about 21 deg. temporary and 6 deg. permanent hardness. The source of the supply is the river, the water infiltrating through gravel to a gathering well 21 ft. deep and 50 yds. distant, a 9-in. glazed stoneware pipe with open joints being laid from a point 15 yds. from river to the well to assist in the collection of the water. For some time the flow of water has been exceedingly low, and on my advice the council have decided to extend the gathering pipe for a distance of 25 yds. at a right angle to the present pipe, and running parallel with the river. The work is to be carried out with pipes perforated in the top half, and the gravel excavated is to be twice screened to remove sand and pieces 1 in. or less in size. The larger pieces will then be placed directly on the top of the pipes, the 1 in. or less will form a second layer, and the sand a third, the remaining portion being filled up to the ground level with surplus material. From the gathering well the water is pumped by a centrifugal pump to sand filters, and thence by a treble-plunger pump direct to the mains, the surplus going to a reservoir of 70,000 gallons capacity situate about 1½ miles from the pumping station on the north-west side of the town. The average daily consumption is about 90,000 gallons, which is, I think, somewhat high.

With regard to the hardness of the water, the council have under consideration the question of installing a softening plant, the estimated cost of which for treating 9,000 to 10,000 gallons per hour would be about £650, including lime store, foundations and pipe connections. The hardness of the water being due principally to carbonate of lime, the cost of softening will be at the minimum, and roughly would entail an annual outlay of £26, or about 3d. per 1,000 gallons, to reduce to 6 deg. Expenditure which entails an increased rate is usually delayed, although sometimes it is false economy, and it is probable that the outlay in this case would be more than covered by the saving effected in not having to scale boilers and pipes. Less soap would, too, be required for all purposes, and I believe it is recognised that a moderately soft water is more healthful than a hard one.

SEWAGE DISPOSAL.

The sewage from the main portion of the town gravitates to the sewage disposal works, a small portion only gravitating to a large underground tank near the

* Paper read at an Eastern District meeting of the Institution of Municipal Engineers at Oundle on Saturday last.

The Surveyor

And Municipal and County Engineer.

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South Bridge, whence it is pumped into the higher level sewer by means of a pump driven by air compressed at the waterworks pumping station. The sewage disposal works are rather primitive, the treatment being precipitation by aluminio-ferric, after which the sewage passes through two settling tanks and thence direct to the river. The effluent is, I consider, fairly good considering the method of treatment, but is undoubtedly much below the usual standard. The tanks are in duplicate, and are allowed to run from three to four days before they are cleaned out. An ejector is installed for the purpose of pumping the top water on to land, and the sludge to sludge beds. Until last year the ejector was worked by the compressor plant at the waterworks pumping station, but owing to leakages in the air main a petrol-engine and air compressor was installed on the site with far better results. With a view to obtaining a more satisfactory effluent, I have brought before my committee the question of installing filter-beds and doing away with the use of precipitants, the annual cost of which amounts to £28, and I estimate that for an extra expenditure of £5 per annum to cover repayment of a loan and interest, two 70 ft. diameter percolating filters, with sprinklers and other works necessary, could be installed at a cost of from £550 to £600. The average daily dry-weather flow is 70,000 gallons, approximately.

REFUSE DISPOSAL.

House refuse is collected from nearly all the premises in the town twice weekly, the receptacles being placed ready for tipping into the carts. The major portion of the refuse is carted to the sewage disposal works, where the tins are sorted out and the paper burnt, the remainder being then mixed with the sludge from the settling tanks, and ultimately carted away by farmers and others for use on the land. The effect of the mixing apparently neutralises any smell, and no nuisance is caused.

HIGHWAYS.

There are 3 miles of main roads in the district, and these are maintained by the council under agreement with the county council, the amount allowed being £400 per annum, under a five years' agreement. This amount is for all work done, including repairs, paving, kerbing, and channelling; one-third only of the cost of scavenging is allowed. At present the whole of the repairs are being carried out with Tarmia binding, a section being done each year, and towards the extra cost (amounting to about 4½d. per square

yard) the Road Board contribute three-fourths and the urban council and the county council one-eighth each. The total cost during the last three years has been from 1s. 6½d. to 1s. 9½d. per square yard, 3 in. to 3½ in. thick. There are about 7 miles of district roads under the council's jurisdiction, and the repairs to these have been carried out with granite and slag by the ordinary method, except two short sections. These have had a binding of tar and pitch, which has, I think, stood well. During the coming year I am hoping to lay a section with Tarmac.

The main streets have been surface tarred each year, and the cost has been from 62d. to 84d. per square yard, ordinary gasworks tar at 2d. per gallon, being used. The variation in cost is due to the material (sand, slag, or granite chippings) used for surface dusting or sprinkling.

STREET LIGHTING.

The whole of the built-upon area of the district is lighted by the council, upright incandescent burners being used. I am hoping gradually to convert them to the inverted type, and the new lamps on the North Bridge are the first start in the matter. The gas is supplied by a private company, who light and clean the lamps and supply mantles for a charge of 36s. per lamp during the period from August 15th to May 1st, the lamps being kept alight until 12 midnight. An additional charge of 3d. per lamp is made for certain lamps lighted during the whole of the night. The lamps are not lighted for three nights before and three nights after a full moon, except on dark nights.

FIRE BRIGADE.

The town has an efficient volunteer fire brigade, towards the expenses of which the council contribute. An effort is being made to procure a new steam fire engine, the cost to be raised by voluntary contribution. The brigade is then to be reformed and to come under the direct control of the council.

BATHING PLACE, RECREATION GROUND AND ALLOTMENTS.

The council also maintains an open-air bathing place, which is very popular during the season. Dressing sheds are provided, and an expert swimmer is in constant attendance. Two hours daily from 11 a.m. to 1 p.m. are reserved for the use of females and boys in their charge under ten years of age, and this is greatly appreciated, a large number making use of the privilege. The council also rent a small recreation ground and provide allotments.

CEMETERY.

The cemetery, which is under the council's control, is about 3 acres in area; it is acknowledged to be laid out, planted and kept in very good condition, a caretaker being constantly employed. It compares very favourably with any I have ever seen.

ISOLATION HOSPITAL.

The council have entered into an agreement with the rural district council for the joint use of their hospital, the urban district council having agreed to contribute £1,000 towards a sum of £1,200 to be expended on the erection of a new ward block containing eight beds and the usual offices. The new building is to be a brick structure. The existing buildings comprise administration block, containing caretaker's and nurses' rooms, &c.; office block, containing mortuary, laundry and disinfecting station, &c.; ward block of eight beds, this building being a galvanised iron structure. On the completion of the new work the two councils will become joint owners, and the affairs will be managed by a committee elected from the members of each body. The cost of administration will be shared by the councils in the proportion of quarter urban and three-quarters rural. The architects for the new work are Messrs. Traylen & Son, of Stamford, and tenders are now being invited.

The district possesses, it may be added, a golf links of nine holes, situate about 1½ miles west of the centre of the town, and maintained by a golf club. There are also splendid facilities for rowing, fishing, quaits, bowls, and other sports.

Business Announcement. — Hill's Patent Motor Vacuum Road Cleanser, Limited, of 4 Broad-street-place, E.C., have acquired the services of Mr. W. Afford Blythe, A.M.I.M.E., as engineer to their company. Mr. Blythe comes from Messrs. J. & P. Hill, Ordnance Works, Sheffield, for whom he was chief draughtsman and plant engineer.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. M. INST. C. E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:

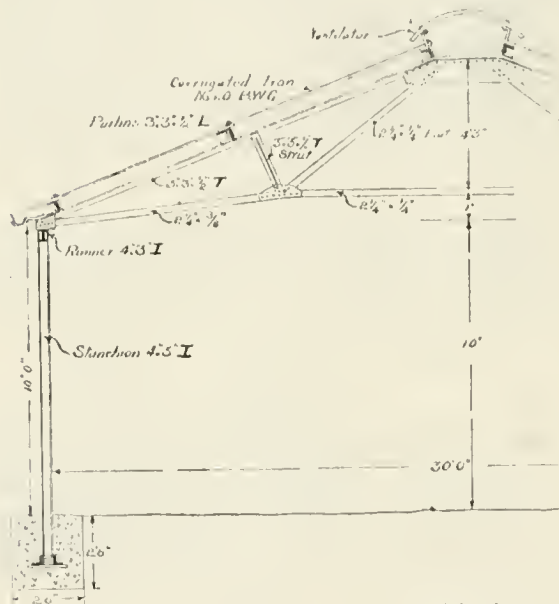
381. Town Planning. An area of 1,000 acres, chiefly undeveloped, in an urban district, is to be included in a town planning scheme. The approximate number of owners, occupiers and lessees is 250. Assuming that the referencing is to be done by the staff of the urban district council surveyor's office, state the information which should be sought, and the best method of ascertaining and recording it. Give an estimate of the cost of the work if done by professional

383. Grain Silo. It is required to construct a grain silo, the bins of which are 64 ft. in height and 8 ft. square in cross-section. What lateral pressure at the base should be provided for? (X. X., Hounslow.)

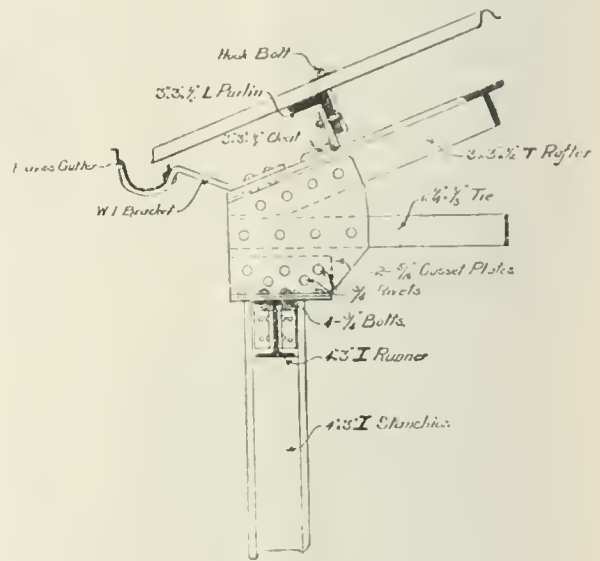
384. Timber. Sketch the cross-section of an oak tree and show the different modes of conversion. How does oak compare with elm for use inside or outside a building?

REPLIES TO QUESTIONS.

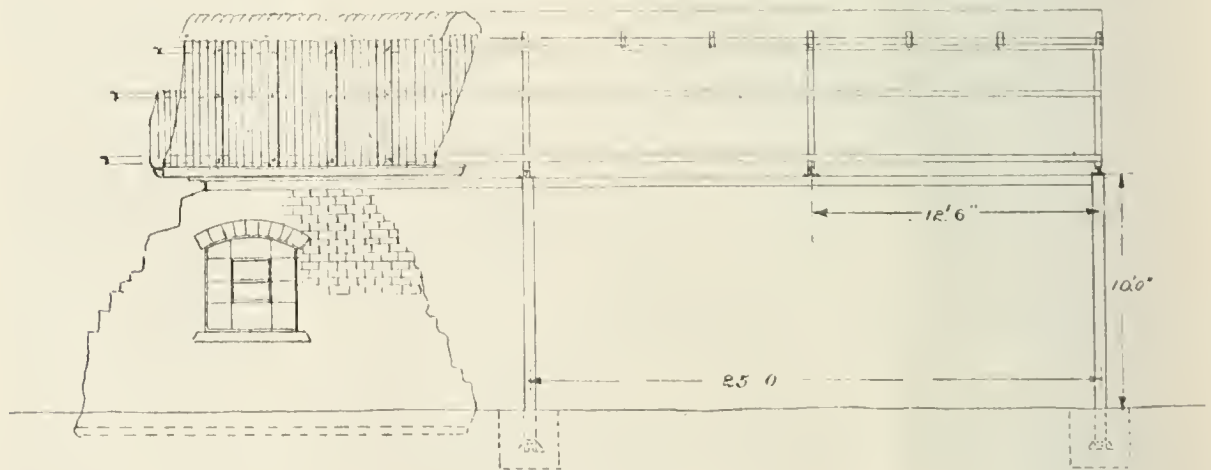
370. Temporary Building Design. A temporary building is required, 50 ft. long, 30 ft. wide, and 10 ft.



SECTION



DETAIL AT FOOT OF TRUSS



ELEVATION

TEMPORARY BUILDING DESIGN.

referencers. Compare the advantages and disadvantages of the two methods, both in the above case and in the case of an area of 1,500 acres in the same district, which includes a considerable extent of partially developed building estates, and is to form the nucleus of a later scheme. (Togun.)

382. Fire Hydrants. Fire hydrants, 2 1/2 in. in diameter, are taken from a 4-in. and a 12-in. main. What will be the ratio of discharge in the two cases, assuming that the initial pressure is the same in each main? (X. X., Hounslow.)

to eaves. Design a suitable structure, with steel trusses and stanchions, to be covered with corrugated iron on boards and felt, the bays to be filled in with 4-in. reinforced brickwork. (J. M. N., Hitchin.)

In the design of a small building in which the loads are small, the sizes of the steelwork are often determined by practical considerations only, but should, nevertheless, be checked to insure sufficient strength.

The general arrangement of the steel in the building will be seen in the elevation. The trusses,

spaced at 12-ft. 6-in. centres, will be four in number, and carried by runners. The latter are supported by six stanchions, four of which form the corners of the building.

The trusses of the simple type shown in the section are in general use for spans up to 35 ft., and the dimensions of the members are taken from practice. If a stress diagram for this roof be drawn, the loads in the members would be found to be so small that the sections thus determined would be quite impracticable.

The roof will be covered with corrugated iron sheets 8 ft. by 3 ft. in dimensions, and of No. 20 B.W.G. thickness, attached to the angle iron purlins by hook bolts, with washers. In fixing the sheets, 3 in. lap at the sides must be allowed, so that bolts will be put in at intervals of 2 ft. 6 in. It should be noticed that these bolts should pass through the ridges of the sheets, and not the valleys, or leaks will occur. As the rafters are 16 ft. long, two layers of sheets 8 ft. long will be required, and these can be fixed to the three purlins, as shown in the section.

The curved ventilator, formed of corrugated iron, is supported by Zed bar cleats, 3 in. wide, riveted to the top purlins at intervals of 4 ft., and adds to the appearance of the roof.

The eaves gutter is supported by bent wrought-iron strips 3 in by 3/4 in., 4ft. apart, which may be riveted to the sheeting, the rafters, or the runners.

In order to fix the size of the stanchions, the loads transmitted by the roof must be found.

The central stanchions carry the load of two trusses and one-half the total load of the roof.

The loads on one stanchion are as below:—

Weight of 1 truss—

37 ft. 3" x 3" x 1/2" T, 8 lb. per ft. = 296 lb.

50 ft. 2 1/4" x 1/4" flat, 1.89 lb. per ft. = 94

390 lb.

Weight of corrugated iron roofing = 3 cwt. per 100 sq. ft. (Molesworth).

Area of roof over 1 stanchion = 16' x 25' = 400 sq. ft.

∴ Load due to this area = 400 x 336 = 1,344 lb.

Maximum wind pressure = 40 lb. per sq. ft. horizontal

∴ Vertical load due to this = 40 x 341 lb. (Molesworth) = 13,640 lb. sq. ft.

∴ Total load due to wind = 400 x 13.6 lb. = 5,440 lb.

Total load on 1 stanchion = 7,174 lb.

The stanchion adopted will be 4 in. by 3 in., 1 section, as it is impracticable to use a smaller, and this is amply strong for direct loads, as may be shown by checking by Rankine's formula for struts.

$$P = \frac{A \times f_c}{1 + a \left(\frac{L}{K}\right)^2}$$

P = permissible load
 A = area of section
 K = least radius of gyration
 L = equivalent length of a pin-jointed strut
 f_c = 7.0 tons sq. in.
 a = $\frac{1}{300}$

$L = \frac{2}{3} \times 10 \text{ ft.} = 6.67 \text{ ft.}$
 From a table of British standard sections
 for a 4" x 3" I
 $A = 2.80 \text{ sq. in.}$
 $K = .677 \text{ in.}$

$$\therefore P = \frac{2.80 \times 7 \times 2,240}{1 + \frac{1}{9,000} \left(\frac{6.67 \times 12}{.677}\right)^2} = \frac{43,900}{1 + 1.544} = 17,280 \text{ lb.}$$

This extra strength will guarantee the safety of the stanchion for eccentricity of fixing the trusses.

As the runners are supported along their whole length by the brickwork, we may assume that the load on them is solely the dead load—i.e., neglect wind.

Central load on 25 ft. of runner = load on 1/2 truss.

Weight of 1/2 truss = 195 lb.

Weight of 200 sup. ft. roofing = 672 lb.

867 lb.

Bending moment—

B. M. = $\frac{W.L}{4} = \frac{867 \times 25 \times 12}{4} = 65,000 \text{ in. lb.}$

$M = f_t \times Z$ where $f_t = 7.5 \text{ tons sq. in.}$

∴ $Z = \frac{65,000}{7.5 \times 2,240} \text{ in.}^3 = 3.87 \text{ in.}^3$

∴ In table of sections 4" x 3" I section will be found suitable for the runner.

The stanchions will be bedded in 2 ft. 6 in. of 6:1 concrete, and the walls will have footings at least 9 in. wide, carried down below the top soil.

The windows may be of the ordinary cast-iron pattern, as shown; but these and the doors will depend upon the exact requirements of the building, which are not stated.

The boards and felt are not included in the design, as the combination is not very practical; but if really required they may easily be allowed for in the foregoing. (H. V. O., West Bromwich.)

FAILURES OF RESERVOIR DAMS.

SOME TYPICAL EXAMPLES.

In a paper read before the Liverpool Engineering Society Mr. J. R. Davidson selected five dam failures of historical interest, all attended with serious loss of life and destruction of property, and after describing the circumstances in each case considered the lessons to be learnt from them.

The examples he selected (the *Times* Engineering Supplement reports) were the Puente dam, of rubble-faced with ashlar, which was built towards the end of the eighteenth century at Lorea in Spain, and which failed in 1802 owing to the erosion of water percolating through a permeable stratum of sand and gravel in its centre, the Bouzey dam in France, from which, in 1895, a huge block of masonry 594 ft. long and 32 ft. deep was suddenly torn out and hurled down stream, the cause being tensional stresses set up at a point at which there was little more to resist them than the tensile strength of a weak mortar; the Dale Dyke or Bradfield dam near Sheffield, an earthen embankment which gave way in 1864 owing to water under high pressure perforating the puddle wall at the line of the pipe trench, eroding material from the inner portion of the bank, and thus causing settlement immediately above the fault; the South Fork dam, Pennsylvania, near Johnstown, which failed in 1889, because owing to heavy rains the water overflowed the embankment and washed it away until ultimately a breach was formed 420 ft. wide at the top and 50 ft. at the ground level; and the Austin dam, where in 1911 the concrete wall fractured into seven pieces, percolation of water under the dam causing one layer of the rock upon which it was built to slide over another, and also permitting an upward pressure, approximating to that due to the head of water in the reservoir, to be brought to bear on the base, thus virtually reducing the weight of the dam.

He summarised the lessons to be learnt from these failures as follows: (1) A gravity dam of masonry should be founded wholly on rock; (2) tensions should be practically non-existent in a masonry dam; (3) in an earth dam provision should be made for settlement and unequal settlement prevented; (4) adequate provision should be made for exceptional floods in every case; and (5) in a masonry or concrete dam a secure foundation should be obtained and precautions taken to guard against uplift. Examination of a large number of failures, he thought, leads to the conclusion that unsound foundations have been the most fertile source of disaster to masonry and concrete dams, while in the case of earthen embankments either inadequate provision for dealing with floods or faulty arrangements for drawing off water have been chiefly responsible for failure.

A New Athens.—Mr. Thomas H. Mawson, lecturer in landscape design at the University of Liverpool, and author of two standard works on landscape architecture, has just been entrusted, on the personal recommendation of the King and Queen of Greece, with the preparation of the plans for the extension, remodelling and beautification of Athens on a vast scale. The scheme includes the provision of a great modern railway station, where the railway lines now running to three separate termini will converge together with the new line which is to bring Paris within forty-eight hours of Athens. Outside there is to be a vast piazza, laid out with beautiful gardens, statuary and colonnades, from which radial avenues will be carried through the city. The piazza will command a fine view of the Acropolis at the back, the Temple of Theseus on the right, and the new Houses of Parliament piled up on a hill at the end of a great boulevard.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bexhill T.C. (February 10th. Mr. F. H. Tulloch).—£3,710 for the laying out of land near Egerton Park for the purposes of public walks and pleasure grounds.—The town clerk, Mr. G. Ball, stated that the council were anticipating a development of Bexhill, and were endeavouring to provide a recreation ground. They were therefore going forward with a scheme of filling up the ground with house refuse. Expenditure was being incurred week by week, and it was desirable, in view of this, that the loan should be applied for.

Blifield R.D.C. (February 18th. Major J. Stewart).—£8,200 for purposes of sewerage for the parish of Thorpe.—Mr. Arthur J. Martin, M.A.S.T.C.E., engineer for the scheme, stated that the work would be done by contract, but no tenders had been obtained yet. After an exhaustive survey of the district, and the consideration of a number of alternative sites for purification works, he prepared the scheme which formed the subject of the Local Government Board inquiry held on March 6, 1912. Since the holding of that inquiry the district council had come to an agreement with the corporation of the city of Norwich, by which the latter had undertaken the pumping and treatment of the sewage. He accordingly prepared the new scheme, in respect of which a loan was now being applied for. The scheme included a complete set of sewers for the village, with all necessary manholes, ventilating shafts, &c., as well as a pumping station and rising main. The city engineer of Norwich, Mr. A. E. Collins, M.A.S.T.C.E., also gave evidence.

Castlecomer R.D.C. (February 18th. Dr. T. H. Browne).—This was an inquiry into a proposed lighting scheme.—The clerk, Mr. Denis O'Carroll, gave evidence generally as to the necessity for the scheme, and Mr. Edward Fogarty, engineer to the council, also gave evidence in support of the application.

Essex C.C. (February 13th. Mr. H. R. Hooper).—£6,000 for the purchase of property in Duke-street and Threadneedle-street, Chelmsford, as a site for new county offices.—It was stated that the property had already been purchased, but the application for a loan had been deferred until the council were able to ascertain the full extent to which they were likely to require increased accommodation.

Londonderry T.C. (February 18th. Mr. P. C. Cowan).—This was an inquiry regarding a temporary and emergency water scheme.—In the course of the proceedings the inspector said he felt that his board would not take exception to his going outside the scope of his official duties and exhorting the Derry Corporation to proceed at the earliest possible moment with the provision of an ample supply of pure water for the citizens. For fifteen years the corporation had been carrying out small schemes which experience showed to be only expensive stop-gaps. These they had invariably entered upon in the face of expert advice. The result had been that in the autumn of 1911 the city was on the verge of a water famine, which could not have failed to prove disastrous.

March U.D.C. (February 9th. Mr. W. H. Collin).—£2,900 for the purchase of 6 acres of land.—The land in question, being about 1½ mile from the station, it was explained that the council proposed to build houses, more particularly for labouring men, to take the place of the insanitary houses at present occupied, and they could follow the scheme up by building again nearer the station if the railway company did not. It was stated that the rent of the proposed houses would be 4s.

Mexborough U.D.C. (February 11th. Mr. M. K. North).—£400 for laying out the Castle Hills Park.—The surveyor, Mr. G. P. Carter, explained that the area of the land was 17,977 sq. yds. The council intended to have a bowling green on the site.

Warrington T.C. (February 12th. Mr. T. C. Ekin).—£14,551 for the extension of the electricity works and plant.—The deputy town clerk, Mr. A. T. Hallaway, explained that the principal reason for the loan was that the corporation had not a sufficient margin of safety for their present demand. The maximum capacity of the plant was 3,150 kw., and the maximum demand was 2,409 kw. Since December they had contracted for further connections amounting to 422 kw.,

which brought them to their maximum capacity. The present application would increase the capacity by 1,000 kw.

APPLICATIONS FOR LOANS.

Bangor (Co. Down) U.D.C.—£550 for the provision of Venturi water meters, and £3,800 for a public park.

Beckenham U.D.C.—£700, supplemental loan for road reconstruction.

Blyth U.D.C.—£400 for street works.

Buckhurst Hill U.D.C.—£850 for works of street improvement.

Carshalton U.D.C.—£1,100 for improvements in Carshalton Park.

Earby U.D.C.—£1,670 for the purposes of the depot and road widening.

East Ardsley U.D.C.—£2,442 for the erection of twelve houses.

Egremont U.D.C.—£1,739 for street construction and sewerage.

Frinton U.D.C.—£600 in connection with the sewer outfall.

Hastings T.C.—£610 for sewerage works.

Hayes U.D.C.—£200 for street and sewerage works.

Ipswich T.C.—£1,000 for extensions of the Orwell electricity works.

Llandudno U.D.C.—£11,000 for the purchase of land for golf links.

Merthyr T.C.—£860 for the provision of manual instruction and domestic subjects buildings at a school.

Rowley Regis U.D.C.—£10,000 for paving works, and £200 for cemetery extension.

Southend T.C.—£500 for a main sewer.

Spalding R.D.C.—£1,680 for the erection of eight cottages at Quadring, and £1,150 for six cottages at Surfleet.

Sutton-in-Ashfield U.D.C.—£20,000 for a sewerage scheme.

LOANS SANCTIONED.

Congleton R.D.C.—£300 for sewage disposal works.

Dawlish U.D.C.—£5,525 for the purchase of land in connection with the water undertaking.

Earby U.D.C.—£4,638 for extensions at the sewage disposal works.

Knarborough R.D.C.—£280 for drainage works.

Monaghan R.D.C.—£1,250 for the erection of working-class dwellings.

Selby U.D.C.—£8,800 for the provision of working-class houses, and £600 for street works and sewerage.

Wantage R.D.C.—£1,000 for the erection of four cottages.

FORTHCOMING INQUIRIES.

MARCH.

	£
2.— Finchley. For the provision of working-class dwellings (Mr. W. H. Collin) ...	93,443
3.— Haslemere. For the purposes of a depot (Mr. F. H. Tulloch) ...	1,300
3.— Irlam. For a housing scheme (Mr. C. H. Eyles) ...	36,780
3.— Rhondda. For the purposes of the gas and water undertakings, and laying out a burial ground (Major J. Stewart) ...	17,000
3.— Seaford. For the purchase of land for a pleasure ground (Mr. Edgar Dudley) ...	1,100
3.— Whitehaven. For works of sewage disposal (Mr. W. M. Cross) ...	2,800
4.— Brighton. For works of street improvement (Mr. Edgar Dudley) ...	2,515
4.— Carlisle. For street and electricity purposes (Mr. W. M. Cross) ...	31,560
4.— Dewsbury. For the purchase of land for sewage disposal (Major C. E. Norton) ...	2,650
4.— Pontypridd. For the purposes of the gas undertaking (Major J. Stewart) ...	4,700
5.— Hove. For street improvement (Mr. Edgar Dudley) ...	10,000
5.— Newport (Mon.). For the provision of a refuse destructor (Major J. Stewart) ...	11,697
5.— Southend. For the purposes of baths, bridge, building alterations, and public conveniences (Mr. M. K. North) ...	7,000
6.— Wantage. For sewage disposal purposes (Major J. Stewart) ...	350
6.— West Hartlepool. For public library extension (Mr. W. M. Cross) ...	2,200

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Cardiff, Deptford, Portland £3,000, Stockton; housing and town planning—Lynn; roads and materials—Lewisham £24,474, Limerick £54,000, Whitby £14,000; sewerage and sewage disposal—Camborne £25,000, Cleethorpes £13,750, Sutton-in-Ashfield £20,000, Uckfield £12,512; water, gas and electricity—Dunfermline.—Particulars of other projected works will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Bath T.C.—A small pavilion is to be erected in Alexandra Park, at an estimated cost of £150, for the use of bowlers and the public generally.

Cardiff T.C.—The question of providing more public baths, including cottage baths, is to be considered in committee.

Cumberland C.C.—A committee has been appointed to report on the best means of providing improved accommodation for the council and the staff.

Deptford B.C.—A conference of the Baths and Wash-houses and Libraries Committees has adopted the plans of the borough surveyor, Mr. John Sutcliffe, ASSOC. M. INST. C.E., for combined baths and library, giving to each service distinct and separate means of administration. Mr. Andrew Carnegie is defraying the cost of the library, and until he has given his approval to the plans the scheme is not to be submitted to the council.

Lewisham B.C.—The Works and Highways Committee have under consideration the construction of a public convenience near Forest Hill railway station.

Llanelli T.C.—The council are giving consideration to a proposal for the construction of an underground convenience, at an estimated cost of £1,050.

Manchester T.C.—The city architect has received instructions to prepare plans for a tramway shelter and public convenience at the southern cemetery.

Newark T.C.—£2,000 is to be paid for property adjoining the town hall, and it is proposed to erect upon the site a police court, police station, and a public hall.

Portland U.D.C.—It is proposed to build new council offices at a cost not exceeding £3,000, and certain architects have been requested to submit rough sketches of the proposed buildings.

Saltburn U.D.C.—An isolation hospital is to be erected at Marske-lane, at an estimated cost of £600.

Stockton T.C.—The council are giving consideration to a report by the borough engineer, Mr. M. H. Sykes, upon the proposed new municipal offices.

Stonehaven T.C.—It has been agreed to erect an additional shelter on the beach.

Stratton and Bude U.D.C.—The tender of Mr. E. Hannaford, at £154, has been accepted for the construction of a public convenience near the fire station.

Tyrone C.C.—The council have agreed to purchase Dungannon House, with about 50 acres, at £2,200, for the purpose of a sanatorium.

Warrington T.C.—The tender of Mr. Peter McLachlan, at £973, has been accepted for the erection of boiler-house, laundry, and chimney, at the public baths.

HOUSING AND TOWN PLANNING.

Buckhaven T.C.—It has been agreed to erect thirty dwelling-houses.

Gwyrfaï R.D.C.—It has been agreed to purchase 2 acres of land for a housing scheme to consist of about thirty-six houses.

Hayes U.D.C.—A housing scheme is to be carried out at an estimated cost of £4,550, including the purchase of a site.

Lynn T.C.—A scheme prepared by the borough surveyor, Mr. A. J. Smith, has been adopted for laying out the Friars Field in building plots for 130 semi-detached houses to be let, twenty-two at £18 per annum, eighteen at £15 per annum, fifty-three at £12 per annum, and thirty-seven at £10 per annum.

Magherafelt R.D.C.—A scheme for the provision of eighty-nine labourers' cottages is to be carried out, at an estimated cost of £15,150.

PARKS AND OPEN SPACES.

Dover T.C.—The Pleasure Grounds Committee have approved a scheme, estimated to cost £500, for improvements at the athletic ground.

REFUSE COLLECTION AND DISPOSAL.

Camberwell B.C.—The borough engineer, Mr. William Oxtoby, M. INST. C.E., submitted a report on the removal of trade refuse, showing a loss on the cost of collection ranging from £251 to £376 a year, and the Works Committee recommend the council to raise the charge from 3s. 6d. per load to 5s. 6d. per load.

Derby T.C.—It has been agreed to pay £8,000 for 76½ acres of land in Osmaston Park-road. Part of the land is to be used for a tip, and part for garden allotments.

Halifax T.C.—Replying at a recent meeting to criticisms on a report with respect to the dust manipulator, Councillor Branson, chairman of the committee concerned, said the council had no reason to regret the work of this manipulator at Charlestown. In 1912 the advantage was £104, and in 1913 £130. But beyond the financial side they had got rid of a nuisance that previously existed. Matters were so bad that they had been threatened with injunction. It was a scandal to the borough. The manipulator had a good work so far, and he did not think they would be doing wrong if they considered further work, in a larger capacity, in that direction.

Horsham U.D.C.—It was reported recently that refuse burning at the electric lighting station was regularly commenced on February 4th. The total number of loads destroyed during the week amounted to twenty-seven, each load averaging 1¼ tons. The units generated on this refuse were 2,620—approximately 25 per cent of the week's output. This worked out at 76½ units generated per ton of refuse. The saving in coal for full three days' burning (after allowing for the slight difference of load) was 5 tons 2 cwt. Compared with the previous week, the actual cost figures were as follows: Week ending February 1st, 11,291 units, 20 tons 7 cwt., £21 16s.; week ending February 8th, 10,330 units, 15 tons 2 cwt., £16 4s.

ROADS AND MATERIALS.

Aberdeen T.C.—Various improvements are to be carried out at the Links upon the recommendation of the Links and Parks Committee. It has been agreed to tar-macadamise, at an estimated cost of £300, a 10-ft. footpath from Constitution-street to the bathing station on each side of the tramway rails. It has also been agreed to make a footpath from Urquhart-road to Cotton-street, 20 ft. in breadth, the estimated cost being £80. A decision has been come to to put shrubs and turf on the triangular piece of ground at the foot of Constitution-street, and to widen the road at least 20 ft., so as to make a wider entrance to the Links at this particular point, the expenditure being estimated at £45.

Argyllshire C.C.—The Lorn District Committee have passed a motion in favour of the construction of a new road from Ballachulish to Kinlochleven, and an appeal is to be made to the Road Board for a grant to meet part of the cost of the proposed scheme.

Carrickfergus U.D.C.—A new granolithic footway is to be constructed from the top of Davy's-street to the entrance of the salt works, Minorin, at an estimated cost of £90, and upon the suggestion of the surveyor, Mr. W. W. R. Teggart, it has been decided to repair the kerbing along the south side of Joy-mount at Scotch Quarter, at a cost of £135, the work to be performed by direct labour.

Conway T.C.—The council have adopted a scheme for a new road from Conway to Llandudno, and have requested the borough engineer, Mr. F. A. Delamotte, to prepare an estimate of the cost.

Isle of Wight R.D.C.—It has been decided to set aside £400 for highway improvements during the ensuing half year.

Kingussie T.C.—The council have formally given support to the proposal to construct a road from Braemar to Kingussie.

Leamington T.C.—The repaving of the west side of the Parade is to be taken in hand in sections, and a start is to be made with the portion from Dormer-place to Regent-street, where the work is estimated to cost £100.

Lewisham B.C.—The Finance Committee recommend that application be made to the London County Council for their sanction to the borrowing, when required, of the sum of £24,474, the estimated cost of paving with creosoted deal blocks certain roads, or portions of the roads, in the borough.

Llanely T.C.—The Markets Committee have approved a scheme for widening the Stepney-street entrance to the market at an estimated cost of £5,000.

Limerick T.C.—A proposal has been submitted by a committee for works of block paving and asphaltting estimated to cost £54,000.

Paignton U.D.C.—The tender of Mr. M. Bridgman, at £1,294, has been accepted for the widening of the Torquay main road at Hallacombe.

Stirling T.C.—The scheme for the improvement of St. Mary's Wynd has been advanced a stage by the decision of the council to purchase properties at a cost of £1,876.

Ulverston R.D.C.—Representations are to be made to the county council with a view to obtaining financial aid for widening and improving the road from Lowick Bridge to Torver.

Whitby U.D.C.—The council have agreed to the proposals of the county council on the proposed diversion and improvement of the Sand-ey-rod. The estimated cost of the scheme is £14,000, and the Road Board offer to pay £7,000 (an increase of £2,000 on the previous offer). The county council offer to pay £3,500, and the Whitby Urban and Rural District Councils are asked to pay £1,750 each.

SEWERAGE AND SEWAGE DISPOSAL.

Aylesbury R.D.C.—A sewerage scheme for Whit-church is to be carried out at an estimated cost of £6,000.

Brampton R.D.C.—The scheme of sewerage and sewage disposal prepared by Messrs. Taylor & Wallin, Newcastle-upon-Tyne, is estimated to cost £1,250. It is a gravitation scheme, and the sewage will be disposed of bacterially. The Local Government Board inquiry was held recently.

Burton-upon-Trent T.C.—Reports with regard to closet conversions have been prepared by the borough surveyor, Mr. G. T. Lynam, and steps have been taken by the Health Committee in order to bring about the desired improvements.

Camborne U.D.C.—A sewerage scheme estimated to cost £25,000 is being considered.

Cleethorpes U.D.C.—The Local Government Board are to be asked to assent to the altered design for the sewage storage tank, as the council understand that the type of construction now to be adopted will enable the board to grant a period of repayment of twenty-five years. The board are therefore asked to sanction a loan of £13,750 for the tank, and to cancel the £8,880 previously asked for.

Dalkeith T.C.—The council have advertised for tenders for the carrying out of their scheme for the purification of the burgh's sewage before it enters the river South Esk.

East Grinstead R.D.C.—The surveyor, Mr. C. Turton, has received instructions to prepare the necessary plans and specification for such surface-water sewers as might be required in connection with the roads proposed to be made up, with a view to tenders being invited for the work.

Leek R.D.C.—The tender of Messrs. S. Salt, at £307, has been accepted for the culverts for the proposed alteration in the road at Rudyard.

Penrith R.D.C.—An offer of 7s. 6d. a year has been accepted for the privilege of having a clothes-line on the sewage field. Here is a new source of revenue which those in charge of sewage disposal works should cultivate. Every little helps, as has been said before.

Penrith U.D.C.—For the supply of 1,000 yds. of 9-in. drainage pipes for the extension of sewage carriers on the sewage farm, the tender of Messrs. Ten-

perley & Sons has been accepted at 1s. 7½d. per yard delivered at Penrith Station.

St. Dogmells R.D.C.—The council have instructed Mr. T. J. Moss-Flower, of 28 Victoria-street, Westminster and Bristol, to prepare separate sewerage and sewage disposal schemes and water supply schemes for St. Dogmells, Newport and Kilgerran.

Sutton-in-Ashfield U.D.C.—The council have approved the plan and estimates of Messrs. Willeox & Raikes, Birmingham, of the proposed works in connection with the sewerage scheme, estimated to cost £20,000, and they have been forwarded to the Local Government Board.

Uckfield R.D.C.—The details of the Waldron drainage scheme were submitted to the council on Monday. The scheme provides for draining Tilmore-corner and Horeham-road by gravitation to an outfall in the parish of Heathfield in the Hailsham Rural District. Mount Pleasant and Cross-in-Hand could be connected up to the system if required, but it is not proposed to do so at present. The estimate of the costs of the scheme is as follows: Sewers, man-holes, ventilating columns, &c., £7,707; outfall works, including the provision of two cottages, £1,971; engineering fees and clerk of works, £634; wayleaves and compensation, £1,000; purchase of outfall land and legal expenses, £500; contingencies, £700; total, £12,512. The advice of Mr. Midgley Taylor is to be obtained before the scheme is forwarded to the Local Government Board.

Wakefield R.D.C.—The council have decided to carry out sewerage schemes in Crigglestone and Crofton, estimated to cost respectively £9,542 and £1,300.

WATER, GAS, AND ELECTRICITY.

Aberdeen T.C.—The Electricity Committee have approved the recommendation of Mr. Bell, electrical engineer, to provide an additional 1,000kw. La Cour converter suitable for transforming a three-phase 6,000-volt supply to low tension for either lighting power or traction, and to replace the two sets which are going to Rubislaw and Boardford works. It was stated that that would mean a saving of £430 per annum. The committee have also agreed to recommend the adoption of Mr. Bell's suggestion for the condensing of a water supply from the Dee, augmenting the present water supply.

Ballinrobe U.D.C.—Application is to be made to the Local Government Board for sanction to a water supply scheme.

Bewdley T.C.—The council recently received a report that the new borehole had been completed, and had proved that there was an abundance of water of excellent quality. The council decided to apply to the Local Government Board for sanction for the remainder of the loan of £3,000 for the carrying out of the necessary work with as little delay as possible. The Kidderminster District Council have agreed to obtain the water supply for Wribbenhall from the corporation.

Dunfermline T.C.—The council recently considered a report by Messrs. Crouch, Hogg & Easton, Glasgow, on the question of an additional water supply to the city. Part of the scheme is the erection of a surface reservoir, and the carrying of a main right down to Rosyth. The total length of pipe will be nearly 20 miles, and the estimated cost of the whole scheme is £82,000. Part of the works, involving an outlay of £10,000, it was agreed to defer for a period of at least ten years, or until such time as it was required, but it was decided to proceed with the other work at once.

Lampeter T.C.—The Local Government Board, writing with reference to the council's application for a loan of £3,365 for the water supply scheme, stated that they observed that the proposed loan included sums for scraping and cleaning mains and for repairs to valves and a tank. It was not the board's usual practice to sanction loans for works of that nature, but the board had decided on this occasion to authorise the borrowing of the sums in question for a period of ten years. Their formal sanctions to loans of £3,000 and £275 were enclosed.—The town clerk explained that sanction for the £3,000 would be extended for thirty years and £275 for ten years.

Marylebone B.C.—The council have intimated to the staff at its municipal electricity works that substantial remuneration will be given to workers who supply valuable suggestions or inventions calculated to perfect the plant and machinery at the works.

Newmill U.D.C.—It was lately agreed to give further consideration to a report by Messrs. Marriott, Son & Shaw on the proposed construction of a reservoir of 1,000,000 gallons capacity at Goose Holes. The site, it was stated, was not an ideal one, and the bottom and sides would have to be concreted. The approximate estimate was from £2,500 to £2,750 (excluding engineer's costs). An alternative site further from the road would cost from £3,250 to £3,500.

Penrith R.D.C.—Application is to be made to the Local Government Board for sanction to borrow £410 for works of water supply for Newbiggin, Croglin.

Selby U.D.C.—The council have approved of a draft agreement for supplying water to the Riccall Rural Council for Barby at 9d. per 1,000 gallons.

Wolverhampton T.C.—The tender of Mr. John Thompson, of Ettingshall, has been accepted for the supply of a steel water tank.

MISCELLANEOUS.

Batley T.C.—Plant for the purification of the water used in the swimming baths is to be provided at a cost of £1,200.

Ghatham T.C.—The tender of Messrs. John Freeman, Sons & Co., Limited, at £35, has been accepted for the supply of a Cornish granite horse trough, 9 ft. long, to include a dog trough between the supports of the cattle trough.

PERSONAL.

Mr. Frank Harris, borough surveyor of Penryn, has resigned.

Mr. F. J. Worden, borough surveyor of Okehampton, has been voted an increase of salary.

Mr. J. H. Walters, borough surveyor of Congleton, has been voted an increase of salary.

Mr. J. Atkinson, borough surveyor of Stockport, has had his salary increased from £600 to £700 per annum.

Mr. B. White, of Kendal, has been appointed assistant surveyor to the Bowland (Yorks) Rural District Council.

Mr. W. H. Cousins, surveyor and inspector to the Street Urban District Council, has been voted an increased salary of £40 a year.

Mr. Arthur Andrew, clerk to the Buglawton Urban District Council, died on Tuesday evening, we regret to learn, at his residence, Shelton, Stoke-on-Trent.

Mr. W. Beach, who now holds the office of sanitary surveyor to the Cuckfield Rural District Council, has been appointed consulting surveyor to the same authority at a salary of £100 a year.

Mr. Robert E. Wilson, surveyor and inspector to the Knaresborough Urban District Council, has been appointed surveyor, inspector, and water engineer to the Leiston (Suffolk) Urban District Council.

Mr. A. W. Humpherson, borough surveyor and inspector of Bewdley, has had his salary increased from £115 to £150 a year, and has been voted a grant of £25 for extra work done in connection with the water supply.

Mr. F. A. Bailey, surveyor of highways to the Leek Rural District Council, has been voted £50 for additional services, and it has been decided to pay him an adequate sum for all plans he prepares on the instructions of the council.

Mr. G. A. Ballard, Assoc.M.Inst.C.E., engineering assistant to the city engineer of York, was on Tuesday last appointed assistant borough surveyor of Guildford. Prior to his York appointment he was assistant to the city engineer of Birmingham.

Mr. Andrew Young, valuer to the London County Council, is retiring from that position, after twenty-five years' service, on November 30th next, with a pension of £1,166 a year. Mr. Young was formerly surveyor to the London School Board, and the position which he is about to relinquish is worth £2,000 a year.

Mr. H. D. Blake, managing director of the Limmer Asphalte Paving Company, Limited, was recently involved in a motor car accident, and his numerous friends throughout the country will be sorry to learn that he was unfortunate enough to sustain injuries which have prevented his attendance at his office for the past two weeks. It is expected that some

little time will elapse before he is able to get about again as usual.

Mr. G. Brown Deas, of the engineer and surveyor's department, Finchley, London, has obtained an appointment under the county council of Fifeshire in connection with the extensive town planning scheme proposed for the Kirkealdy district. Mr. Deas served his pupilage with the late Mr. Alex. McCulloch, of Dundee and Leith, and was subsequently under the corporation of the county borough of Devonport and the works department of the Admiralty.

Mr. G. S. Coleman, B.Sc., Eng.(Lond.), Assoc.M.Inst.C.E., has resigned his position as senior engineering assistant to the city surveyor of Manchester in order to take up a similar position under Mr. Oswald J. Wilkinson, Assoc.M.Inst.C.E., of Manchester, who has charge, among other important works, of the designing of the extensive alterations to the Manchester sewage disposal works at Davyhulme. This work will entail an initial outlay of £180,000, and is to be proceeded with immediately.

Mr. James Caine, an employee of the Eccles Corporation, has invented and patented two machines—a plough and a cleanser—to remove obstructions from sewers and prevent floods in wet weather. The borough surveyor, Mr. T. S. Pieton, reported to the Drainage Committee that the appliances had been successfully tested, and the council have encouraged the inventor by purchasing the original machines. In a trial they removed 20 tons of solid sediment in 83½ hours without the aid of water. The obstructions included macadam, bricks, lead piping, and a Rugby football.

Mr. J. J. Knewstubb, surveyor and sanitary inspector to the Penrith Urban District Council, has received an increase of salary of £30 per annum, £15 of which is, subject to the approval of the Local Government Board, to be apportioned in respect of his office as inspector of nuisances. It was stated in the course of the discussion that this was the first increase for ten years, the addition thus being at the rate of £3 per annum, and it was further alleged that "the surveyor would soon leave the council if he could get a better job." We can well imagine he would. The prospects Penrith holds out to a professional man are not so alluring as to invite a loyal life's service.

Road Board Publications.—The specifications issued by the Road Board relating to the tar treatment of roads, and for strengthening and surfacing a water-bound road have now been revised, and can be obtained from Messrs. Waterlow & Sons, Limited, London-wall, E.C., price 8d. (post free 9d.), and 5d. (post free 6d.) respectively. A description of simple tests for ascertaining the quality of tar has been added to the specifications relating to the tar treatment of roads.

FOR OTHER ADVERTISEMENTS

See End of Paper.

EAST HAM CORPORATION.

STREET WIDENING AND TRAMWAY DUPLICATION WORKS.

LEADING FOREMAN.

The East Ham Corporation invite applications for the position of Leading Foreman on the work of Street Widening and Tramway Duplication in High-street North, East Ham, which will probably last for about 6 months.

Salary, £4 1s. per week.

Candidates must have had experience in work of a similar character, and be thoroughly capable of taking charge of men.

Applications, on Forms to be obtained from the Borough Engineer, Town Hall, East Ham, and accompanied by copies of three recent testimonials (which will not be returned), to be addressed to "The Worshipful the Mayor, Town Hall, East Ham, E." and endorsed "Foreman," not later than 12 o'clock noon of Monday, the 16th March, 1914.

Canvassing, either directly or indirectly, will disqualify.

(By order)

C. EUSTACE WILSON,

Town Clerk.

Town Hall,

East Ham, E.

February 25, 1914.

(1,377)

URBAN DISTRICT COUNCIL OF ENFIELD.

TO CONTRACTORS.

TARRED SLAG MACADAM.

The Council invite Tenders for the supply, delivery, spreading, rolling and completing, including six months' maintenance, of about 12,950 yds. (i.e., 1,850 yds. long by 7 yds. wide) super. of Tarred Slag Macadam on the Cockfosters-road, within the Enfield District.

Specification, Form of Tender, and all information can be obtained by Contractors experienced in this class of work on application to Mr. Richard Collins, the Council's Surveyor, at these offices.

The Contractors will be required to observe Trade Union hours of labour, and to pay wages according to the published scale of the London County Council for the time being in force.

Tenders (on the form supplied only) to be sent in to me not later than noon on Tuesday, the 10th day of March next, endorsed "Tender for Tarred Slag Macadam."

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

T. W. SCOTT,

Clerk.

Public Offices,

Enfield, Middlesex.

February 25, 1914.

(1,378)

COUNTY OF ARMAGH.

The County Council are prepared to receive Tenders for the supply of—

- One Light Compound Steam Motor Tractor.
- Two End-Tipping Wagons.
- One Portable Stonebreaker.

For Conditions and Form of Tender apply to Mr. R. H. Dorman, M.INST.C.E., County Surveyor, Armagh.

Sealed Tenders, endorsed "Tender for Machinery," to be delivered at this Office not later than Monday, the 9th March, 1914.

The lowest or any Tender will not necessarily be accepted.

JOSEPH ATKINSON,

Secretary to the County Council.

Courthouse,
Armagh.

February, 1914

(1,376)

BOROUGH OF REIGATE.

TO CONTRACTORS.

The Council of the Borough of Reigate invites Tenders for the Supply of the following materials, and for the execution of the following works—viz. :—

- Granite Macadam, Basalt and Flints.
- Granite Kerb.
- Kent Ragstone.
- Tar-paving.
- Artificial Stone Paving.
- Gravel.
- Concrete Beach.
- Pea Beach.
- Compo Grit.
- Portland Cement.
- Beddington Grit.

Forms of Tender, Conditions of Contract, and full particulars may be obtained upon application to Mr. Fred T. Clayton, the Borough Surveyor, and every person tendering will be required to deposit at his office, at the Municipal Buildings, Reigate, a sample of the material for which he tenders.

Every person whose Tender may be accepted will be required to enter into a Contract in writing, the form whereof may be seen at my office, and himself and his sureties will be required to enter into a bond for the due performance of his Contract.

Sealed Tenders, endorsed "Tender for Granite Macadam," or as the case may be, are to be delivered at my office at the Municipal Buildings aforesaid, on or before Noon of Wednesday, the 11th day of March next.

The Council does not bind itself to accept the lowest or any Tender.

Dated this 23rd day of February, 1914.

(By order of the Council)

ALFRED SMITH,

Town Clerk.

(1,373)

BOROUGH OF REIGATE.

TO CONTRACTORS OF TARVIA.

The Reigate Town Council invites Tenders for the Supply of about 16,000 gallons of Tarvia in barrels for tarring purposes, to be delivered at Reigate or Redhill Stations.

Forms of Tender, Conditions of Contract, and full particulars may be obtained upon application to Mr. Fred T. Clayton, the Borough Surveyor, at his office at the Municipal Buildings, Reigate.

The person whose Tender is accepted will be required to enter into a Contract in accordance with the form to be seen at my office at the Municipal Buildings aforesaid.

Sealed Tenders, endorsed "Tender for Tarvia," are to be delivered at my office at the Municipal Buildings aforesaid, on or before Noon of Wednesday, the 18th day of March next.

The Council does not bind itself to accept the lowest or any Tender.

Dated this 23rd day of February, 1914.

(By order)

ALFRED SMITH,

Town Clerk.

(1,375)

BOROUGH OF REIGATE.

TO ROAD TARRING CONTRACTORS.

The Reigate Town Council invites Tenders for Tar-washing about 170,000 yards super. of Roads within the Borough, the price to include Cleaning, Tarring, and Gritting the Tar Surface, and all other necessary works in connection therewith.

Sealed Tenders, which are to state the price per yard super., will full description of the mode of treatment, are to be delivered at my office at the Municipal Buildings, Reigate, on or before Noon of Wednesday, the 18th day of March next.

The person whose Tender is accepted will be required to enter into a Contract in accordance with a form to be seen at my office aforesaid.

The Council does not bind itself to accept the lowest or any Tender.

Dated this 23rd day of February, 1914.

(By order)

ALFRED SMITH,

Town Clerk.

(1,374)

WEST WARD RURAL DISTRICT COUNCIL, WESTMORLAND.

WATER SCHEME.

The West Ward (Westmorland) Rural District Council invite separate Tenders or one whole Tender for:—

CONTRACT No. 1.

- 1½ miles (approximate) 3-in. diameter Mannesman Steel Tubes delivered and laid complete.
- 6½ miles (approximate) 5-in. diameter do.
- 7 miles (approximate) 6-in. diameter do.
- With Specials, Valves, &c.

CONTRACT No. 2.

The Erection of Intake Works, Screening Chamber, Three Service Reservoirs, Break Pressure Tank, Valve Chambers, &c., on route of Contract No. 1.

CONTRACT No. 3.

- 3 miles (approximate) 3-in. diameter Mannesman Steel Tubes, delivered and laid complete.
- 4½ miles (approximate) 4-in. diameter do.
- 33 miles (approximate) 3-in. Cast-iron Pipes, delivered and laid complete.
- 12 miles (approximate) 4-in. do.
- 1½ miles (approximate) 5-in. do.
- ¼ mile (approximate) 7-in. do.
- With Specials, Valves, &c.

CONTRACT No. 4.

The Building of Break Pressure Tanks and Valve Chambers, &c., on route of Contract No. 3.

The whole of the Works to be carried out in accordance with Plans and Specifications prepared by Mr. Joseph Graham, Civil Engineer, 28 Castle-street, Carlisle.

Intending Contractors, upon deposit of £5 (cheque only), will obtain copies of Specification and Bill of Quantities with Form of Tender at the Office of the aforesaid Engineer, where the Drawings will be on view. The cheque will be returned to the Contractor upon the receipt of a *bona-fide* Tender and the return of all documents to the Engineer.

The Council do not bind themselves to accept the lowest or any Tender.

JAMES TAYLOR,

Clerk.

1 Brunswick-road,
Penrith.

February, 1914.

(1,372)

SOME RECENT PUBLICATIONS.*

THE ENGINEER'S YEAR-BOOK of Formulae, Rules, Tables, Data, and Memoranda, for 1914. A compendium of the modern practice of civil, mechanical, electrical, marine, gas, and mine engineering. Compiled and edited by H. R. Kempe, M.INST.C.E., M.I.MECH.E., M.I.E.E. Price 15s. London: Crosby Lockwood & Son.

Having recently celebrated our own coming of age, we extend our hearty congratulations to Mr. Kempe on the appearance of the 21st edition of his excellent annual, and on his enterprise in facing boldly the necessity for expanding his Year-book in order to deal adequately with the ever-increasing scope of engineering practice. The 1914 edition contains no fewer than 1,770 pages, and the fact that fifty-three pages are occupied by the index is not only important as indicating the thoroughness with which the work of indexing has been done, but is also significant of the great range of subjects included in the work. There are over 1,350 illustrations, specially prepared for the volume.

Important new sections and parts of sections have been added in recent issues, but the services of specialists have again been called into requisition for the preparation of fresh matter for the 1914 edition. There is a new section, short, but valuable, on "The Cost of Engineering Works," and one on "The Arrangement and Construction of Engineering Workshops," by Mr. H. N. Allott, M.INST.C.E. The first part of the mining section has been entirely rewritten by Prof. Henry Louis, M.A., D.SCI., and "Irrigation" and "Rainfall" by Mr. Reginald Ryves, M.CON.S.E., ASSOC.M.INST.C.E., who has also supplied data on bridges, struts, columns, and piles. There is a fresh contribution on "Link Motions and Valve Gear," by Mr. W. H. Booth, M.AM.SOC.C.E.; and the sections on "Machine Tools" and "Power Transmission" have been revised and simplified by Mr. Dempster Smith, M.I.MECH.E.

As we pointed out in our review of last year's issue, the comprehensive nature of the work makes it specially valuable to men who, like surveyors to local authorities, are engaged in a great many different kinds of work, and to those engineers who are thrown upon their own resources at stations distant from headquarters. It may also be pointed out that students and assistants will find the book to be an excellent investment, since it will often save them from the necessity of buying expensive books for a temporary purpose, or spending time in visiting libraries, and will make it possible to avoid expenditure on volumes which will have to be replaced later on by fuller and more authoritative works.

An important feature of the volume is the ease with which it can be used as a work of reference, owing to the full and conveniently arranged index, the excellent printing, and the skill employed in the binding. The last-named factor is one of considerable practical importance, and it may be noted that while a new copy opens properly at any page, a copy used much during the past twelve months is equally efficient in this respect, the back standing stiffly when the pages near the beginning or the end are consulted. Most engineers are, of course, familiar with this Year-book, but to the few who have not been accustomed to use it, and to the younger men, including those whose means are limited, it may be recommended as a thoroughly sound compendium of information in engineering practice generally, and a convenient book of formulae and formal data.

STUDIES IN WATER SUPPLY. By A. C. Houston, D.S.C., M.B. C.M., Director of Water Examination, Metropolitan Water Board. Price 5s. nett. London: Macmillan & Co.

"It is easy to carry conservatism too far in these matters, and more than one case could be quoted where a more tolerant attitude would have saved the ratepayers large sums of money." These words occur in Dr. Houston's book entitled "Studies in Water Supply," and have special reference to the fact that in the United Kingdom the process of sterilisation by means of hypochlorite has been looked upon with considerable disfavour without any reasonable justifica-

tion. It is to be hoped that this book will be carefully read by all those who have to do with matters of water supply. Dr. Houston has written a book which is a monograph, as distinguished from the ordinary textbook, in which the writer generally gives a statement of matters upon which he has special experience, and fills in the rest of the book—sometimes the larger portion—with material collected from a number of other sources. Such books as that written by Dr. Houston are therefore of altogether exceptional value, because in them there is no chance of the errors which creep into the most careful compilation from other men's work.

Dr. Houston's reports have from time to time been dealt with in *The Surveyor* fully, so that it is unnecessary again to discuss them. They tend to justify rivers as sources of water supply; they deal with the important question of abstraction, the supplementary process of water purification, with sterilisation and with the treatment of water with lime for the purpose of sterilisation. The storage of water in relation to purification is a matter with which Dr. Houston's name will always be associated. The present book gives, in a handy form, the information which is contained in a large number of reports and other publications written by Dr. Houston in the past. Great attention is given to the question of water-borne disease, and the improbability of London water at the present time having any influence upon the incidence of water-borne disease is very clearly stated, while the importance and extreme danger of accidental infection is emphasised. Dr. Houston appears to throw some doubt upon the question whether the fall in the typhoid death-rate, which is so remarkable in American cities where sterilisation of the water has been introduced, is due altogether to the purification of the water. Apparently he regards the purification of the water as only one of the causes which have produced the beneficial result. However, there is no suggestion that the treatment of the water is not highly beneficial.

The financial value of a pure water supply forms an interesting chapter in the book. The final chapters deal with bacteriological routine methods and special methods which will be of value chiefly to the bacteriologist, as they are entirely technical. The book is very well indexed, and contains many diagrams which have been excellently prepared and reproduced.

A general study of Dr. Houston's results is desirable, for at the present time we have before us the results of much research work, and what is chiefly required is to educate the general public. The teachings of science will remain useless until they are practically applied.

STANFORD'S GEOLOGICAL ATLAS OF GREAT BRITAIN AND IRELAND. Edited by H. B. Woodward, F.R.S. Third Edition. Price 12s. 6d. nett. London: Edward Stanford, Limited.

One of the most interesting and valuable books ever published is this handy volume, which, although of a size that may be carried in a pocket, contains complete geological county maps of Great Britain, Ireland and the Channel Isles, together with sections, views, complete illustrations of the fossils belonging to the various formations, together with small scale maps. Over 490 pages of printed matter deal with the geological structure of Great Britain, the formations and the mineral products. This is followed by descriptions of the geology of the counties, each being taken separately in detail. It would be difficult to suggest a more useful and practical way of teaching geology than the method which has been adopted of describing the features observable along the principal lines of railway. With this book in hand the ordinary railway journey must become a perfect object lesson. For mile after mile we have the geology of the country made clear to us in the ordinary railway cutting, and what better practical training can be imagined than in a country like our own, where the strata are ever changing as we advance, to note the exposed surface of each formation as we pass through it in the train, having in hand a carefully written description, the work of one of our greatest geologists? Exactly the same method has been followed in dealing with Ireland as with Great Britain.

The atlas should be among the books of reference of every engineer; not among those kept in the bookshelves, but on the desk, and it will also accompany him on his journeys. Moreover, unlike most books of reference, it can never become obsolete.

To the student the book will be invaluable. We in this country are peculiarly and fortunately situated in that the various geological strata are spread out

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

before us like an open book, while the deep cuttings of railways intersect the various formations in all directions. By following the notes contained in this book, a single long railway journey from east to west will prove a lesson in practical geology that will give the student a more solid grasp of his subject than can be gained by months of ordinary study.

LOCKWOOD'S BUILDERS' PRICE BOOK, 1914. Edited by F. T. W. MILLER, A.R.I.B.A. Price 4s. London: Crosby Lockwood & Son.

Any increase in the cost of building which has taken place during the past year has been due to a rise in the price of labour rather than in that of materials, although certain of the latter have also shown an upward tendency. Due effect has been given to both factors in adjusting the prices for the present issue of "Lockwood." Every section of the work has been thoroughly revised and corrected where necessary, while many have been amplified so as to embrace modern building developments. As in former issues, a separate section is devoted to each trade, each being divided into subsections dealing with measurement, memoranda, and prices respectively. The memoranda are usually very full, and will be found of great practical value. A large amount of useful matter for reference will be found in the several appendices, which include one comprising legal notes. There is also a supplement containing the London Building Acts, 1894 to 1908, and other enactments and regulations relating to building in the metropolis. The new edition of "Lockwood" retains the familiar form and the old excellence, and we have no hesitation in again recommending the work to our readers.

THE INTERNATIONAL "WHITAKER," 1914. Price 2s.

The appearance of the second annual issue of the International Whitaker is abundantly justified by the success which attended the publication of the first volume last year. The main body of the work is again devoted to an account of the government, trade and defence of every country in the world. These have been revised in every instance from official sources, and in many cases by Government Departments. It has been said that this book forms the best universal school geography yet published. It is certainly a wonderfully complete compilation, and excellent value for so modest a price.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—MR. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

WEST MIDLAND DISTRICT.

A meeting of the West Midland District will be held at Birmingham on March 5th.

PROGRAMME.

5 p.m. Meet at the Council House, Birmingham.

Business: Paper by MR. H. M. LAWSON, deputy road surveyor, Birmingham (associate member), entitled "Modern Road Construction."

It is hoped there will be a good attendance at this the last meeting of the present winter season.

F. C. COOK, A.M.INST.C.E., A. T. DAVIS, M.INST.C.E.,
Hon. District Secretary. District Chairman.

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District will be held at Wakefield on Saturday, March 21, 1914.

SOUTH-WESTERN DISTRICT.

A meeting of the South-Western District of the institution will be held at Taunton on March 21st.

EASTERN DISTRICT.

A meeting of the Eastern District is to be held at Chelmsford on April 18th.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on June 13th.

THE ANNUAL MEETING.

The date for the annual meeting of the Institution of Municipal and County Engineers at Cheltenham has been fixed definitely for June 24th, 25th, 26th and 27th next. It has been decided to make a special

feature of town planning and of roads, and, if possible, to arrange for an exhibition of town plans.

EXAMINATION.

The April examination of the institution will be held in London, at the New Examination Hall, Queen's-square, W.C. on April 2nd, 3rd and 4th.

THOMAS COLE,
Secretary.

92 Victoria-street, S.W.

PROPOSED VISIT TO HAMBURG.

Mr. Thomas Cole, the secretary, has circularised the members as follows:—

"An invitation has been received from the presiding burgomaster (Dr. Predöhl) for the institution to visit Hamburg at Whit-sundie next, when it is intended to inspect the municipal works of that city. These will include waterworks, gasworks and sewerage works, also town planning, of which Hamburg presents a striking example.

"It is proposed to leave London on Wednesday, May 27th, and return so as to be in London on Thursday morning, June 4th.

"The cost of the trip, travelling second class on rail, saloon on boat, with hotel, tips, &c., will be about £10. Carriage drives may be extra.

"As considerable pains are being taken by His Majesty's Consul-General, the presiding burgomaster, and other chief officials of the city to make the visit a success, I hope that members will respond in good numbers to the hearty invitation that we have received, and that you will facilitate the arrangements by giving me early intimation as to whether it is your intention to join the party."

INSTITUTION OF MUNICIPAL ENGINEERS.

President—MR. HORACE BOOT, M.I.E.E., M.I.MECH.E.

Arrangements have been made for a meeting to be held at Tisbury on June 13th. A meeting will also take place at Birmingham in March.

B. WYAND,
Secretary.

39 Victoria-street, S.W.

SOCIETY OF ENGINEERS.

At a meeting of the Society of Engineers to be held on Monday next at the Institution of Electrical Engineers, Victoria-embankment, W.C., a paper entitled "Esperanto: An International Language for Engineers," will be read by Mr. T. J. Gueritte, B.Sc., M.SOC.C.E.(FRANCE), M.S.E., the following being a synopsis: Importance of standardisation in general—advantages of a universal language—the use of such a language in connection with (a) the study of science, (b) the carrying out of engineering work, (c) international congresses, (d) the sale of technical books at moderate prices—Is an international language possible?—Conditions that must be fulfilled—In what manner Esperanto fulfils these conditions—Illustrations of the applications of Esperanto.

The chair will be taken at 7.30 p.m.

A. S. E. ACKERMANN,
Secretary.

17 Victoria-street, S.W.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

ASSISTANT COUNTY SURVEYOR.—February 28th.—County Palatine of Chester. £350 per annum.—Mr. Reginald Potts, clerk, County Offices, Chester.

SECRETARY.—February 28th.—Institution of Municipal and County Engineers. £400 per annum.—Mr. Thomas Cole, secretary, 92 Victoria-street, Westminster, S.W.

CLERK OF WORKS.—February 28th.—Durham County Council. £3 per week.—Mr. W. Crozier, county surveyor and engineer, Shire Hall, Durham.

COUNTY SURVEYORS.—February 28th.—Limerick County Council. £300 per annum.—Mr. John J. Quaid, county secretary, Limerick.

CLERKS OF WORKS (Two).—February 28th.—Windsor Rural District Council. 13 guineas per month.—Mr. J. E. Gale, clerk.

SUPERINTENDENT OF FIRE BRIGADE. February 28th.—Municipality of Karachi. 200 rupees per month, with free quarters.—Mr. Measham Lea, chief officer and chief engineer.

ROAD FOREMAN.—March 2nd.—Corporation of Birmingham. 40s.—45s. per week.—Mr. Henry E. Stilgoe, city engineer and surveyor.

CLERK OF WORKS.—March 2nd.—Hexham Rural District Council. £2 10s. per week. Mr. J. H. Nicholson, clerk.

ASSISTANT SANITARY INSPECTOR. March 2nd.—Cuckfield Rural District Council. £80 per annum.—Mr. C. H. Wagh, clerk, Boltro-road, Hayward's Heath.

JUNIOR ASSISTANT.—March 2nd.—Settle Rural District Council. £52 per annum.—Mr. T. E. Pearson, clerk.

ENGINEER AND SURVEYOR.—March 2nd.—Scunthorpe Urban District Council. £200 per annum.—Mr. H. M. Hett, clerk.

CLERK OF WORKS.—March 3rd.—Corporation of Southport. £3 per week.—Mr. J. Ernest Jarratt, town clerk.

SURVEYOR'S ASSISTANT.—March 3rd.—Ware Urban District Council. £52 per annum. Mr. G. S. Gisby, clerk.

ASSISTANT INSPECTOR OF NUISANCES. March 4th.—Hambledon Rural District Council. £90 per annum.—Mr. F. Smallpeice, clerk, 138 High-street, Guildford.

SURVEYOR AND INSPECTOR.—March 5th.—Knaresborough Urban District Council. £125 per annum.—Mr. Thomas Mainman, clerk.

SURVEYOR'S JUNIOR ASSISTANT.—March 7th.—Corporation of Halifax. £78 per annum.—Mr. Percy Saunders, town clerk.

ASSISTANT INSPECTOR OF NUISANCES. March 9th.—Corporation of Llanelly. £104—£130.—Mr. H. W. Spowart, town clerk.

ASSISTANT SURVEYOR.—March 9th.—Stourbridge Urban District Council. £60 per annum.—Mr. F. Woodward, surveyor.

ASSISTANT WATERWORKS ENGINEER.—March 11th.—Corporation of Madras, India. £33 6s. 8d. per mensem, with an allowance of £2 per mensem.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, London, S.W.

REFUSE DESTRUCTOR MANAGER.—March 17th.—Kensington Borough Council. £160 per annum, with house, coals and lighting.—Mr. W. Chambers Lecte, town clerk.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

ASSISTANT ENGINEER.—For Government Waterworks in the Gold Coast. £600—£650.—Messrs. Hunter, Duff & Middleton, 17 Victoria-street, Westminster, S.W.

ASSISTANT ENGINEERS AND DRAUGHTSMEN.—Sierra Leone Government, Public Works Department. Engineers, £300—£400; draughtsmen, £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

CLERK OF WORKS.—Cheshire County Council. £3 3s. per week.—Mr. W. Holland, county surveyor, The Castle, Chester.

ASSISTANT QUANTITY SURVEYOR.—Corporation of Sheffield. £150—£180.—Mr. F. E. P. Edwards, city architect.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

HENDON.—March 2nd.—Designs for public baths, for the urban district council. Premiums £100, £75, and £50.—The Clerk.

TWRCELYN.—March 9th.—Plans and specifications for a water supply and drainage scheme for Cemaes.—Mr. T. H. Hughes, clerk, Fir-grove, Menai Bridge.

HAWARDEN.—March 16th.—Plans and estimates for laying out a plot of land for the erection of workmen's cottages, for the Hawarden Rural District Council.—Mr. F. Barrett, sanitary inspector, Hawarden.

BELFAST.—March 20th.—Designs for an art gallery and museum, for the corporation.—Mr. R. Meyer, town clerk.

BURTON-UPON-TRENT.—March 24th.—For children's cottage homes, for the Board of Guardians.—Mr. C. F. Chamberlin, clerk.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

MOLD.—Plans for a fire station and caretaker's house, for the urban district council.—Mr. D. Thomas, surveyor, Town Hall.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

CARLISLE.—February 28th.—For the erection of an office and convenience at the cattle market, for the corporation.—Mr. H. C. Marks, engineer and surveyor.

BLOFIELD.—February 28th.—For the erection of four cottages, for the rural district council.—Mr. H. H. Cole, clerk, 12 Bank-street, Norwich.

FEATHERSTONE.—February 28th.—For the erection of 149 working-class dwellings, for the urban district council.—Mr. S. Chesney, architect.

ROMFORD.—February 28th.—For the conversion of buildings into a fire station, for the urban district council.—Mr. H. T. Ridge, acting surveyor.

NORBURY.—February 28th.—For the erection of 128 cottages, for the London County Council.—Architect, County Hall, Spring-gardens, S.W.

LEICESTER.—February 28th.—For the erection of a brick chimney shaft, 212 ft. high, for the corporation.—Mr. E. George Mawbey, borough engineer and surveyor.

BECKENHAM.—March 2nd.—For the erection of an iron building, 60 ft. by 25 ft., at the Church Fields-road depot, for the urban district council.—Mr. John A. Angell, surveyor.

ESSEX.—March 2nd.—For the building of a new bridge over the river Roding in ferro-concrete on the Hennebique system, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

STRATFORD-ON-AVON.—March 2nd.—For laying water mains, erection of mechanical filter and pumping-house, and construction of concrete reservoir, for the corporation.—Mr. R. Dixon, borough surveyor.

MARGATE.—March 2nd.—For laying 1,900 yds. of 8-in. water main, for the corporation.—Mr. Stanley, waterworks manager, 13 Grosvenor-place.

PAIGNTON.—March 2nd.—For the erection of a public convenience, for the urban district council.—The Surveyor.

NANTWICH.—March 2nd.—For the construction of an underground convenience, for the urban district council.—Mr. W. F. Newey, engineer and surveyor.

EASTBOURNE.—March 2nd.—For the erection of boundary wall and drainage work at hospital, for the corporation.—Building Surveyor, Town Hall.

NORTHUMBERLAND.—March 3rd—31st.—For the erection of a police station, for the county council.—Mr. J. A. Bean, county surveyor, Moothall, Newcastle-on-Tyne.

BEDWAS.—March 3rd.—For the erection of new council offices and stores, for the urban district council.—Mr. A. S. V. Taylor, surveyor.

KIRKBURTON.—March 3rd.—For the erection of six houses, for the urban district council.—Messrs. J.

B. Abbey & Son, architects, District Bank Chambers, Market-street, Huddersfield.

HOVE. March 4th. For the construction of underground lavatories, for the corporation. Mr. H. H. Scott, borough surveyor.

NORTHAMPTON. March 4th. For holding extensions to the tramway-car sheds, for the corporation. Mr. Alfred Fidler, borough engineer.

GLAMORGAN. March 4th. For alterations and additions to schools, for the county council. The Clerk, County Hall, Cardiff.

LANCHESTER. March 5th. For the erection of a hospital, for the Joint Hospital Board. Mr. W. T. Wilson, architect, 21 Durham-road, Blackhill.

WEST RIDING. March 6th. For the erection of a school, for the Education Committee. Education Architect County Hall, Wakefield.

ANTWERP. March 6th. For the construction of two metal sheds, for the municipality. Secrétariat, Hotel de Ville.

LETTERKENNY. March 6th. For the erection of eleven cottages, for the rural district council. Mr. R. S. Waters, clerk.

ELY. March 7th. For the erection of sixteen workmen's dwellings, for the urban district council. Mr. S. Weaving, architect, 15 Upper King-street, Norwich.

BEDFORD. March 7th. For the erection of buildings in connection with two pumping stations, and screening chamber, together with the construction of approach roads and areas, formation of site, and other works, for the corporation. Major Tulloch & Haworth, 28 Victoria-street, Westminster, S.W.

BASINGSTOKE. March 9th. For the erection of a generating station, for the corporation. Mr. F. R. Phipps, borough engineer.

LAMPETER. March 10th. For the construction of a new covered reservoir with inlet and outlet mains, for the corporation. Mr. J. Ernest Lloyd, town clerk.

BISHOP'S CASTLE. March 10th. For additions and alterations to the Smithfield, for the corporation. Borough Surveyor.

PORTLAND. March 10th. For the erection of a public convenience, for the urban district council. Mr. R. S. Henshaw, engineer and surveyor.

OLDHAM. March 11th. For the erection of a public wash-house, for the corporation. Borough Surveyor.

GOWER. March 13th. For the erection of isolation hospital buildings, for the Gower and Oystermouth Hospital Committee. Mr. H. A. Ellis, architect, 10 Fisher-street, Swansea.

SMALLBURGH. March 14th. For the erection of six cottages, for the rural district council. Mr. F. Davies, clerk, North Walsham.

SOUTHAMPTON. March 28th. For constructing concrete foundations, fencing and other works, for the county council. Mr. A. L. Roberts, architect to the Education Committee, The Castle, Winchester.

SWANSEA. March 31st. For the construction of masonry and concrete approaches and piers, for a steel girder bridge of 111-ft. span, also for the supply of steelwork for the said bridge, for the corporation. Mr. H. Howard Humphreys, 28 Victoria-street, Westminster.

BURNLEY. April 4th. For the completion of the construction of an impounding reservoir, with catchwaters, aqueducts, and meter-houses, for the corporation. Messrs. James Diggle & Son, engineers, Hind Hide-street, Heywood, Lanes.

KEIGHLEY. April 11th. For the construction of a storage reservoir, filter beds, clear water basin, and other appurtenances, for the corporation. Mr. Ratcliffe Barnett, engineer.

Iron and Steel.

MATLOCK. February 28th. For the erection of steel bridges over the river Derwent to carry steel tube sewers, for the urban district council. Messrs. James Diggle & Son, 14 Victoria-street, Westminster, S.W.

MARGATE. March 2nd. For 573 yds. of wrought-iron fencing, with entrance gates, for the corporation. Mr. E. A. Borg, borough surveyor.

WELLINGTON. March 3rd. For the provision of and laying about 5,750 yds. of 3-in. and 2-in. cast-iron water mains, with valves, meters, hydrants, stand-posts, air valves, and other incidental works, for the

rural district council. Messrs. Willcox & Raikes, 63 Temple-row, Birmingham.

NORTH BROMSGROVE. March 3rd. For the supply and erection of three sets of gas engines, and three throw pumps, capable of lifting in the aggregate 20,000 gallons per hour, for the urban district council. Mr. R. Green, 37 Waterloo-street, Birmingham.

SEISDON. March 5th. For laying and jointing about 1,300 lin. yds. of 3-in. cast-iron pipes, including the opening, refilling and maintenance of trenches, for the rural district council. Mr. W. Canman, district surveyor, Wombourn, nr. Wolverhampton.

BEDFORD. March 7th. For the provision and erection of four sets of steam engines and centrifugal pumps, together with all necessary pipe work, for the corporation. Major Tulloch & Haworth, 28 Victoria-street, Westminster, S.W.

CHEPPING WYCOMBE. March 11th. For the supply of galvanised inspection chamber covers, stop-cocks and bilcocks, and wrought-iron steam tubes, for the corporation. Mr. T. J. Rushbrooke, borough surveyor and water engineer.

COVENTRY. March 16th. For the supply of cast-iron pipes, lead pipes, solder, and hydrant and valve boxes, for the Waterworks and Fire Brigade Committee. Mr. J. E. Swindlehurst, water engineer.

MADRAS. March 24th. For the supply of 2,000 cast-iron manhole covers and frames, for the corporation. Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster.

Roads.

WINDSOR. February 28th. For the supply of tarred slag and Leicestershire granite, for the corporation. Borough Surveyor.

MERTHYR TYDFIL. February 28th. For private street works, for the corporation. Borough Surveyor.

TYNEMOUTH. February 28th. For constructing a macadam road, for the corporation. Mr. J. F. Smillie, borough surveyor.

BOLSOVER. February 28th. For the supply of broken granite, basalt, slag, limestone, kerbing, channelling, tar and pitch, for the urban district council. Mr. G. H. Browne, surveyor.

RICCALL. February 28th. For the supply of road materials, for the rural district council. Mr. J. Townend, clerk, 1 Abbey-place, Selby.

EAST RIDING. February 28th. For the supply of 7,000 tons of stone for macadamising purposes, for the county council. Mr. John Bickersteth, clerk, County Hall, Beverley.

HOLBEACH. February 28th. For the supply of granite, granite kerbing, slag, and gravel, for the urban district council. Mr. T. C. Wilders, clerk.

BUCKINGHAM. February 28th. For the supply of granite, granite chippings, and slag, for the rural district council. Mr. Frank L. Reynolds, surveyor.

LOUGHTON. March 2nd. For the supply of Norway granite kerb, for the urban district council. Mr. H. White, surveyor.

BLYTH AND CUCKNEY. March 2nd. For the supply of best broken slag, for the rural district council. Mr. F. Hopkinson, surveyor, 66 Bridge-street, Worksop.

TONBRIDGE. March 2nd. For making up a street, for the rural district council. Mr. F. Harris, engineer and surveyor, Broadway, Southborough, Tunbridge Wells.

CHERTSEY. March 2nd. For making up and draining certain roads, for the rural district council. Mr. H. Beeney, surveyor, West Byfleet.

LICHFIELD. March 2nd. For the supply of granite, slag, chippings, tools, and oil, for the rural district council. The Surveyor.

SOUTH STONEHAM. March 2nd. For the carting of gravel and flint, for the rural district council. E. T. Westlake, clerk, 20 Portland-street, Southampton.

LANCASHIRE. March 2nd. For the hire of steam rollers, for the county council. Mr. W. H. Schofield, county surveyor, Preston.

LANCASHIRE. March 2nd. For the supply of granite macadam, limestone macadam, rubble, chippings, and gravel, for the county council. Mr. W. H. Schofield, county surveyor, Preston.

TILBURY.—March 2nd.—For the supply of broken granite, Kentish rag-stone, hoggin, and coal, for the urban district council.—Mr. S. A. Hill-Willis, engineer and surveyor.

WALTON-UPON-THAMES.—March 2nd.—For the supply of broken granite and broken flints, for the urban district council.—Mr. R. Wilds, surveyor.

TILBURY.—March 2nd.—For private street works in Christchurch-road, northern end of Toronto-road, and northern end of Quebec-road, for the urban district council.—Mr. S. A. Hill-Willis, surveyor.

EAST RETFORD.—March 2nd.—For the supply of slag, granite, refined tar, and Tarvia, for the rural district council.—Mr. T. Henry, surveyor.

MANSFIELD.—March 2nd.—For making up certain streets, for the corporation.—Mr. T. P. Collinge, borough engineer and surveyor.

SAWBRIDGEWORTH.—March 2nd.—For street watering, for the urban district council.—Mr. W. Morris, clerk.

TENTERDEN.—March 2nd.—For the supply of granite, Kent rag-stone, tar, team labour, mason's work, and fodder, for the corporation.—Mr. W. L. C. Turner, borough surveyor.

EAST GRINSTEAD.—March 2nd.—For the supply of materials, for the rural district council.—Mr. F. S. White, clerk.

WEST SUFFOLK.—March 2nd.—For the supply of broken materials, for the county council.—Mr. W. Lionel Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

BARTON-UPON-IRWELL.—March 3rd.—For the supply of setts, kerbs, macadam, flags, and limestone chippings, for the rural district council.—Mr. A. H. Mountain, surveyor.

ROMSEY.—March 3rd.—For tar paving, for the corporation.—Borough Surveyor.

LLANDAFF.—March 3rd.—For flagging footpaths and road widening, for the rural district council.—Mr. J. Holden, surveyor, Park House, 20 Park-place, Cardiff.

DOVER.—March 3rd.—For tarring 25,000 yds. super. of roads, for the rural district council.—Mr. F. G. Sargent, district surveyor.

LEWISHAM.—March 3rd.—For the supply of tarred slag macadam, for the borough council.—Borough Surveyor.

LEWISHAM.—March 3rd.—For the supply of 3,100 tons of tarred slag macadam, for the borough council.—Borough Surveyor.

MIDDLETON.—March 3rd.—For the supply of macadam, setts, kerbs, flags, cement, pipes, pitch, oil, brooms, and castings, for the corporation.—Mr. Frederick Entwistle, town clerk.

CASTLE WARD.—March 3rd.—For the supply of highway materials, for the rural district council.—Mr. D. Hope, surveyor, Ponteland.

PORTLAND.—March 3rd.—For the supply of 2,700 tons of 1½-in. and 2-in. broken granite or basalt, for the urban district council.—Mr. R. Stevenson Henshaw, engineer and surveyor.

RINGHAM.—March 4th.—For the supply of road materials, for the rural district council.—Mr. R. H. Beaumont, clerk.

BRIDLINGTON.—March 4th.—For the supply of 3,500 tons of whinstone and 1,760 tons of slag, for the rural district council.—Mr. J. Haggitt, district surveyor.

POTTERS PURY.—March 4th.—For the supply of granite and slag, for the rural district council.—Mr. J. B. Fairchild, surveyor, Potterspurty, Stony Stratford.

SADDLEWORTH.—March 4th.—For the supply of road materials, for the urban district council.—Mr. E. Rowbotham, clerk.

CUDWORTH.—March 4th.—For the supply of 1,000 tons of tarred slag, 250 tons of granite, and 500 tons of slag, for the urban district council.—Mr. T. Lyman, surveyor.

WARE.—March 4th.—For making up certain streets, for the urban district council.—The Surveyor.

SOKE OF PETERBOROUGH.—March 5th.—For the supply of granite, chippings, local stone, general cartage, and team labour, for the county council.—Mr. A. C. Wallingford, county surveyor, 65 Priet-gate, Peterborough.

GRAVESEND.—March 5th.—For the supply of sea-shell sand and small shingle, for the corporation.—Mr. H. H. Brown, town clerk.

LOUGHBOROUGH.—March 5th.—For the supply of broken granite, for the corporation.—Mr. Albert H. Walker, borough surveyor.

GUISEBOROUGH.—March 6th.—For the supply of tarred slag, ordinary slag, tarred whinstone, ordinary whinstone, and concrete flags, and kerbs, for the urban district council.—Mr. R. H. Kilburn, surveyor.

WORSBOROUGH.—March 6th.—For the supply of broken granite, tarred dross, rough dross, dross-chippings, and limestone asphalt, for the urban district council.—Mr. J. Whitaker, surveyor.

OUNDELE.—March 6th.—For the supply of granite, slag, and tar-macadam, for the urban district council.—The Surveyor.

DROITWICH.—March 6th–7th.—For the supply of granite and slag macadam, for the corporation.—Mr. H. Hulse, borough surveyor.

SOUTH WESTMORLAND.—March 6th.—For road making and other works, for the rural district council.—Mr. J. W. Nelson, surveyor, Kendal.

CLOWN.—March 7th.—For the supply of broken slag and granite, for the rural district council.—Mr. J. T. Pears, surveyor, Hollin Hill, Clown, Chesterfield.

SHEPTON MALLETT.—March 7th.—For the supply of materials, street watering, and cleansing and maintenance, for the urban district council.—Mr. D. Hinchcliffe, surveyor.

EAST SUFFOLK.—March 7th.—For the supply of road materials, for the county council.—Mr. W. Jervis, county road surveyor, County Hall, Ipswich.

BELFORD.—March 7th.—For quarrying, breaking, carting, and laying road materials, for the rural district council.—Mr. T. W. Dodd, surveyor.

MOTTRAM.—March 7th.—For the supply of rock setts, for the urban district council.—Mr. S. Hudson, surveyor.

NEATH.—March 7th.—For making up certain streets, for the rural district council.—Mr. D. M. Davies, engineer.

FAVERSHAM.—March 7th–10th.—For the supply of best hand-broken Guernsey granite and flints, for the rural district council.—Mr. J. G. Chittenden, district surveyor.

WILLINGTON.—March 7th.—For the supply of road metal and cartage, for the urban district council.—Mr. J. H. Gardner, surveyor.

STOCKTON.—March 7th.—For the supply of road metal and cartage, for the rural district council.—Mr. W. Heslop, highway surveyor.

SELBY.—March 7th.—For the supply of road materials, for the rural district council.—Mr. J. Townend, clerk.

SOUTH SHIELDS.—March 7th.—For laying concrete on footways and back streets, for the corporation.—Mr. L. Roseveare, borough engineer and surveyor.

STAFFS.—March 7th.—For the supply of cartage and road materials, for the county council.—Mr. J. Moneur, county surveyor, Stafford.

CORNWALL.—March 7th.—For the supply of materials, hauling, and team labour, for the county council.—Assistant County Surveyor, Clinton-road, Redruth.

BELPER.—March 7th.—For the supply of highway materials, for the rural district council.—Mr. R. C. Cordon, engineer and surveyor, Duffield, near Derby.

HAYES (Middlesex).—March 7th.—For making up certain streets, for the urban district council.—Mr. D. C. Fidler, engineer and surveyor.

DRIFFIELD.—March 7th.—For the supply of whinstone and granite, broken slag, sea cobbles, sea gravel, and tarred chippings, for the rural district council.—Mr. T. Casson Beaumont, surveyor.

BROWNHILLS.—March 9th.—For spraying about 35,000 super. yds. of roads, for the urban district council.—Mr. J. H. Shaw, surveyor.

RYE.—March 9th.—For the supply of materials, for the rural district council.—Mr. L. Amon, highways clerk.

WREXHAM.—March 9th.—For the supply of road-stone, for the rural district council.—Mr. R. C. Roberts, clerk.

WING.—March 9th.—For the supply of 1,200 tons of granite, 1,200 tons of slag, sand, and gravel, for the rural district council.—Mr. M. G. Gurney, surveyor, Linslade, Leighton Buzzard.

LEAMINGTON.—March 9th.—For the supply of 3,000 tons of road stone, for the corporation. Road Surveyor.

MORLEY.—March 9th.—For the supply of broken granite macadam, chippings, Yorkshire flags, and kerbs, for the corporation.—Mr. F. Turner, borough engineer and surveyor.

COLCHESTER.—March 9th. For the supply of Derbyshire stone lime, granite kerbing, granite setts, broken granite, Kettering iron slag, broken Kentish ragstone, Kentish sifted red flints, Portland cement, and sewer and drain pipes, for the corporation.—Mr. A. E. Slater, acting borough surveyor.

EASTLEIGH.—March 10th.—For making up certain streets, for the urban district council.—Mr. W. Wallace Gandy, engineer and surveyor.

UPPINGHAM.—March 10th.—For the supply of broken granite and screenings, for the rural district council.—Mr. F. Oakley, clerk.

ST. THOMAS.—March 10th.—For the supply of materials, for the rural district council.—Mr. J. S. Madge, assistant surveyor, Brooklands, Heavitree, near Exeter.

MAIDSTONE.—March 10th.—For the supply of Guernsey granite, Cornish elvan, or stone of a similar nature, Cherbourg quartzite, tarred ragstone concrete, Portland cement, and ballast (Thames or Colne), for the corporation.—Mr. T. F. Bunting, borough surveyor.

SCULCOATES.—March 10th.—For the supply of stone, Hornsea gravel, land gravel, tarred slag, and asphalt, for the rural district council.—Mr. A. Culkin, surveyor, 113 Alliance-avenue, Hull.

MOUNTAIN ASH.—March 10th.—For the supply of broken mountain limestone, gravel, broken native stone, and haulage, for the urban district council.—Mr. W. G. Thomas, surveyor.

STOKE-ON-TRENT.—March 11th.—For making up certain streets, for the corporation.—Borough Surveyor.

LOFTUS.—March 11th.—For the supply of broken whinstone and slag, for the urban district council.—Mr. J. B. Wormleighton, surveyor.

HESTON.—March 11th.—For the supply of tar and Tarvia, for the urban district council.—Mr. J. G. Carey, Council House, Hounslow.

HARTSMERE.—March 11th.—For the supply of about 2,500 tons of 1½-in. granite, and 1,550 tons of pit stones, for the rural district council.—Mr. Harold Warnes, clerk, Eye, Suffolk.

RYTON.—March 11th.—For making up certain streets, for the urban district council.—Mr. J. P. Dalton, surveyor.

STAINES.—March 12th.—For the supply of quartzite, broken macadam and chippings, ragstone, limestone chippings, tar-macadam, and Tarvia, for the rural district council.—Mr. G. W. Manning, surveyor.

CHESTERTON.—March 12th.—For the supply of 5,000 tons of broken granite, for the rural district council.—Mr. J. Dunn, surveyor, Brunswick House, Cambridge.

CAISTOR.—March 13th.—For the supply of granite and slag, for the rural district council.—Mr. A. A. Padley, clerk.

DORCHESTER.—March 13th.—For the repair of district roads, for the rural district council.—Mr. J. J. Estridge, highway surveyor.

EASTRY.—March 13th.—For the supply of surface and approved dug flints, and steam rolling, for the rural district council.—Mr. F. S. Cloke, clerk.

DURHAM.—March 13th.—For the supply of whinstone slag, tar-macadam, pitch, tar, creosote oil, and cartage, for the rural district council.—Mr. G. Gregson, surveyor.

LEXDEN AND WINSTREE.—March 14th.—For the hire of one or two steam rollers, for the rural district council.—Mr. John Ennals, surveyor, Lexden, Colchester.

DROXFORD.—March 16th.—For the supply of granite or hard stone, for the rural district council.—Mr. A. V. Carter, surveyor.

DARTFORD.—March 16th.—For the supply of road materials, for the rural district council.—Mr. J. Hookins, surveyor, Gartly, Dartford.

POCKLINGTON.—March 16th.—For the supply of best blue stone and slag, for the rural district council.—Mr. T. Robson, clerk.

BISHOP'S STORTFORD.—March 20th.—For the supply of tar in accordance with the Road Board Specification for tar No. 1, for the urban district council.—The Surveyor.

KING'S LYNN.—March 23rd.—For tar spraying roads, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

COVENTRY.—March 23rd. For the supply of broken road stone, granite kerbs, granite setts, stoneware pipes, castings, and workmen's tools, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

KING'S LYNN.—March 27th.—For the supply of road materials, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

DUMBARTON.—(No date).—For the widening of 4 miles of road, for the county council.—Mr. W. Craig, county clerk, County Buildings, Dumbarton.

Sanitary.

HAYWARD'S HEATH.—February 25th.—For the construction of a sewer and manholes, for the urban district council.—Mr. G. Plummer, surveyor.

GRIMSBY.—February 28th.—For scavenging work, for the rural district council.—Mr. J. H. Evans, sanitary inspector.

KNARESBOROUGH.—February 28th—March 3rd.—For laying main sewer, for the rural district council.—Mr. W. Lupton, surveyor, 14 Bower-road, Harrogate.

BURNTISLAND.—February 28th.—For laying pipes for drainage, for the corporation.—Mr. J. A. Waddell, burgh surveyor.

READING.—February 28th.—For works of sewerage and surface-water drainage, for the corporation.—Mr. G. Midgley Taylor, Caxton House, Westminster.

NANTWICH.—March 2nd.—For work of sewer construction, for the urban district council.—Mr. W. F. Newey, surveyor.

SHIPSTON-ON-STOUR.—March 2nd.—For laying 3,632 yds. of 9-in. and 6-in. stoneware pipe sewers, and about 300 yds. of 5-in. cast-iron rising main, also the construction of manholes, lampholes, flushing chambers, engine-house, and other incidental works, for the rural district council.—Messrs. Willeox & Raikes, 63 Temple-row, Birmingham.

COALVILLE.—March 2nd.—For laying 1 mile of 9-in. sewers and 490 yds. of 18-in. sewer, and 300 yds. of 4-in. cast-iron and steel main, for the urban district council.—Mr. L. L. Baldwin, surveyor.

NEWCASTLE-ON-TYNE.—March 2nd.—For the removal of house refuse, for the corporation.—City Engineer.

ROTHERHAM.—March 2nd.—For the removal of nightsoil, for the rural district council.—Mr. B. Hay, surveyor.

WALSALL.—March 2nd.—For removing house refuse, for the rural district council.—Mr. A. H. Lewis, clerk.

KENDAL.—March 2nd.—For concrete work in connection with the extensions to the sewage disposal works, for the corporation.—Mr. F. W. Oxberry, borough engineer.

BUSHEY.—March 3rd.—For laying glazed stoneware pipe sewer, for the urban district council.—The Surveyor.

WATFORD.—March 3rd.—For the re-drainage of certain properties, for the urban district council.—Mr. D. Waterhouse, engineer.

WALLINGTON.—March 5th.—For the removal of refuse, for the Parochial Committee.—Mr. E. J. Gowan, clerk, Katherine-street, Croydon.

MANCHESTER.—March 6th.—For the execution of sanitary alterations, for the corporation.—Manager of the Drainage Department.

BATH.—March 7th—10th.—For the supply of glazed stoneware sewer pipes and gully traps, for the corporation.—Mr. C. R. Fortune, city surveyor.

CASTLEREA.—March 7th.—For sewerage work, for the rural district council.—Mr. C. Mulvany, engineer.

DARTFORD.—March 7th.—For laying stoneware and iron pipes, with manholes, for the rural district council.—Mr. J. E. Goreham, engineer, 65 Highfield-road, Dartford.

WARSOP.—March 9th.—For the removal of house refuse, for the urban district council.—Mr. L. A. Westwick, surveyor, White Hart Chambers, Mansfield.

SANDERSTEAD.—March 10th.—For scavenging work, for the Parochial Committee.—Mr. E. J. Gowan, clerk, Katherine-street, Croydon.

BEDLINGTON.—March 10th.—For cleansing privies and ashpits, for the urban district council.—Mr. R. M. Laverick, inspector.

BIRMINGHAM.—March 10th.—For the construction of brick and pipe sewers, for the corporation.—Mr. H. E. Stilgoe, city engineer and surveyor.

LOFTUS.—March 11th.—For the diversion and relaying of main sewer, for the urban district council.—Mr. B. J. Wormleighton, engineer and surveyor.

PENGE.—March 12th.—For the removal of house and trade refuse, for the urban district council.—The Surveyor.

CHESHAM.—March 14th.—For the reconstruction with cast-iron pipes of about 712 lin. yds. of 12-in., 977 yds. of 9-in., and 935 yds. of 6-in. existing stoneware pipe sewers and house connections with manholes and flushing chambers, for the urban district council.—Mr. Percy C. Dormer, engineer and surveyor.

BENFIELDSDIE.—March 14th.—For the removal of refuse, for the urban district council.—Mr. T. Knox, surveyor, Shotley Bridge.

MADRAS.—March 24th.—For the supply and delivery of 2,000 cast-iron manhole covers and frames, for the corporation.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

Stores.

NUNEATON.—March 3rd.—For the supply of blue bricks, kerbs, coal, slack, disinfectants, soap, earthenware pipes, granite kerbs, setts, iron castings, petroleum, and Portland cement, for the corporation.—Mr. F. C. Cook, borough surveyor.

BATLEY.—March 9th.—For the supply of flagstones, setts, paviers, kerbs, sanitary tubes, pitch, creosote oil, natural pitch or bitumen, cement, broken granite, broken basalt, ironmongery, brushes, and engine oils, for the corporation.—Mr. Oscar J. Kirby, borough engineer.

DERBY.—March 9th.—For the supply of bricks, castings, cement, lime, disinfectants, earthenware, freestone, gritstone, granite, gravel, sand, limestone, pitch, tar and slag, for the corporation.—Mr. John Ward, borough surveyor.

COLNE.—March 10th.—For the supply of Lancashire and local setts, flags, kerbs, channels, Portland cement, granite macadam, limestone macadam, lime, ironwork, pitch, creosote oil, earthenware pipes, gullies, brushes, manholes, and lamphole covers, for the corporation.—Mr. T. H. Hartley, borough surveyor.

EASTBOURNE.—March 11th.—For the supply of cast-iron goods, wrought-iron goods, tools, ironmongery, oils and colours, timber, broken granite, granite kerb and setts, bricks, pipes, junctions (stoneware), brooms, and brushes, for the corporation.—Mr. A. Ernest Prescott, borough surveyor.

EXETER.—March 11th.—For the supply of bricks, bass brooms, refilling stocks of sweeping machine, Portland cement, building lime and slates, cast-iron pipes, granite channelling, kerb, Yorkshire flags, concrete flags, painting and paperhanger's work, stoneware pipes, iron castings, stone, sand, timber, ironmongery, oils, plumber's material and labour, asbestos goods, and baskets, for the corporation.—City Surveyor.

EAST HAM.—March 14th.—For the supply of glazed stoneware pipes, gully fittings, Portland cement, grey stone, chalk, blue lias lime, lime for sewage precipitation, bricks, coal, coke, engineers' sundries, broken granite, crushed granite, granite setts, granite chippings, granite kerb, channelling, broken flints, cast-iron work, shovels, brooms, picks, handles, disinfectants, hire of horses, paving flags, sewer ventilating columns, uniforms, and redressing setts (labour only), for the corporation.—Mr. C. Eustace Wilson, town clerk.

GREAT CROSBY.—March 16th.—For the supply of granite macadam and chippings, limestone chippings, tarred limestone macadam, Portland cement, stone-

ware pipes, disinfectants, pitch and tar, incandescent mantles and chimneys, glass for street lamps, horse provender, granite setts, extra cart hire, and horsing fire brigade, for the urban district council.—Mr. Joseph A. Wright, surveyor.

SUTTON COLDFIELD.—March 16th.—For the supply of granite macadam, kerb, limestone macadam, setts, gravel, broken pebble stones, Yorkshire or Pennant kerb, Rowley setts, earthenware pipes, cement, lime, iron castings, iron, steel, timber, hardware, oils, paints, and bass brooms, for the corporation.—Mr. W. A. H. Clarry, borough engineer and surveyor.

GAINSBOROUGH.—March 18th.—For the supply of broken granite or whinstone granite or whinstone setts, broken and block slag, slag chippings and dust, York setts, kerbs, channels and flags, concrete flags, stoneware and earthenware pipes, gullies, cast-iron pipes, tar-macadam, pitch and creosote oil, Portland cement, and coal, for the urban district council.—Mr. Sam. W. Parker, engineer and surveyor.

HEYWOOD.—March 21st.—For the supply of setts, kerbs, flags, earthenware pipes, bends, junctions, taper pipes, traps, gullies, pitch, creosote oil, limestone chippings (white), hand-broken granite, granite chippings, and Portland cement (English), for the corporation.—Mr. J. B. Nuttall, borough surveyor.

Miscellaneous.

KENT.—February 28th.—For the supply of six petrol-driven motor lorries, the bodies to be constructed of steel with end tipping gear, and capable of carrying a load of 5 cub. yds., for the county council.—County Surveyor, Maidstone.

BEDFORD.—March 7th.—For the provision and erection of electrically driven centrifugal pumps, comprising four single-phase 2,000-volt electric motors, coupled direct to four centrifugal pumps, together with float actuated automatic starting gear, high-tension and other switchgear, and electrical connections, for the corporation.—Major Tulloch & Haworth, 28 Victoria-street, Westminster, S.W.

BARNES.—March 9th.—Offers are invited for a Merryweather double-cylinder "Greenwich" steam fire engine complete with all fittings.—Mr. G. Bruce Tomes, surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

ALSAGER.—For making up a private street, for the urban district council.—Mr. H. V. Lynam, surveyor:—
J. Taylor & Son, Stoke-on-Trent † £142
F. Barke & Son, Stoke-on-Trent † 96
Emery & Co., Birmingham 95
S. Morris, Alsager 75

DUBLIN.—For the supply of street lamp pillars and brackets, for the corporation.—Mr. Henry F. Cotton, superintendent of lighting, Dublin:—
Hammond, Lane Co., Dublin. †
J. & C. McLaughlin.
Carron Co., Falkirk.
Edison & Swan Co., Dublin.
W. Gregg, Son & Phoenix, Belfast.
Ross & Walpole, Dublin.
W. Lucy & Co., Oxford.
Electric Street Lighting Company, London.
Drake & Gorham, London.
British Thomson-Houston Co.

GOSPORT.—For house drainage work, for the urban district council.—Mr. H. Frost, surveyor:—
— Dash, Gosport, £232.

MALDON.—For the construction of 400 yds. of 9-in. sewer, with manholes, for the rural district council.—Mr. W. Almond, surveyor:—
W. Lingwood, junr., Romford .. £251
G. Wakeling, Grays .. 234
F. Stammers, Southminster 223

PORT GLASGOW.—Accepted for paving, tar-macadam and other work, for the corporation:—
F. Flaherty, Falkirk.

RUSHDEN.—Accepted for the erection of working-class dwellings, for the urban district council.—Mr. W. B. Madin, surveyor:—
Houses of the Type "A" Class.—R. Marriott, Rushden, £5,775.
Houses of the Type "C" Class.—W. Thompson, Irthlingborough, £2,053.

TODMORDEN.—For the construction of cast-iron pipes and fireclay pipe sewers, for the rural district council.—Messrs. C. H. Marriott, Son & Shaw, Dewsbury:—
Oldfield Watson, Hebden Bridge, £2,585.

The Event of 1914.

GREAT MANCHESTER BUILDING TRADES EXHIBITION

City Exhibition Hall, Manchester.

March 3rd to March 14th.

WORKING EXHIBITS and all the latest Inventions and Appliances for the Building Trade.

SPECIAL DAYS (March 5 and March 11, between 11 a.m. and 4 p.m.) have been set apart for Architects, - Borough Surveyors, Borough Engineers, &c. -

The Public will be excluded on these days.

A Visit Would Well Repay You

Managers: WALTER CAWOOD, Ltd., 196 Deansgate, Manchester.

THURNSCOE.—For the erection of stables, outbuildings, and temporary offices, for the urban district council.—Mr. T. Bull, surveyor:—

T. Gray & Sons, Sheffield	£425
E. E. Dickinson, Bolton-upon-Dearne	399
R. Hann, Thurnscoe	386
Smith, Heywood & Co., Shepley	385
Shepard Brothers, Doncaster	379
S. Burton & Co., Barnsley	367

WHARFEDALE.—Accepted for the erection of diphtheria pavilion, and additions to administration block at isolation hospital, for the Joint Hospital Committee:—

Plumber.—Suttle & Sons, Otley, £391.
Joiner.—Greenhow & Murgatroyd, Keighley, £544.
Plasterer.—A. Firth, Leeds, £340.
Mason.—J. Renwick & Son, Otley, £1,490.
Slater.—J. Richardson & Son, Leeds, £177.

WIDNES.—For alterations and additions to the accident hospital, for the corporation.—Mr. J. Sinclair, borough surveyor:—

J. Beech, Widnes.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

FEBRUARY.

28.—Junior Institution of Engineers: Annual Dinner. Holborn Restaurant. 6.30 p.m.

MARCH.

- 2.—Society of Engineers: Mr. T. J. Gueritte, M.Soc.C.E. (FRANCE), on "Esperanto: An International Language for Engineers." Institution of Electrical Engineers, 8 p.m.
- 3.—Opening of Eighth Manchester Building Trades Exhibition.
- 4.—Institute of Sanitary Engineers: Mr. J. E. Farmer on "Sewage Disposal and Works Management." 8 p.m.
- 21.—Institution of Municipal and County Engineers: North-Eastern District Meeting at Wakefield.
- 21.—Institution of Municipal and County Engineers: South-Western District Meeting at Taunton.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

STOURBRIDGE URBAN DISTRICT COUNCIL.

The above Council invite applications for the post of Assistant to the Surveyor, at a salary of £60 per annum.

List of duties will be supplied on application to the undersigned.

Applications, in candidate's own handwriting, stating age, and accompanied by three testimonials, endorsed "Assistant," to reach the undersigned not later than noon, the 9th day of March.

FREDK. WOODWARD,
Surveyor.

The Town Hall,
Stourbridge.
February 21, 1914. (1,351)

CITY OF SHEFFIELD.

TO QUANTITY SURVEYORS.

Applications are invited for the post of Assistant Quantity Surveyor in the City Architect's Department.

Salary £150, increasing by £10 per annum to £180.

Form of application may be obtained by communicating with the undersigned.

F. E. P. EDWARDS,
City Architect.

Town Hall,
Sheffield.
February 24, 1914. (1,362)

KNARESBOROUGH URBAN DISTRICT COUNCIL.

SURVEYOR AND INSPECTOR OF NUISANCES.

The above Council are prepared to receive applications for the combined office of Surveyor and Inspector of Nuisances for their district, at an annual salary of £55 as Surveyor and £70 as Inspector.

The person appointed will be required to perform all the duties usually attaching to the office of Surveyor of Highways; prepare plans for the Council; keep the necessary books and accounts; and superintend the carrying out of drainage and sewerage works. As Inspector he will have to perform all the duties imposed upon Inspector of Nuisances by the

Public Health Act, 1875, and subsequent Acts, and by the Orders of the Local Government Board, and also act as Inspector under Dairies, Cowsheds, and Milkshops Orders; and the Housing and Town Planning Act, 1909; devote the whole of his time to the performance of his duties, and reside in the house belonging to the Council, at a rental.

The appointment as Inspector will be for one year, and subject to the approval of the Local Government Board. The Surveyorship subject to two months' notice on either side.

Applications, in candidate's own handwriting, stating age and qualifications, with copies of two testimonials of recent date, must reach me, the undersigned, on or before Thursday, 5th day of March next. Notice will be sent to any candidate required to attend before the Council. Canvassing, either directly or indirectly, will be deemed a disqualification.

(Signed) THOMAS MAINMAN,
Clerk to the above Sanitary Authority.
February 21, 1914. (1,366)

MADRAS CORPORATION, INDIA.
WANTED—ASSISTANT WATERWORKS ENGINEER.

The President, Corporation of Madras, invites applications for the appointment of a Waterworks Assistant to the Special Engineer (J. W. Madeley, Esq., M.A., M.INST.C.E., M.A.M.SOC.C.E., &c.).

The duties will be to assist the Special Engineer in the design, construction and maintenance of works connected with the Water Supply Distribution System of the City of Madras, especially cast-iron main laying and the installation and working of waste water meters.

The salary will be Rs.500 (£33 6s. 8d.) per mensem. An allowance of Rs.30 (£2) per mensem will be paid to the Officer appointed so long as he maintains and uses on the work a first-class motor bicycle in good running order. No other allowance of any kind will be made.

Before sailing for Madras the successful candidate will be required to sign a three years' Agreement, to be prepared by the Corporation. By mutual consent the appointment may be extended for a further period.

The Corporation reserves the right to determine the appointment at any time by three months' notice in writing, or by payment of one month's salary.

The Officer appointed will be allowed ordinary first-class railway fares and second-class steamship passage to Madras, via Marseilles and Bombay, by P. and O. steamer. A like class return free passage will be granted on the termination of the appointment, subject to satisfactory service, according to the conditions of the Agreement. Half-pay will be granted on the voyage out from the date of leaving England.

Leave will be granted on full pay to the extent of one month for every eleven months of active service, but for not more than three months at a time.

Preference will be given to candidates who have had experience in the design and maintenance of water-pipe distribution systems, including detection and prevention of waste by waste water prevention meters, stethoscopes, and other means.

Applicants must not be more than 35 years old, and copies of certificates of age, testimonials and medical certificate of fitness for service in India must be enclosed with the applications, which must reach the undersigned not later than 11th March, 1914.

The applications will be sent out to Madras, where the selection will be made by the President of the Corporation.

The President reserves the right of rejecting all applications without giving reasons.

The Officer appointed will be required to commence his duties in Madras not later than eight weeks after he has received notification of the acceptance of his application.

Applications must be in writing, and should be sent to the undersigned in envelopes superscribed "Waterworks Assistant."

JAMES MANSERGH & SONS,
Agents to the Corporation
of Madras.

5 Victoria-street,
Westminster,
London, S.W.
February 19, 1914. (1,371)

COUNTY BOROUGH OF HALIFAX. SURVEYOR'S JUNIOR ASSISTANT.

Applications are invited for the appointment of a Junior Assistant in the Borough Engineer's Department, at a salary of £78 per annum.

Preference will be given to candidates with experience in the routine duties of a Municipal Engineer's Office, of Private Street Improvement Works, and of Sewer Construction.

Applications, in candidate's own handwriting, stating age and experience, enclosing copies of not more than three recent testimonials, and endorsed "Surveyor's Assistant," must be sent to the undersigned not later than Saturday, 7th March, 1914.

PERCY SAUNDERS,
Town Clerk.

Town Hall, Halifax.

February 20, 1914.

(1,360)

SCUNTHORPE URBAN DISTRICT. APPOINTMENT OF ENGINEER AND SURVEYOR.

The Scunthorpe Urban District Council invite applications for the position of Engineer and Surveyor to the Council. Salary £200 per annum.

Applicants must have had practical experience in the works usually undertaken by an Urban Authority, including Waterworks (electrically driven), Markets, Slaughter-house, Fire Appliances, &c., Private Street Works, Highways, Sewers, Sewerage Works, and Sanitary Works of every description; and must be competent to prepare Plans, Drawings and Quantities for Municipal Works or Buildings, and perform all the ordinary duties of a Surveyor of Highways.

Applications, in candidate's own handwriting, stating age and experience, and enclosing copies of not more than three testimonials, must be sent to the undersigned not later than Monday, the 2nd day of March, 1914.

Further particulars of duties and terms of engagement supplied on application.

H. M. HETT,
Clerk to the Council.

18A High-street,
Scunthorpe, Lincolnshire.

(1,330)

THE ROYAL BOROUGH OF KENSINGTON. APPOINTMENT OF RESIDENT MANAGER AT WOOD-LANE DEPOT.

The Council of the above Borough require the Services of a Competent Manager to take sole charge, under the direction of the Borough Engineer, of the Council's Refuse Destructor, Clinker Block-making Installation, and the Works generally at the Wood-lane Depot, Shepherd's Bush. Candidates must be between 30 and 40 years of age, and should have had practical experience in connection with the working of installations of a similar nature, have a practical knowledge of steam plant, and be conversant with the general duties of a manager of works.

The salary attaching to the position will be at the rate of £160 per annum, rising by conditional annual increments of £10 to a maximum of £200 per annum, with house and allowance of coals and lighting.

The appointment will be subject to the provisions of the Kensington Borough Council (Superannuation) Act, 1907, under which percentage deductions are made from all salaries and emoluments.

Application must be made in the candidate's own handwriting on printed Forms to be obtained at my Office, and must be delivered to the undersigned, accompanied by copies of not more than three testimonials of recent date, not later than four o'clock in the afternoon of Tuesday, March 17th, 1914.

Personal canvassing of any Members of the Council will be a disqualification.

(By order)

WM. CHAMBERS LEETE,
Town Clerk.

Town Clerk's Office,
Town Hall,
Kensington, W.

February, 1914.

(1,354)

TRAVELLER wanted to sell Bitumen Damp-course Sheeting to Builders in the South of England on commission, as an additional line.—Write, with full particulars, to Box 1,383, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

WANTED, at once, a fully qualified Surveyor, or an Architect with a full knowledge of surveying to take charge of some Garden City developments.

Applicants must be over 30 years of age, must be fully qualified to deal with all questions of Estate development, must have a thorough knowledge of plans, must be able to make surveys and measure up for certificates. Commencing salary £200 per annum.

Apply by letter only, stating age, full details of experience, and enclosing copies only of three recent testimonials, to

WELSH GARDEN CITIES, LTD.,

(1,361)

3 Dumfries-place, Card ff.

A GENT ENGINEER required at once for Railway Contract, must be a first-class man with thorough knowledge of railway work and cost. Reply, with not more than three recent testimonials, stating salary expected, &c., to J. W. Pearce & Co., Limited, Contractors, Barrow-in-Furness.

E NGINEER AND SURVEYOR to District Council has a vacancy for Articled Pupil. Water and Sewerage Works, and good general experience.—Box 1,386, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,370)

S URVEYOR AND ENGINEER to a large Rural District Council (with main roads) has a vacancy for a pupil. Low premium.—Apply Box 1,382, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,345)

APPOINTMENTS WANTED.

E XPERIENCED Quantity Surveyor desires work; good references; moderate terms.—Address Box 1,385, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, London, E.C. (1,368)

(Continued on p. xxix.)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1056) subject to later confirmation by letter.

CITY OF EXETER.

The Exeter City Council invite Tenders for the Supply and Delivery of the following Goods for twelve months ending 31st March, 1915:—

- (1) Bricks.
- (2) Bass Brooms and Refilling Stocks of Sweeping Machine.
- (3) Portland Cement.
- (4) Building Lime and Slates.
- (5) Cast-iron Pipes.
- (6) Granite Channelling and Kerb.
- (7) York Stone Flags.
- (8) Concrete Flags.
- (9) Painting and Paperhanger's Work.
- (10) Stoneware Pipes.
- (11) Miscellaneous Iron Castings.
- (12) Stone and Sand.
- (13a) Timber (Foreign).
- (13b) Timber (English).
- (14) Ironmongery.
- (15) Oils.
- (16) Plumbers' Material and Labour.
- (17) Asbestos Goods.
- (18) Maunds or Baskets.

Printed Schedule, Specification, and Forms of Tender can be obtained from the City Surveyor, Municipal Offices, Exeter. Tenders may be submitted for all or any of the Articles required, and the Council reserve the right to accept a portion of a Tender only.

Sealed priced-out Schedules, endorsed with the heading to which the Tender applies, must be sent to me before 10 a.m. on Wednesday, the 11th March, 1914.

The lowest or any Tender will not necessarily be accepted.

(1,357)

H. LLOYD PARRY,
Town Clerk.

GREAT CROSBY URBAN DISTRICT COUNCIL.

The above Council are prepared to receive Tenders for the Supply of the following Materials during the year ending March 31st, 1915, in such quantities and at such times as may be ordered:—

1. Granite Macadam and Chippings.
2. Limestone Chippings.
3. Tarred Limestone Macadam.
4. Portland Cement.
5. Stoneware Pipes, &c.
6. Disinfectants.
7. Pitch and Tar.
8. Incandescent Mantles and Chimneys.
9. Glass for Street Lamps.
10. Horse Provender.
11. Granite Setts.
12. Extra Cart Hire.
13. Horsing Fire Engine.

Specifications can be obtained from Mr. Joseph A. Wright, Surveyor, Council Offices, Coronation-road, Great Crosby.

Sealed and endorsed Tenders to be delivered to the Council Offices by noon on Monday, March 16th, 1914, addressed to the "Chairman of the Council."

The lowest or any Tender not necessarily accepted.

JOSIAH DEAN,
Clerk to the Council.

February 21, 1914. (1,359)

BOROUGH OF SUTTON COLDFIELD. ANNUAL CONTRACTS.

The Corporation are prepared to receive Tenders for the Supply of the following Materials during the year ending March 31st, 1915:—

- Form No.
1. Granite Macadam and Kerb.
 2. Limestone Macadam and Setts.
 3. Gravel and Broken Pebble Stones.
 4. Yorkshire or Pennant Kerb.
 5. Rowley Setts.
 6. Earthenware Pipes.
 7. Cement and Lime.
 8. Iron Castings.
 9. Iron and Steel.
 10. Timber.
 11. Hardware.
 12. Oils and Paints.
 13. Bass Brooms.

Conditions of Contract and Forms of Tender may be obtained on application to the undersigned.

Sealed Tenders, only on the Forms supplied, to be sent in not later than Monday, March 16th, 1914, endorsed "Tender for Materials."

The Corporation do not bind themselves to accept the lowest or any Tender.

W. A. H. CLARRY, ASSOC. M. INST. C. E.,
Borough Engineer and Surveyor.

The Council House,
Sutton Coldfield.
February 24, 1914. (1,365)

COUNTY BOROUGH OF EASTBOURNE.

The Town Council of Eastbourne invite Tenders as follows:—

- For the Supply of—
- Portland Cement.
 - Cast-iron Goods.
 - Wrought-iron Goods.
 - Tools, &c.
 - Ironmongery (Miscellaneous).
 - Oils and Colours.
 - Timber.
 - Broken Granite.
 - Granite Kerb and Setts.
 - Bricks.
 - Pipes, Junctions, &c. (Stoneware).
 - Brooms, Brushes, &c.

Specifications may be seen, and Form of Tender obtained at the Borough Surveyor's Office, Town Hall, Eastbourne.

All Tenders must be received by the undersigned on or before Wednesday, the 11th day of March, 1914, at noon.

No Tender will be considered unless sent in on the proper Form.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
A. ERNEST PRESCOTT,
Borough Surveyor.

Dated this 25th day of February, 1914. (1,353)

BISHOP'S STORTFORD URBAN DISTRICT COUNCIL.

TENDERS FOR TAR.

The above Council are prepared to receive Tenders for the Supply during the coming season of Tar, in accordance with the Road Board Specification for Tar No. 1.

The approximate quantity required will be 15,000 gallons, but the Contractor must agree to supply any greater or less quantity at the price quoted per gallon.

Tenders must be made upon the Official Form, which, with a copy of the Specification, can be obtained from the Surveyor to the Council at this address, and must be delivered to me, the undersigned, not later than 4 o'clock p.m. on Friday, the 20th day of March, 1914, in sealed envelopes marked "Tender for Tar."

The Council do not bind themselves to accept the lowest or any Tender.

CECIL J. HANCOX,
Clerk of the Council.

Council Offices,
Bishop's Stortford.
February 25, 1914. (1,364)

BOROUGH OF HEYWOOD.

The Corporation of this Borough are prepared to receive Tenders from persons willing to Contract for the Supply of the following Materials for a period of 12 months ending 31st March, 1915:—

- Setts, Kerbs (Haslingden).
- Flags (Haslingden).
- Earthenware Pipes, Bends, Junctions, Taper Pipes, Traps, and Gullies.
- Pitch and Creosote Oil.
- Limestone Chippings (White).
- Hand-broken Granite and Granite Chippings.
- Portland Cement (English Manufacture).

Samples and Specifications may be seen, and Form of Tender obtained, on application to Mr. J. B. Nuttall, Borough Surveyor. Applications to be made before the 7th March.

Contractors tendering for this work must pay their workpeople at least the standard or trade union rate of wages, and observe the trade conditions which attach to the various kinds of work for which Tender is sent in.

Sealed Tenders must be delivered at my Office not later than Saturday, the 21st March, endorsed in accordance with the Specification.

The Corporation do not bind themselves to accept the lowest or any Tender.

(By order)
GEO. G. BOUCHIER,

(1,358) Town Clerk.

BOROUGH OF COLNE.

The Highways and Streets Committee of the Borough of Colne are prepared to receive Tenders for the Supply and Delivery of the following Materials for the twelve months ending 31st March, 1915:—

- Lancashire and Local Setts, Flags, Kerbs, and Channels.
- Portland Cement.
- Granite Macadam.
- Limestone Macadam.
- Lime.
- Ironwork (Street Grates, Manhole and Lamp-hole Covers).
- Pitch.
- Creosote Oil.
- Earthenware Pipes and Gullies.
- Brushes.

Specifications and Forms of Tender and other information may be obtained on application at the Office of the Borough Surveyor, Mr. T. H. Hartley, and Tenders to the Chairman of the Highways and Streets Committee, properly endorsed, must be delivered at his Office not later than 10 a.m. on March 10th, 1914.

The Committee do not bind themselves to accept the lowest or any Tender, and persons tendering must do so at their own cost.

(By order)
ALF. VARLEY,
Town Clerk.

Town Hall,
Colne, Lancs.
February 24, 1914. (1,363)

HARTISMERE RURAL DISTRICT COUNCIL.

GRANITE AND PIT STONES.

The above-named Council invite Tenders for the Supply of about 2,500 tons of 1½-in. Granite, and 1,550 tons of Pit Stones, to be delivered as required at the following Stations:—

Diss, Eye, Finningham, and Mellis, on the Great Eastern Railway; Aspell, Mendlesham, and Brockford, on the Mid-Suffolk Light Railway.

Samples of Materials to be sent, carriage paid, to the Master of the Workhouse, Eye.

Tenders to be sent to the undersigned not later than Wednesday, the 11th March, 1914. *No Form of Tender is issued.*

The Council do not bind themselves to accept the lowest or any Tender.

HAROLD WARNES, Solicitor,
Clerk to the Council.

Eye, Suffolk.

February 24, 1914.

(1,367)

CITY OF COVENTRY.

WATERWORKS STORES (CAST-IRON PIPES, LEAD PIPES, SOLDER, &c.).

The Waterworks and Fire Brigade Committee of the Corporation of the City of Coventry invite Tenders for the Supply and Delivery of Cast-iron Pipes, Lead Pipes, Solder, Hydrant and Valve Boxes, &c., for the year ending 31st March, 1915.

Form of Tender and full particulars may be obtained, and Samples inspected, on application to the undersigned.

Tenders are to be delivered at the Water Engineer's Office, St. Mary's Hall, Coventry, on or before Monday, the 16th day of March, 1914, sealed and endorsed "Tender for Waterworks Stores."

The lowest or any Tender will not necessarily be accepted, and no Tender will be considered which is not made out on the Form supplied.

J. E. SWINDLEHURST, M.INST.C.E.,
Water Engineer.

St. Mary's Hall,
Coventry.

February 23, 1914.

(1,355)

CITY OF COVENTRY.

CONTRACT FOR MATERIALS.

The General Works Committee of the Corporation of the City of Coventry invite Tenders for the Supply and Delivery of the following Materials during the year ending 31st March, 1915:—

Broken Road Stone.
Granite Kerbs.
Granite Setts.
Stoneware Pipes.
Castings.
Workmen's Tools.

Form of Tender and full particulars may be obtained, and Samples inspected, on application to the undersigned.

Tenders to be delivered at the City Engineer's Office, St. Mary's Hall, Coventry, on or before Monday, the 23rd day of March, 1914, sealed and endorsed "Tender for Materials."

The lowest or any Tender will not necessarily be accepted, and no Tender will be considered that is not made out on the Form supplied.

J. E. SWINDLEHURST, M.INST.C.E.,
City Engineer and Surveyor.

St. Mary's Hall,
Coventry.

February 23, 1914.

(1,356)

BOROUGH OF MAIDSTONE URBAN DISTRICT COUNCIL.

TO STONE MERCHANTS, QUARRYMEN AND OTHERS.

The above Authority is prepared to receive Tenders for the Supply of Road Materials, &c., according to the Schedule mentioned below.

Specifications, Forms of Tender, and all other information may be obtained on application at the Office of the Borough Surveyor, Mr. T. F. Bunting, at the Fair Meadow, Maidstone.

Sealed Tenders, which will only be received on the Forms supplied, endorsed "Tender for the Sup-

ply of —," must be delivered at my Office not later than Tuesday, March 10th, 1914.

Samples of the Materials which it is proposed to supply must be sent to the Office of the Borough Surveyor by the same date, carriage paid.

The Council do not bind themselves to accept the lowest or any Tender.

S. LANCE MONCKTON,

Town Clerk.

Maidstone.

February 20, 1914.

Schedule of Materials:—

Guernsey Granite.
Cornish Elvan or Stone of a similar nature.
Cherbourg Quartzite.
Tarred Ragstone Concrete.
Portland Cement.
Ballast (Thames or Colne). (1,344)

EAST HAM CORPORATION.

ANNUAL SUPPLIES.

The East Ham Corporation invite Tenders for the aftermentioned Supplies, and for Executing the following Work, for the period ending the 31st March, 1915, except where otherwise mentioned:—

Glazed Stoneware Pipes.
Glazed Stoneware Gully Fittings (London Make).
Portland Cement.
Grey Stone, Chalk and Blue Lias Lime.
Lime for Sewage Precipitation.
Stock and other Bricks, &c.
Thames Ballast, Sand, &c.
Coal and Coke.
Engineer's Sundries (Oils, Colours, Painter's Brushes, Ironmongery, &c., for Borough Engineer's Department).
Engineer's Sundries (Ironmongery, Painter's Requisites, Brushes, &c., for Electric Lighting and Tramways Department).
Broken Granite.
Crushed Granite.
Granite Setts.
Guernsey and other Granite Chippings.
Granite Kerb and Channelling.
Broken Flints.
Cast-iron Work, Gullies, &c.
Shovels, Brooms, Picks and Handles.
Disinfectants.
Oilskins.
Hire of Horses and Carts for Watering Streets.
Hire of Horses and Carts for General Cartages.
Hire of Horses and Carts for Seavenging.
Hire of Horses and Carts for Collection of House Refuse.
Uniforms for Firemen, &c.
Uniforms for Tramway Employees.
Sewer Ventilating Columns.
Paving Flags.
Boots, Sewer Smocks, &c.
Veterinary Attendance on and Shoeing Horses.
Provender.
Reglazing and Repair of Street Lamps.
Jarrah Wood Blocks.
Receiving, Sorting and Levelling Refuse at Destructor Works.
Removal of Tinware from Destructor Works.
Redressing of Setts (Labour only).
Particulars and Forms of Tender may be obtained upon application at the Office of the undersigned, or by forwarding an addressed envelope (foolscap size), duly stamped.

The person or persons whose Tender is accepted will be required to observe and fulfil the obligations upon Contractors specified in the Fair Wages Resolution adopted by the House of Commons on the 10th March, 1909, which is fully set forth in the Form of Tender, and to enter into a Contract with a Bond for the due performance thereof.

Tenders to be sent in addressed to His Worship the Mayor, Town Hall, East Ham, E., and endorsed according to the supply or work tendered for, not later than 12 o'clock noon of Saturday, the 14th day of March, 1914.

The Corporation does not bind itself to accept the lowest or any Tender.

(By order)

C. EUSTACE WILSON,

Town Clerk.

Town Hall,

East Ham, E.

February 24, 1914.

(1,369)

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

MARCH 6, 1914.

No. 1,155.

Minutes of Proceedings.

Severity Factors and Traffic Statistics.

In the correspondence columns of last week's issue we printed a letter from Major W. W. Crosby, chief engineer of the Maryland State Roads Commission, on the subject of traffic statistics and severity factors. We consider that this is a very important communication, since it presents, in forcible terms, the main arguments in favour of the adoption of a rational schedule of severity factors for different classes of vehicles, by the use of which the traffic statistics of different areas and different countries could be compared. We understand that Major Crosby does not think that the schedule so far adopted by the Road Board meets all requirements, and we take it that in commending our treatment of the subject on p. 156 of our Special Annual Issue he is inclined to support our view as to the need for taking into consideration the type of road crust as well as the type of vehicle. It may be contended, in opposition to our view, that if we had a suitable schedule of severity factors for vehicles the different effects upon different kinds of road crust would provide us with a measure of the merits of those crusts. This might be the case if the severity factors were promulgated as the result of superhuman intelligence, and represented the true averages of the effects on all kinds of roads. Practically, we might approximate to such a result by many years of experience, during which we assigned different "liability" or "endurance" factors to the different crusts. In this period, which now is before us, we should, it is here contended, obtain comparable results only by taking into consideration the main factors of each area. Results are not to be made comparable by the assumption that the "severity" of the vehicle is the same on all roads and in all climates. A typical schedule could, of course, be drawn up, but it should be specifically stated that it applied to a certain kind of road in a particular climate. This typical schedule could then be altered to suit local conditions and different kinds of roads, and the final procedure would either be to continue the use of revised local schedules or, if it were believed that an average schedule could be drawn up, this could be done, and the merits of different kinds of road crust and pavement would then be more or less measured by the relation of wear to total severity. Alternatively, the schedule adopted might be drawn up as the result of the behaviour of the most efficient and economical crust, the best crust, for each kind of vehicle. Such a schedule cannot, however, be drawn up beforehand—it is an impossible task.

We know very well that highway engineers would like to be able to compare the costs of

different road systems in relation to the traffic. This cannot be done, because the severity factors would be arbitrary, and would favour one locality as compared with the other. There are at present only two things which can be attempted with any hope of success. First, we may compare tonnages, or tonnages modified by "importance" factors, and use these tonnages of total traffic, in their relations to the costs of construction and maintenance, as measures of the combined efficiency of the roads and of the vehicles which run on them. This would enable us to compare the highway efficiency of one country with that of another country. Secondly, we may assign severity factors to the vehicles and endurance factors to the roads, and compare the efficiency of different areas by noting the tonnage, or importance-tonnage, carried in proportion to the average severity-endurance factor per mile. This is, in some respects, better than comparing costs, since prices of materials and labour differ greatly in different areas. Merely to enumerate the vehicles and assigning different endurance factors to different *crusts*, to let them take their chances as to the characters and weights of the vehicles running over them, would be no more illogical than is the procedure adopted in assigning severity factors to different *vehicles* and letting them take their chances as to the nature of the crusts traversed. We admit that the latter method provides the best rallying point, but we do not see how an arbitrary set of severity factors can be a measure of complex and often obscure phenomena, and we believe that the considerations which are set forth in this note provide the best basis for common action. This is a difficult subject, beset with subtleties which do not yield to forcible methods of attack, and we should be glad to know the views of our British and American readers as to the main points which we have endeavoured to express here and in the "Highways" article in our issue of January 30th.

* * *

Sludge Disposal.

On a recent occasion we dealt with this subject in connection with the presidential address to the Institute of Sanitary Engineers by Mr. J. D. Watson, M.INST.C.E., engineer to the Birmingham, Tame and Rea District Drainage Board. In the same week, on January 15th, the chemist to the same board, Mr. F. R. O'Shaughnessy, F.I.C., read before the Birmingham section of the Society of Chemical Industry a paper in which he described in detail the methods which have been adopted in recent years in dealing with the sludge produced at the works for which Mr. Watson is responsible. Managers of smaller sewage works may consider

that they are called upon to undertake impossible tasks in dealing with their sludge without causing a nuisance from smell, but what would they do with 4,860 cub. yds. of sludge containing 86.6 per cent of water, which is produced *every week* at the Saltley works at Birmingham? Yet this is the quantity with which Mr. Watson and his staff have to deal, and which they have satisfactorily treated during the past two years by the method indicated in the title of Mr. O'Shaughnessy's paper, "The Utilisation of the Phenomena of Putrefaction, with Special Reference to the Treatment and Disposal of Sewage Sludge."

Briefly, the sludge is first settled out in fine primary sedimentation tanks, with a total capacity of about one-sixth of the daily flow of 30,000,000 gallons, the passage of the sewage through these tanks occupying about four or five hours. Each of these tanks runs for two to three weeks, when it is put out of operation; the supernatant water is drawn off, and the sludge is pumped into the primary sludge digestion tanks. In two days the sludge begins to ferment vigorously, and after a fortnight the action slows down. A portion of the sludge is then pumped into the secondary digestion tanks, where further vigorous action takes place. A question was asked in the course of the discussion as to the reason why sludge which appeared to be "worked out" in the primary digestion tanks should show renewed activity when pumped into the second digestion tanks? The author's theory was that after a time the bulk of the solid matter in the sludge settled to the bottom of the primary digestion tanks, and that the fermentative action was stopped by the accumulation of the products of putrefaction immediately over it, so that when it was pumped a second time the whole mass became thoroughly mixed, and the organisms were again capable of acting vigorously. This seems quite feasible, but in any case the actual result was as stated, and it was estimated that the effect of the second pumping and further digestion of the sludge was the reduction of the time required for maturing by five or six weeks. Eventually the worked-out sludge from the secondary digestion tanks was pumped out on to specially prepared plots of land provided with ample sub-drainage and a layer of ashes over the floor. The sludge was spread over these plots to a depth of 18 in., and then left to dry. The time required for the drying process varies from three weeks to several months, according to the condition of the sludge and the state of the weather, but ultimately it becomes sufficiently dry to be carted away. No figures are given as to the water content of the "dry" sludge, but it is described as a "hard, innocuous mass." From this we may assume that it contained 50 to 60 per cent of moisture, and the cost of tankage digestion, pumping, drying and carting to tip was found to be 4.7d. per cubic yard of wet sludge, 86.6 per cent of water, or 6.3d. per ton of wet sludge. Calculated upon the sewage, these figures work out at 9s. 6d. per 1,000,000 gallons of sewage, or 1½d. per head of population. These costs were working costs, including maintenance and repairs of working parts of machinery, but not the interest on capital or sinking fund charges, which were stated to be probably small.

While this method of sludge disposal is suitable to this particular case, it should not be accepted as of general application, as it is well known that the sewage of Birmingham is of a peculiar character, due to the amount of special trade wastes which it receives. At the same time this record of the developments which have taken place at these works in this question of sludge disposal is extremely interesting, indicating as it does the ability and seriousness with which this vexed problem has been attacked, and the successful

manner in which the results of the local experience and of the scientific investigations of others have been applied. Those who, like ourselves, remember the state of the Birmingham sewage farm before Mr. Watson took charge of it are aware of the enormous improvement which has taken place during the past few years, and recognise that great credit is due to Mr. Watson and his staff for the present satisfactory state of affairs.

* * *

A Building Line Problem.

It is, of course, well known that neither the Public Health (Buildings in Streets) Act, 1888, nor the Public Health Act, 1875, which is to be read into it so far as definitions are concerned, contains any definition of the term "building." In case of a dispute as to whether a given structure is a building within the meaning of the Act of 1888, it appears, according to the authorities, to be a question of fact for the magistrates to decide, "provided the thing erected is of such a nature that it is capable of being a building." The proviso is rather suggestive of hair-splitting, since one would think that a tribunal competent to decide the one question would be equally competent to decide the other. In practice we suppose it comes to this—that where magistrates have found a structure to be a building within the meaning of the Act, their decision may be upset by the High Court, by a side wind, as it were, if the latter come to the conclusion that the structure is of such a nature that it is not capable of being a building.

There are not many reported decisions under the Act of 1888 on this particular point, though there are several as to whether various erections are "buildings or structures" within the meaning of the London Building Act, 1894, under which the building lines of streets in the Metropolis are regulated. One of last year's cases under the Act of 1888—*Sunderland Corporation v. Charlton* (briefly referred to in our issue of January 30th last, page 231)—is of interest in this connection as indicating the possibility of driving, if not the proverbial coach and horses, at all events a wheeled construction of sorts, through the Act. One of the objects of this Act is manifestly to give urban authorities a voice in controlling the dimensions and character of projections such as bay windows, porches, and so forth, in front of buildings. In this case the owner of a house constructed a porch of wood and glass, with a felt roof, mounted it on wheels, and placed it before his front door. It was not attached to the house in any way, but in the position in which it stood it projected some 6 ft. 6 in. beyond the front main wall of the house (and, we presume, beyond those of the adjoining houses). On the owner being summoned for a contravention of the Act, the magistrates refused to convict, on the ground that the porch did not constitute an addition to the house. Upon appeal to the Divisional Court, it was held that the Court could not say that in so deciding the magistrates had gone wrong in point of law, and that therefore their decision must stand. It is evident that a structure of this kind is equally within the mischief aimed at by the Act whether it is attached to the house or not, and it is to be hoped that this decision will not create a precedent. It is to be observed, however, that the offence charged was building an addition to the house. It may perhaps be possible in similar cases so to frame the charge as to secure a conviction. The Act, it will be remembered, prohibits not only the building of an addition to a house beyond the front main wall of the building on either side, but also the erection of any building beyond the same datum line. Though an unattached porch may not be

an addition to a house, it may, we venture to think, itself be a building within the meaning and scope of the Act.

* * *

Practical Points in Road Crust Construction.

A very useful paper on road crust construction and maintenance, which was read yesterday at the Birmingham meeting of the Western Midland District of the Institution of Municipal and County Engineers, by Mr. H. M. Lawson, is reproduced in another part of this issue. Mr. Lawson's careful descriptions of the methods employed in Birmingham in constructing water-bound broken-stone crusts are especially welcome just now, since it is felt by not a few experienced surveyors that sufficient attention is not being paid to road crusts of this class. The position generally is that water-bound crusts are decidedly to be preferred under certain traffic conditions, while, when the traffic is a good deal more severe, other forms of road crusts are to be preferred, on economic grounds. It is clear, therefore, that unless we make the best water-bound crusts that can be made, or, at any rate, the most economical in first cost and maintenance combined, we are not in a position to say where the line is to be drawn, and there can be no doubt that in some cases the superseded crust has been by no means the best or most economical possible under the conditions of the locality. In some cases there has been almost a panic, and the superseded crusts have been considerably inferior to the best that could have been made and maintained for the same total cost. Sometimes, of course, the surveyor is looking ahead, and has reason to believe that before long the severity of the traffic will be such as will definitely justify the changes in the methods of construction.

But, apart from the economics of particular cases, it is very desirable that the construction and maintenance of water bound crusts should be carried to the highest pitch of efficiency, since we have no other means of comparing costs in all parts of the country. The cost of the water-bound crust is, in fact, the least common denominator of costs generally. The diagrams accompanying Mr. Lawson's paper show road crusts of a very good type. It is probably intended that the concrete foundation of the channel shall be well keyed into the slag course, so that there may be a continuous crust beneath the kerb and channel, and it may be suggested that, since the junction of the slag with the concrete is the weakest part of the crust, the concrete might be a little thicker, and its underside in line with that of the slag course. Other points in the paper to which attention may be specially directed are the use, in rolling, of small quantities of water, the careful mixing of the stone so that there may be no segregation of sizes, the favourable opinion of small cube granite paving, and the use of oak block paving. The only fault we have to find with this useful paper is that the author does not give as fully as might be desired the results of his experience with the different kinds of paving described.

* * *

Sewage Disposal in the United States.

The forty-fourth annual report of the Massachusetts State Board of Health deals with the year ending November 30, 1912, and records, among other matters, the results of various experiments which were carried out at the Lawrence Experiment Station in connection with the purification of sewage and trade wastes. Some of these results were described in these columns during the past year. Among the other experiments, those dealing with the disposal of sludge in deep tanks produced varying results, and the conclusions arrived at were that the experiments made with sludge in these tanks, 17 ft. deep, seemed to show that sludge from certain domestic sewages may be offensive under all conditions of deep tank treat-

ment, except when containing iron or other metallic salts, or an equivalent alkalinity. They also showed that modification of the odour of some of the sludges was obtained by stirring this sludge with slight air or water currents. The results do not agree with the published records of results obtained with Imhoff tanks in Germany, and ought not properly to be compared with them for the reasons that the experimental tanks were not so deep as Imhoff tanks have generally been constructed, and the sludge was introduced into the tanks artificially, and not allowed to settle out naturally from crude sewage passing through the separate channel in the tank as arranged in Imhoff tanks. While, therefore, the results of these experiments are interesting and useful, they should not be accepted as having any bearing upon the efficiency of other types of tanks.

Another series of experiments mentioned in the report was carried out with the view of ascertaining to what extent the volume of sewage treated upon sprinkling filters could be increased by more complete preliminary clarification of the sewage. The results showed that when practically all the suspended matters were removed from the sewage the possible rate of filtration could be doubled without causing any deterioration of the final effluent. It is stated in the report that these results add valuable confirmatory evidence to the statement which has frequently been made in previous reports, that the practical rate at which any biological filter can be operated is largely dependent upon the amount of organic matters which are applied to it, and not upon the amount of water by which those organic matters are carried. The practical man will, however, wish to know whether the extra cost of the more complete clarification, involving chemical precipitation, is justified, or whether it would be more economical in the end to construct larger filters at the outset and save the cost of chemical treatment.

* * *

Rather Mean! Long experience of the ways of a certain type of councillor has led us to view without

surprise the reports which appear from time to time in local journals of particular instances of shabby treatment meted out to officials, and especially, it seems, to surveyors. The latest example comes from the Wellington Rural District, where Mr. E. V. Richards has put in twenty-eight years of continuous service as surveyor. It might have been thought that this long record would have rendered him immune from petty treatment at the hands of the council, but apparently this is far from being the case. It appears that on certain occasions recently Mr. Richards has been obliged to visit outlying parts of his district on urgent business at the end of his ordinary day's duties, and after he had driven his horse and trap for long journeys. In these circumstances, rather than postpone his visit to the next day, he ventured to hire a motor car, the total cost amounting to £2 13s. It is somewhat surprising to find that the Finance Committee "did not feel justified in passing the account," and although one member pointed out that one item at least concerned the safety of the public, the council took the same view as the Finance Committee, with the result, presumably, that Mr. Richards will himself have to pay the amount. The matter hardly calls for criticism, inasmuch as a mere statement of the facts is sufficient to demonstrate the spirit of these worthy representatives of local government. Treatment of this kind, however, is very disheartening to any official, and must result in the creation of a relationship between him and his authority which is not calculated to secure the best interests of the public.

Road Construction and Maintenance.*

By H. M. LAWSON, Deputy Road Surveyor, Birmingham.

In submitting this paper the author is conscious of the fact that this subject has been dealt with by many well-known road engineers, but his object is to give actual experience of various methods of road construction, and to invite other engineers to do likewise, so that comparisons may be made. It is well known that the area of water-bound macadam roads far exceeds that of any other method of construction, and therefore he proposes to deal with this class first.

In many instances water-bound macadam roads are condemned as useless under average traffic conditions; the chief reason for this is that in many cases



MR. H. M. LAWSON.

[Mr. Lawson served his articles—from 1900 to 1903—with Messrs. Lacey, Sillar & Leigh, civil engineers, Westminster, and King-street, Manchester. From 1903 to 1905 he served as assistant under Mr. F. W. Lacey, M.INST.C.E., borough engineer of Bournemouth, and was then appointed assistant engineer with Messrs. J. G. White & Co., Limited, London, being engaged with the firm on contracts which comprised road making, sewer and bridge construction, and general public works. In 1908 Mr. Lawson joined the staff of Messrs. John Mowlem & Co., Limited, of Westminster, being engaged as chief assistant engineer and works superintendent on contracts of a value of £100,000. This work entailed reconstruction of bridges, road alterations and improvements on an extensive scale. He had full charge of all men employed in these works, and was responsible for the measuring and rendering of all accounts. Previous to his present appointment, Mr. Lawson held the position of road surveyor and superintendent to the Metropolitan Borough of Chelsea. His district comprised about fifty miles of main roads, two-thirds of which were constructed in macadam, tar-macadam, and bituminous-grouted macadam, the remainder being wood, stone, and asphalt. He had sole charge of all outside work, which in most cases was executed by direct labour.]

these roads have no foundations or proper drainage. In this respect many of the macadam roads in Birmingham district come under this heading; therefore it is of great importance to get a solid and well-drained foundation, and adequate surface drainage, also to ascertain that every care has been taken to decide the wearing qualities of the stone employed, and to ensure that it is of one uniform quality.

Some time ago the author had his attention called to a road that was being constructed, where the contractor proposed to lay stones of different qualities. He took exception to this, and found that the contractor could hardly understand why objection was raised. However, it is obvious to any road engineer that, wherever one has stones of different qualities (and this applies also to stone-sett and wood paving), the softer stone soon begins to show itself by wearing down below the harder, resulting in a series of ups and downs.

The city engineer of Birmingham, in dealing with the construction of new water-bound macadam roads carried out by contractors with a view eventually to their being taken over by the city authorities and maintained by "the inhabitants at large," issues a specification which is strictly adhered to, inspectors being appointed for the special purpose of looking after this class of work.

The form of construction is as follows: A layer of clean clinker ashes or broken stone, 6 in. in depth when rolled solid, is followed by a second layer, consisting of hand-pitched slag, 6 in. to 8 in. in depth (according to the nature of the traffic), set on edge, in the manner of a rough pavement. Over this layer a coating of broken slag or other approved material is laid, so as to fill up the interstices to form a smooth surface; each layer is thoroughly consolidated. A row of 4-in. by 6-in. granite setts on concrete is laid outside the channel stone as a margin course. The metalling for finishing the carriageway is then spread with forks in two coats. The first coat having been uniformly spread over, the whole carriageway is then rolled until consolidated. The second coat is then uniformly applied and consolidated, making a thickness of 6 in., the surface then receiving a coating of fine chippings of the same description of material as the metalling used; the chippings are screened through a 3-in. mesh, and include the finer material, down to dust. The carriageway is then lightly watered and rolled until thoroughly consolidated, two men being engaged in sweeping the chippings into the interstices of the stone. On completion, it is coated with a thin layer of 3-in. chippings of similar material, free from dust. Each layer is laid to a camber or gradient of 1 in 25.

The author has found, in carrying out this work, that at times, unless one has been careful in choosing a sufficiently tough stone (and in some cases the cost prohibits this), the stone is broken and crumbled in the process of consolidation by steam rolling; to obviate this, a little binding material in minimum quantity is spread over the metal and slightly watered. Too much attention cannot be given to the spreading of the stone, which really requires great care and skill, as the evenness of wear of the surface greatly depends upon uniform spreading.

In Birmingham the city engineer pays a small bonus to the spreaders; this method works exceedingly well, as there is competition among the men, and only the ablest men are selected for the work. Great care must be taken to see that very little water is used, as there is a tendency on the part of rollermen to use as much as possible, to expedite rolling operations. The loading of this stone into the carts is done with forks, but in a district formerly under the author's supervision, when carting stone on to a site and tipping it close to the spreading, a difficulty was experienced owing to a thorough turning over of the material being impracticable. This was remedied by tipping the stone on to concrete mixing boards, thereby ensuring that it was properly turned, and so obviating any chance of having larger stones in some parts of the road and smaller ones in other parts, besides preventing all the dust, &c., from settling at the bottom.

The method of recoating is to scarify the crust of the old road, regulating the old material, and then applying a 3-in. coat of new metal. Generally speaking, there are two ways of repairing a macadam road, patching or recoating the whole surface. As soon as any potholes or uneven wear appears it should be attended to immediately, the cause ascertained and remedied, and the necessary repairs undertaken. If repairs are delayed it generally means that in a very short time the recovering of the whole surface is necessary, which adds considerably to the cost of repair. Any road, the crust of which is weak, will very soon become bumpy. It is most difficult to keep the surfaces of roads in good condition, owing to the various statutory authorities, such as gas and water companies, interfering with them; also by reason of the fact that in most of the main roads in this city there is a tramway track, and in many parts the sides between the track and the channel is constructed in macadam. This requires constant attention, owing to the traffic causing a rut to form next to the paving.

Macadam roads are also being considerably damaged by motor bus traffic, and in comparing the repairs to a certain road prior to buses running with a corresponding period afterwards, the cost was found to be practically trebled. These motor vehicles do a vast amount of damage, particularly in roads not constructed to sustain their weight and destructive

* A paper read at the meeting of the West Midland District of the Institution of Municipal and County Engineers, held at Birmingham yesterday afternoon.

influence. In some counties the surveyor is suggesting the advisability of establishing weighbridges, with a view to having the gross loads and axle weights of heavy motor vehicles checked, as there is no doubt that the registered axle weights are in many cases greater than those allowed under the Heavy Motor Car Order, 1904.

TAR-SPRAYING.

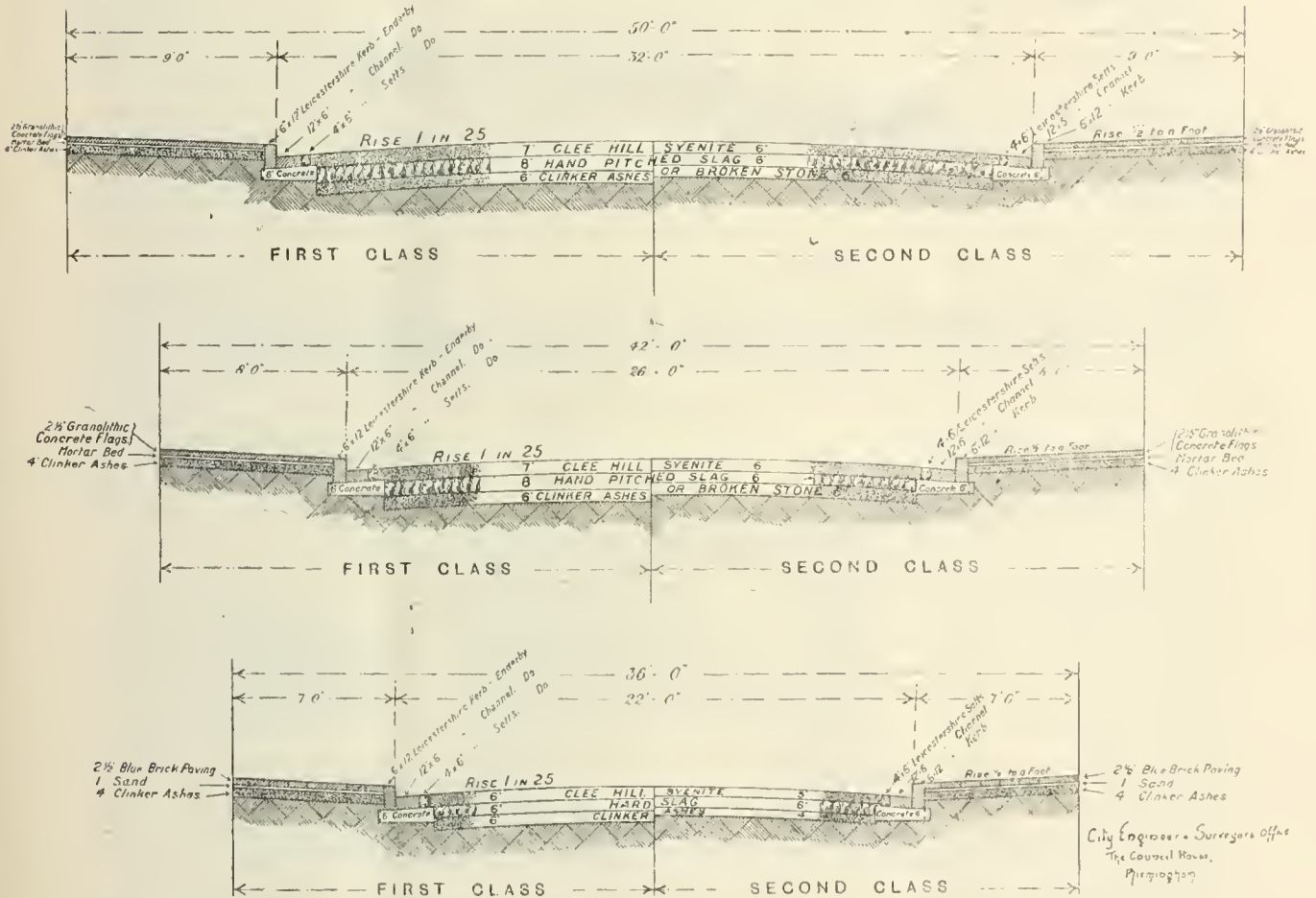
In treating road surfaces by the application of tar, the author has found that the life of the roads is prolonged, and also the dust nuisance reduced to a minimum. The chief object is to secure a deep penetration of tar below the surface, so that the metal may be kept together, and a road treated properly in this manner should have the appearance of a tarred-macadam road.

Last year, in Birmingham, 1,771,515 super. yds. of roads, comparable with a length of over 131 miles, were tar-sprayed. The major portion of this work was done by six 1,000-gallon machines, hauled by

strengthened where necessary, and rolled to an even surface. The asphalt macadam was conveyed a considerable distance from the works in specially lined carts, and laid at a temperature of about 250 degrees, regulated, and then rolled. A coat of Trinidad bitumen, properly fluxed, was squeegeed over the surface after rolling, and then 3-in. granite chippings sprinkled over the whole surface. The price per square yard was 5s. 6d., including excavating and carting away the old material.

At the same time an experiment was tried by laying Roadmant, 1 in. thick, direct on to the surface of an existing macadam by-road used by motor buses in order to avoid the necessity of turning round in the main thoroughfare. The material was supplied in rectangular blocks, weighing about 1/2 cwt., these were placed in an ordinary asphalt cauldron and heated. The material, on becoming plastic, was well stirred, and 3-in. granite chippings added, stirred again, and mixed with specially prepared flux. The method of laying is similar to that of

STANDARD SECTIONS OF MACADAM STREETS.



steam rollers, the cost per super. yard being just under a penny. Of course, it must be borne in mind that it was a most favourable season for this class of work.

To get the best results from tarring, the surface must be thoroughly clean and dry, it being a waste of time and money to treat the surfaces of roads with tar when in a bad condition. The author has observed many failures owing to this alone, and thinks that it is obvious that by tar-spraying a bad road it cannot be converted into a good one.

Tar-spraying should be carried out in a methodical manner, all roads coated or reconstructed in the winter months being tar-sprayed in the early spring, and again, if necessary, in the early autumn. Hills having a steep gradient should be specially gritted if tar is applied to the surface.

ASPHALT MACADAM, ETC.

Some two years ago the author supervised the laying of a considerable mileage of Trinidad Lake asphalt macadam.

The old road was scarified, material heaped up and carted away, the crust and foundation being

mastic asphalt, the material being conveyed from the cauldron in buckets, tipped up, and laid with wooden floats. The whole surface is then dusted over with sharp sand, which is afterwards rubbed in. One difficulty that presented itself in laying this asphalt was to impress on the men the necessity of constantly stirring, to ensure proper mixing and to avoid the burning of the material. The cost was 3s. 6d. per yard super., and at the time of writing the author understands it is in good condition, no repairs of any kind having been necessary.

Some good results have been obtained with Plascom grouting, by scarifying the old road and excavating to a depth of 4 in., regulating and well rolling the same. A layer of 2 1/2-in. stone was then laid and well rolled, clean chippings spread over it and brushed into the interstices, before the Plascom (which was mixed with one-third proportion of Leighton Buzzard sand) was applied. Another layer of 2 1/2-in. stone was then spread on the top of the above layer in a similar way, except that in this case the top layer was dressed with 3-in. clean chippings after the grouting was completed, the same being applied and rolled before the Plascom had set. The cost per super. yard

was, approximately, 6s. Very bad weather was encountered during this work, which added considerably to the cost.

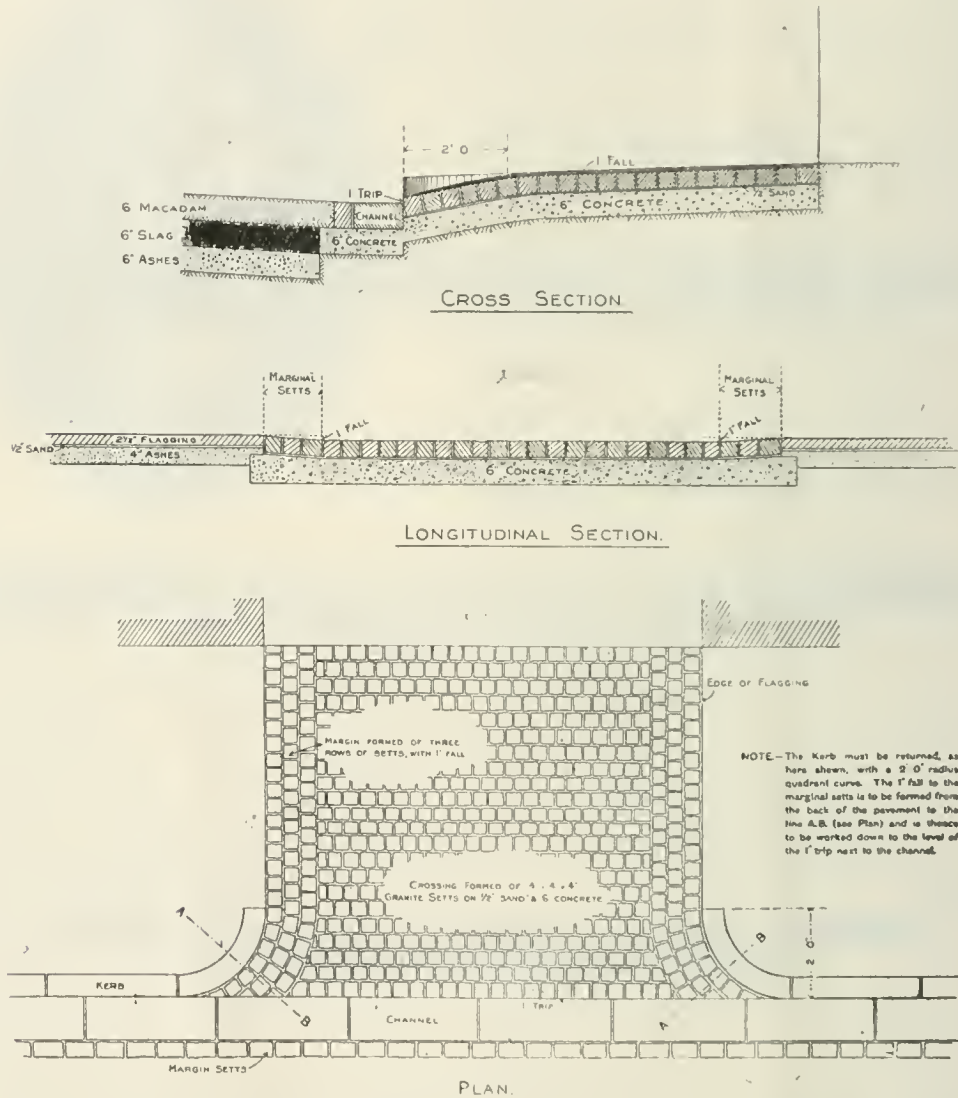
Glutrin (a non-bituminous binder) has been used in the reconstruction of a road in Birmingham, being mixed with $\frac{1}{2}$ -in. limestone chippings to form a matrix, then spread over the whole surface to a thickness of 1 in. Stone was then applied and rolled until the matrix rose to the surface. At the time this certainly hardened the surface, but now the hardness has disappeared. The author has obtained more success with this binder in patching work after diluting the glutrin with water and spraying it from a water cart.

ARMoured PAVING.

Some time ago the author supervised the laying of Durax cubes, to what is generally known as the oyster shell pattern (owing to its intersecting segmental courses), on an existing foundation of a

5-in. or 6-in. setts laid upon a foundation consisting of Portland cement base concrete, 9 in. thick (6 to 1), on which is placed a bedding of slightly damped cement and sharp sand, free from silt or loam, to a thickness of 1 in. The paving should be laid before the concrete becomes too hard, when sufficiently damp or mellow enough for the 1-in. feed to unite with it. The setts should be damped with a rose-water can, and then grouted with a mixture of 3 of sharp sand to 1 of cement, and rammed as soon after as possible, the whole forming a 16-in. seal of solid mass. Great care must be taken to see that the whole of the materials are thoroughly mixed and of the best quality. No traffic should be allowed over the paving for at least ten clear days.

Both cement and pitch have been used for grouting sett paving, but the author favours the former in all cases where possible, although, to meet present-day requirements, pitch grouting has certain advantages inasmuch as roads finished in this manner can



macadam road. The road was scarified, the crust trimmed down, and the foundation strengthened where necessary. Cubes about 3 $\frac{1}{2}$ in. in depth were laid in segmental courses on a bed of tarred chippings $1\frac{1}{2}$ in. thick, $\frac{3}{4}$ -in. pea ballast having been swept into the joints, and the steam roller then carefully run over the surface before grouting with pitch and creosote oil. The cost was 7s. 9d. per yard super., the company giving five years' maintenance. This form of paving has also been laid on a concrete bed $7\frac{1}{2}$ in. thick in a very narrow thoroughfare traversed by heavy warehouse traffic. The cubes were bedded on sand, well rammed and grouted in with pitch and creosote oil, at a cost of, approximately, 12s. 4d. per super. yard. This class of paving is both useful and economical in roads of medium heavy traffic, being cheaper in construction than ordinary granite paving.

SETT PAVING.

The author is of opinion that the following describes the most serviceable form of paving for heavy traffic—

be opened to traffic immediately after completion. There is also less tendency for mud to collect on this kind of grouting, which, however, must be skilfully handled to ensure the proper proportion and correct mixing of the ingredients. The method adopted by the writer is to use a grouting mixed to the following proportions: 2 to 3 gallons of creosote oil and 1 gallon of coal-tar added to every 1 cwt. of pitch. (The quantities of oil and tar being determined by the nature of the pitch.) The joints of the setts having been filled about half way up with $\frac{3}{4}$ -in. or $\frac{1}{2}$ -in. pea ballast, or shingle, and then rammed. Great care must be taken to see that this racking is thoroughly dry. The pitch mixture is then poured from a spouted pail into the corner of the setts (this prevents surplus being left on the top), to about half their depth, and the remainder of the joints filled up with racking as before. Sweep with hard broom and squeegee over the whole surface with the pitch mixture as quickly as possible, so as to leave the smallest accumulation on the top. On no considera-

tion should this work be done other than when atmosphere and materials are in a perfectly dry state.

Perhaps here it might be of interest to mention a particular form of paving in which the author is concerned, which consists of specially dressed 5 in. wide by 4 in. deep Grey Royal setts, laid on a concrete foundation. The contractors were called upon to replace a considerable number of setts with broken corners. The stones were paved when wet on bedding which was more than damp, and when the stone was surface dry, boiling pitch grout was poured into the joints, with the result that it attacked the shakes or flaws in the setts, generated steam in them, and this acting as a wedge, slightly detaching the flaw or shake portion of the sett. Under heavy continuous traffic it became wholly detached, pulverised, and peeled out. The author is of the opinion that had this work been completed with pitch grouting in dry weather this would not have happened, or, under the above circumstances, had cement and sand instead of pitch been used for grouting.

In Birmingham the standard size of setts used is 4 in. by 4 in. by 5 in. deep, laid with a crossfall of 1 in 45 from the crown of the road to channel, and in straight diagonal courses, meeting in the centre at an angle of 90 deg., with the apex pointing downhill, at an angle of 45 deg. with the channel where the kerbs are parallel. The setts are paved on a 1-in. bed of local sand grouted with a proportion of 5 parts of clean sharp sand to 2 parts of cement. The concrete bed is 7½ in. in depth, the ballast for it consisting of clean, non-porous blast-furnace slag with such an admixture of sand sufficient to fill up the interstices of the stone. After completion, a layer of clean sand is spread over the whole surface, and no traffic allowed over it for three weeks.

In this district the most suitable material for paving streets of steep gradients traversed by heavy traffic has proved to be "grit-stone," the steepest gradient paved with this material being 1 in 11. Care should be taken to see that this class of paving is constantly swilled with water so as to prevent an accumulation of mud and dirt on the surface, and if this has proper attention, complaints of slipperiness are practically unknown. In London and other cities specially dressed 5 in. wide by 1 in. deep Grey Royal setts have been laid on steep gradients, with very close joints, with much success. . . .

ASPHALT.

The author has had some little experience with asphalt, laid and maintained by one of the well-known companies who specialise in this class of work. The paving consisted of compressed asphalt, 1½ in. in thickness, in a bed of concrete 6 in. in depth. The advantages of this class of paving are many, its disadvantages few, the chief being its slipperiness in times of rain, mist, &c., to horse traffic; but in the author's opinion it is, under similar conditions, no worse than granite-paved roads. The cost for new asphalt work was, approximately, 12s. per square yard, the corporation preparing the carriageway for the concrete foundation.

HARDWOOD PAVING.

This, like granite paving, is laid on a concrete bed, and in Birmingham the following method is adopted. The concrete being laid out to a correct level and curvature, with a camber or crossfall of 1 in 45, the surface is rendered and floated over to a depth of 1½ in., with a rendering composed of 2 parts of Portland cement to 5 parts of Hartshill granite chippings, which has been well turned over and intermixed—three times while dry, and three times after the water has been added. The Hartshill granite chippings used are washed, and are such as will pass through a ½-in. mesh, free from dust, but containing the coarse grit.

Prismatic oak blocks, 9 in. long, 3 in. wide, and 4 in. deep, are laid in straight courses, square, transversely to the line of kerb, just tight enough for a semblance of a joint to appear. (This joint is obtained by the use of a creosoted deal strip ¼ in. in thickness.) A boiling mixture of pitch and creosote oil is then squeezed over the surface, and worked into the interstices while hot. The blocks forming the channel on each side of the road are in three courses running longitudinally. Each block in the channel courses is dipped on one side and one end immediately before being laid, and alongside the kerb on each side of the road an expansion joint, 1½ in. wide, is allowed, this being filled with boiling pitch grout to a depth of 1 in., and the rest of the joint filled with puddled clay.

When the paving is complete, the surface is top-dressed with a layer of ¾-in. Hartshill granite chippings, and closed to vehicular traffic for at least seven days. Wherever wood paving abuts against macadam a tender course of granite setts, consisting of three courses, is laid.

In laying Jarrah or Karri hardwood paving, the author favours paying the blocks tight on a bedding of sand, and ramming each course, similarly to granite paving, and squeegeeing with a pitch mixture sufficient to fill up the interstices between the blocks, and spreading over the whole surface a thin layer of fine, sharp sand, this wood being too dense to be top-dressed with grit. This method minimises the wear at the joints (which, combined with the expansion and contraction, makes this paving so difficult to deal with), and also acts as a cushion between the blocks and the hard foundation, which affords more elasticity and resiliency, and consequently gives a consistency in the wear of the blocks.

Another method adopted by the author was, after the surface of the concrete had been rendered, to dip each block into a small tank containing pitch and creosote oil, to half their depth, and then squeegeeing the whole surface. The latter grouting, uniting with the film formed by the hand-dipped blocks, gives as nearly as possible a well-filled joint, and a plastic film is formed which is watertight between each course and end of blocks.

The author has seen some paving laid with sectional hardwood blocks, and thinks that experience has not yet proved that this class of paving justifies the laying of 9 in. and 12 in. of concrete foundation (including floating) to receive a 3-in. deep hardwood block. In fact, no hardwood paving, in addition to its initial cost being more, has any advantages over softwood to justify its selection. There is, however, this in its favour—old blocks which have become worn and uneven on the surface can be taken up, cleaned and trimmed, and sawn to the required thickness, and then relaid. In this city a machine for this purpose has been used effectively, dealing with many thousands at the rate of about twelve per minute, the cost being, approximately, 10s. per 1,000.

SOFTWOOD PAVING.

The foundation for this class of wood paving is similar to that for hardwood, with the exception that the camber or crossfall in this case should be 1 in 36. The author favours the following method: Uniformly cut creosoted deal wood blocks, either 4 in. or 5 in. deep, which are sound and free from sap and shakes. (The creosoting of the blocks should have been done at a pressure of not less than 80 lb. to the square inch, and they should absorb about 8 lb. to 10 lb. of oil to the cubic foot of timber.) The blocks should be laid close jointed in straight courses, with the grain vertical to the rendering, the surface afterwards squeegeed with a boiling pitch mixture well worked into the interstices while hot. In some cases the joints are filled to the top with pitch and oil, and in others the final grouting is with a 3 to 1 mixture of sand and cement. The channel courses formed as in the case of hardwood paving previously mentioned. An expansion joint of 1½ in. to be left alongside the kerb, and filled in as before described.

The author is of the opinion that the best form of expansion joint consists in a mixture of sawdust and tar. A barrel of tar and 16 bushels of sawdust will be sufficient to do about 70 lin. yds. of an expansion joint 1½ in. wide by 5 in. in depth. This method is somewhat costly, but excellent results have been obtained both with hard and soft wood paving. No traffic should be allowed over the finished surface until at least seven days after the wood has been laid and grouted. Before being opened to traffic, the whole carriageway should be dressed with a layer of good, sharp, angular ¾-in. grit or flint.

In all cases of wood paving the author has provided a "weep-hole," consisting of two holes of ¾-in. diameter, drilled in suitable positions in both ends of the gully, the bottom of the hole being on a level with the surface of the rendering. This has proved very useful in the case of water getting under the blocks.

CLEANSING.

It is obvious that road surfaces need systematic cleansing, gritting and watering, but the author would like to emphasise the trouble that has been experienced in regard to sweeping newly constructed water-bound macadam roads, for, if careful attention is not given to this matter, the binder will soon be removed. In a former district under the author's control,

machine sweeping brushes were not used on water-bound macadam surfaces.

The watering of streets in any city is also of great importance, especially as there is now so much motor traffic on the roads. The author had under his control steam motors fitted with tanks, and has found that this method is much more economical and effectual than horse-drawn water carts. These machines were fitted with interchangeable bodies, so that the motors, when not engaged for watering, could be utilised for carting stone or any other materials. In addition to these machines, a steam motor vacuum extractor was used for emptying gullies, and a considerable saving was effected, as compared with ordinary gully vans, besides being more hygienic and saving that splashing which invariably takes place when gullies are being emptied.

The author is aware that it is a much debated point whether the use of mechanically propelled vehicles should be used by road authorities owing to the damage caused to the roads; but he is of opinion that, as this mode of traction is increasing so much, in time the roads will be able to withstand this form of traffic.

In conclusion, the author wishes to express his appreciation of the city engineer's kindness in allowing him to give this paper.

AN INTERNATIONAL LANGUAGE FOR ENGINEERS.

At a meeting of the Society of Engineers on Monday a paper entitled "Esperanto: An International Language for Engineers," was read by Mr. T. J. Gueritte, B.Sc., M.S.E., M.Soc.C.E. (FRANCE).

The author pointed out that there were four main reasons for the adoption by scientific and technical men of a universal language: (1) that modern science is, to a considerable degree, *specialised* and *international*, Engineers, of whatever nationality, are obliged to study works by authors of other nations; (2) that in the actual carrying out of engineering works or the pursuit of research abroad one comes in contact with people of diverse nationalities, and it is a difficult and interminable task to master a number of different languages; (3) that the work of international congresses would be greatly facilitated and their expense reduced; (4) that the present high prices of technical books would be reduced, because, if written in an international language, they would have a much wider circulation, and translations would not be necessary.

That an international scientific language is possible is shown by the fact that at one time Latin was the medium of international exchange of ideas. This language is both difficult to learn and unadaptable to changing conditions. A modern national language such as English or French would never be generally accepted as a "world language" on account of irregularities of formation and pronunciation, and international jealousy. There is no probability of any one language becoming the universal language of all men, but an auxiliary language for intercommunication between scientists is practicable. Esperanto is such a language, and its use is possible because (a) it is a living language, (b) it is international and neutral, (c) it is learnt with the least possible difficulty, (d) it lends itself to the technical requirements of every science, (e) it has been used most successfully in public discussions at international congresses, (f) it is capable of reducing the cost of international books.

Mr. E. Fiander Etchells, who opened the discussion, proceeded to make a few remarks in Esperanto, which appeared to be greatly appreciated by a section of the audience whose knowledge of the language was evident. He then gave his own experiences, which were to the effect that Esperanto not only afforded an easy means of communication between engineers of different nationalities, but that it was possible to learn it and to speak it with such facility that one's nationality was not detected, which he took to be a great advantage, seeing that all met upon a common footing, and that, whereas it was practically impossible for an engineer to speak in public in a foreign language without detracting from the value of his speech by the strangeness of his pronunciation, in Esperanto the nationality of the speaker was not obvious.

Sir William Collins expressed his approval of Mr. Gueritte's suggestion, and applauded the enterprise of the Society of Engineers in bringing the subject forward.

Mr. Harrison Hill, who is an enthusiastic Esperantist, related some amusing experiences which

supported Mr. Etchells' statement that the nationality of the speaker was not obvious when speaking Esperanto.

Mr. Sexton considered that Esperanto had a special application to scientists. It was particularly fitted for the translation of scientific papers. One could learn to read it in a few hours, and the Society of Engineers would do good work if they would push the matter.

Mr. Chatterton also expressed great approval of Mr. Gueritte's suggestion.

Miss Lawrence stated that a knowledge of Esperanto had enabled her to get into touch with the poorer people on the Continent in a remarkable manner. From the remarks made by Miss Lawrence and from those of other speakers it appears that Esperanto has been taken up with most satisfactory results by the poorer people on the Continent and by some of the mill people in Lancashire.

Mr. Moscheles strongly advised engineers to take up Esperanto.

Mr. Cox stated that the logical and mathematical construction of the language appealed especially to engineers. The expression was good, and there was no ambiguity. He found it possible to explain himself upon engineering matters very clearly and with great ease in Esperanto.

Mr. Honeysett dealt with the special fitness of Esperanto for expressing all technical terms. Whereas in English we had a great number of words coming from absolutely different roots dealing with the same subject, this was not so in Esperanto, where one root with suffixes would translate all the English words relating, say to digging—such as "trench," "navy," "spade," "spoil," "bank," "filling" and so forth.

Mr. Brock suggested that Spanish was more suitable than Esperanto as a universal language. Few Englishmen knew Esperanto, and they were not sufficiently enthusiastic to take up a new language. They would, however, take up Spanish readily, because it was particularly suitable for expressing engineering terms, and it was spoken by 75,000,000 people.

Miss Lawrence pointed out that after an Englishman had spent many months learning Spanish he would then be able to speak to people of one nationality in that language, while if he learned Esperanto, which would take a much shorter time to learn, he could speak to people of all nationalities.

Mr. W. C. Easdale considered that if Spanish had a claim to be considered as suitable for universal use, Hungarian had equal claims. He was, however, more in favour of Esperanto, owing to the fact that national prejudices would prevent the universal adoption of any national language. Esperanto appeared to him likely to be so useful that, although he understood several foreign languages, he certainly intended to learn it.

Mr. Sharp referred to the work of the Engineering Standards Committee. Standardisation had proved to be of the greatest advantage in all engineering matters, and it therefore seemed fit that the language of engineers should be standardised. As to the time taken to learn Esperanto, he would give the instance of the game of chess, which, though it might be learned in a short time so as to enable a person to take part in a game, would yet require a lifetime of study. The same might be said of Esperanto.

Prof. Smith held forth at some length upon the defects of Esperanto, and advocated the use of an improved form of Esperanto.

Madame Blaise also eloquently demonstrated the usefulness of Esperanto.

Mr. Mudie, who replied on behalf of the author to the discussion, stated that there are 200,000 persons who understand Esperanto; that, as it started upon the Continent, there are more Esperantists abroad than at home, but that the language is making considerable headway in this country, and is likely to be very useful to engineers.

Town Planning at Hull.—An extensive town planning scheme has been approved by the Hull Corporation Works Committee. The land involved lies in the north-eastern district of the city and extends into the area of rural authorities. The city engineer, Mr. A. E. White, estimates the total cost at £73,000, of which the corporation would pay £15,000, Sculcoates Rural Council £23,000, and the owners £35,000. The cost of the work it is proposed to carry out in advance of the development of the whole scheme is estimated at £27,000.

ROAD BOARD ADMINISTRATION.

THE HOUSE OF COMMONS DEBATE.

In the recent House of Commons debate on the Address there was a long disquisition—briefly noted in our issue of the 20th ult.—on the status and policy of the Road Board. Sir J. Bethell proposed as an amendment the addition of the words: "But humbly regrets that His Majesty's Speech contains no reference to the unfair administration by the Road Board of the funds under its control." The hon. member's main contention was largely based on a fallacious comparison, the claims of West Ham to a share in the Road Board grants being urged, with special reference to the Western approach road to London.

"The board," said Mr. Bethell, "appear to favour substantial grants being made for widening and improving roads on the West side of London to facilitate the rapid transit of the light motor car; but they declined to make grants towards the cost of improving the means of communication between London and the Albert and Victoria Docks." Now, the board has explicitly stated that its funds do not permit of the consideration of any important expenditure on costly urban improvements, the money being more urgently needed for the carrying out of large numbers of much less expensive improvements, and mainly in connection with through routes; and all that can be done for London, at present, is to assist the boroughs in the improvement of pavements on main traffic routes, and to make grants in aid of arterial thoroughfares connected with the network of country roads. The improvement of streets in West Ham is not in the same category as the creation of a great main road connecting London with the West and the South-west, and the Southern Midlands. We do not deny, however, that, in spite of the moderating influence of Sir George Gibb's perfectly judicial attitude in the matter, there may be, owing to the constitution of the board, and especially in view of recent happenings, some tendency towards a policy favouring the owners of ordinary motor cars at the expense of those interested in other forms of traffic, and perhaps also at the expense of the ratepayers. But we are not aware of any conspicuous opportunity for the consideration of the claims of commercial traffic having been neglected by the board; and if its policy is to be modified, the claims of agricultural districts would demand special attention, and the advantages of improving secondary and by roads would have to be considered.

Continuing the debate, Mr. W. Thorne supported the claims of West Ham, and Mr. W. Pearce contended that the question raised was one affecting the whole trade of London, good approaches to the docks being necessary for the development of business. It may be pointed out, however, that if this matter is really one in which the Road Board should be concerned, it is desirable that a complete scheme in relation to the docks should be put forward, and the advice of the board obtained as to its soundness.

Sir Archibald Williamson struck into the debate with a plea for Scotland, the only important point in his speech being that a county with roads already in good order does not obtain as much from the board as one in which the roads are in great need of improvement. With the justice of the cases cited we are not for the moment concerned, but when neglect of the roads has been caused rather by poverty than by lack of enterprise, it may be contended that the county deserves help. A more important consideration is that it ought to be possible for the board to assist counties in which the roads are in good or fair condition by making grants in aid of ordinary maintenance. This view was urged later in the debate by Colonel Weston.

GRANTS TO RURAL AND TO URBAN AREAS.

A different note was struck by Mr. Kellaway, who, after stating that the county of Bedford had been "very badly used" by the Road Board, expressed the opinion embodied in the following extract from his speech: "I do not think anyone will be able to discover any principle on which the Road Board is now making its grants. I do not believe that the Road Board itself has ever yet formulated a policy on which its grants shall be made to the different authorities of this country." On this point it may be remarked that, as regards the classes of improvements which are considered to be most urgently needed, the board certainly has a policy—that ex-

pressed in its circulars; but with respect to repartition of the funds in different areas it seems to have no general policy; and we have more than once expressed the opinion that the claims of different areas should be considered in the light of definite principles, involving the necessary number of factors, and not confined to a single aspect of the question.

Mr. J. Samuel criticised the policy of the board in making grants chiefly to the counties, and he pressed the claims of the towns, and especially of non-county boroughs. On this point it is sufficient to remark that the policy of the board, which may, of course, be modified in the future, seems to be consistent with the needs of the immediate present.

A case was cited by Sir Richard Winfrey, in which, as the result of an expenditure, including a sum of £7,000 granted by the Road Board, the ratepayers found themselves burdened with an extra twopenny rate. There seem to be many such cases, in which the ratepayers, and sometimes the local authority, regret the action taken. The responsibility rests, however, with the local authority which asks for the grant, and if the outcome is unwelcome, it is the sagacity of these gentlemen which is at fault; it is futile to blame the board.

In support of the policy of the Road Board in this respect, Mr. Walter Rea pointed out that if the board is to pay the whole cost of certain classes of improvement "we shall have one wild scramble to create unnecessary roads in every area in the country, the pressure on the Road Board will be such that they will be unable to give proper consideration to what is really required, and the money will be frittered away in areas represented by the most persistent Members of Parliament. Mr. Rea seems to confuse road making with road improvement, and to be unduly apprehensive as to the effect produced by the claims of Members of Parliament in the interests of their constituencies; but the underlying idea is sound. Mr. Rea also pointed out that large numbers of motor cars registered in London are used chiefly on country roads, a fact which is no doubt considered in the attitude of the board towards applications from the counties near London.

A NATIONAL ROAD AUTHORITY.

Continuing the debate, Mr. McCurdy said that he regretted that the Road Board had been created. The real indictment of the Road Board does not, he said, turn upon the minor matters referred to in the debate, but is a matter of broad principle. The Road Board is not, he considers, showing either the wisdom or the courage to grapple with the great problems of national traffic upon the scale that the time and the occasion demand. Neither London nor other urban areas receive their fair share of the attention of the board. "The Road Board are mainly confining their energies to the petty and parochial task of rounding-off road corners in rural districts, instead of turning their attention to great schemes or improving the main roads where the great centres of population are." Weak and inaccurate as is this statement in the light of the facts, we see in it some support of our own view—namely, that the attention of the board might well be directed to works of reconstruction of important routes or groups of roads rather than to petty improvements, and the putting down of costly crusts on roads on which they will not last as they would on properly designed or suitably reconstructed roads. But we have in view roads in rural areas where, with their present resources, the board can do much better work than they can in urban areas. The grievances of County Longford and of Lincolnshire were then set forth by Mr. Farrell and Mr. Bentham, but no consideration of importance was raised by either member.

THE GOVERNMENT'S CASE.

On behalf of the Government the Financial Secretary to the Treasury, Mr. Montagu, pointed out that the Treasury cannot control the Road Board in the manner suggested by some of the speakers, since the independence of the board was carefully provided for in the Act. He protested strongly against the wording of the amendment. "There is," he said, "no evidence whatever, and none has been produced to-night, that there has been anything at all unfair in the allocation of money by this independent body of commissioners who administer the Road Board grants." As regards the principle upon which the funds are allotted, he had, however, very little to say, pointing out that the allotment is, roughly, 82 per cent to England and Wales, 11 per cent to Scotland, and 7 per cent to Ireland on a population basis. This, of course,

hardly touches the question of a policy as regards the actual distribution of the funds, and it may be suggested that it is a bad principle and very unfair to Ireland with her large mileage of roads and poor population. This view was expressed later in the debate by Mr. W. Field, who said that the poorest districts and the sparsely populated districts are precisely the places where grants ought to be given. Mr. Montagu went on to say that the second principle on which the board acts is that reconstruction of road crusts is to be given precedence over other matters.

On this point we consider that the policy of the board leaves much to be desired. Some expenditure in this direction is necessary, but there is too much of it, and not enough expenditure on works which should come first in logical and engineering sequence. We have fully explained our view on several occasions, and need not repeat here the arguments which we have used. Mr. Montagu's third point—that the board avoids the making of grants which would be largely spent in acquiring property—is an important one, and we think that this policy is approved by a great majority of road surveyors and local authorities throughout the country.

The speeches that followed were not important, except that on one point Mr. Joynton-Hicks raised a wide question of policy. He said: "The Road Board likes to make a contribution or grant where there is a certainty that a rich county council will make a correspondingly large grant. There is a very great difficulty in poorer districts in getting the county council or the local authority to make a corresponding grant." The main idea underlying this observation is worth consideration, and it is desirable that the board should assist the poorer authorities to a greater extent than they do at present—not in the carrying out of petty improvements demanded by certain classes of road users, but in primary reconstruction, with a view to decreased costs of maintenance. In the division the amendment was supported by only 55 votes against 248 for the Government. These figures are significant of the attitude towards the Road Board of the Opposition, showing, as they do, that the occasion was not considered to be one which could fairly be seized for an attack upon the Government.

We heartily congratulate the board upon this result, since, although we think that its policy needs development both as regards the basis of allotment to different areas, and with respect to road engineering—we consider that the terms of the amendment were harsh and unjust. What Sir George Gibb has done in the face of great difficulties suggests very forcibly that he could do much better with a somewhat differently constituted board, and especially if he were relieved of the undue pressure exerted from influential quarters, and, apparently, through the Treasury.

The debate on another amendment, regretting that there was no mention in the King's Speech of an intention to readjust local taxation so as to provide for larger Imperial contributions towards the cost of education and main road maintenance, led to an important expression of opinion by the Chancellor of the Exchequer. Mr. Lloyd George said that the benefits conferred by motor traffic were not proportionate to the expenses incurred by the local authorities. The great development of business traffic in areas round large towns led to much damage being done to the roads, and the local trader had to pay higher rates on account of the very traffic that took away his business. This, the Chancellor said, "is unjust, and irritatingly unjust." It was also unfair to the railway companies which pay heavy rates in the districts through which their competitors run. The Government intended, he said, to take measures for the relief of local taxation. Possibly we shall know before long whether this means that Imperial grants will be made on some settled plan towards the cost of main road maintenance, or whether we are to look for a widening of the basis of contributions to Road Board funds, and for an extension of the Road Board's powers so that they may make grants for maintenance as well as for improvement.

The Birmingham Waterworks.—A paper dealing with the Birmingham waterworks will be read by Mr. E. A. Lees, M.I.C.E., at a meeting of the Institute of Sanitary Engineers to be held on April 20th at Caxton Hall, Westminster. Mr. John D. Watson, president, in the chair.

A PROFESSORSHIP FOR MR. E. R. MATTHEWS.

UNIVERSITY OF LONDON APPOINTMENT.

Mr. E. R. Matthews, A.S.M.I.C.E., F.R.S.E., the borough engineer of Bridlington, has been appointed to the Chadwick Chair of Municipal Engineering in the University of London.

Mr. Matthews is only recently one of the selected candidates from whom the appointment of city engineer of Capetown was to be made, the result of this being not yet known.

Prof. Matthews intends, in addition to the duties of the professorship, to practise at Westminster as a consulting engineer, and more particularly as an



expert in the design and construction of coast defence works. He recently delivered two lectures at the Manchester University on this important subject, and, as is well known, is the author of a treatise on this and other engineering subjects. He gave evidence on two occasions before the Royal Commission on Coast Erosion, and accompanied them, at their request, when inspecting the Yorkshire coast. He also supplied the Royal Commission on Canals and Waterways with much data regarding the silting up of the estuaries of our rivers. Born in 1873, Prof. Matthews was educated at St. Michael's private school, Hastings. He was for nearly nine years one of the assistants to the borough engineer of Hastings, Mr. P. H. Palmer, M.I.C.E., and has held his present appointment as borough engineer of Bridlington since October, 1898.

DEVON COUNTY SURVEYORSHIP.

THE NORTHERN DIVISION APPOINTMENT.

The Devonshire County Council Bridge and Main Roads Committee on Friday last interviewed the following gentlemen for the post of surveyor for the northern portion of the county at a salary of £600 a year: Mr. J. A. Reay, surveyor, Hertfordshire County Council; Mr. R. O. Jones, assistant surveyor, Glamorgan County Council; Mr. A. J. Lyddon, deputy county surveyor, Essex; Mr. E. H. Collett, engineering inspector of the Road Board. The appointment will be made at the next meeting of the county council.

Royal Institute of Public Health.—The annual congress of this body will be held in Edinburgh from July 15th to 20th inclusive.

Immingham Tide Table.—We have received from the Great Central Railway Company a copy of the Immingham Tide Table for 1914. This neat booklet, which has been produced in pocket size, gives the high water and low water tides at Immingham for each day of the year, in addition to useful facts and figures, charges, steamship services, &c., respecting the ports of Immingham and Grimsby. Copies of the tide table will be sent free on application to Great Central Publicity Office, 216 Marylebone-road, London, N.W.

Sewage Disposal and Works Management.*

By JOHN E. FARMER, Sewage Works Manager to the Corporation of Croydon.

Last, but not the least, item in the management of sewage disposal is the finding by observation and research the means of improvement in the present methods of purification, and also the cause of the effect obtained. Some work in this respect which I have done may be of some interest.

It has been known for years that a filter of fine-grade material gives better results in purification than one of coarse grade; also, some materials give better results than others; but there has not been, to my knowledge, any work done to settle definitely the cause of these differences.

One difficulty has been the want of a means to measure the physical properties of the different materials used as a nidus for the bacteria. If this could be overcome, the point could be settled as to whether the cause of the difference between two different materials when used as a nidus was due to greater absorptive powers of one than the other, or to greater surface area. The former used to be given as the reason by many a few years ago, but I think the latter is generally recognised as the reason at the present time.

To find the purification given by clinker as a nidus in a filter, as compared with gravel, a filter was constructed in two halves—one half filled with clinker, and the other half with gravel—in 1904, at Croydon, the gradient being the same for both materials—*i.e.*, drainage tiles and 3-in. gravel=9 in.; 3-in. to 1-in.=1 ft.; 1-in. to 3-in.=3 ft. 3 in.; total, 5 ft. Area, 200 sq. yds.; rate of working, 200 gallons per square yard per twenty-four hours; fed by revolving sprinkler.

The average results of thirty-one samples taken between October 13, 1904, and June 19, 1905, are:—

TABLE I.

	Tanks' Effluent,	Clinker half,	Gravel half,	
Free ammonia as nitrogen ...	5.747	0.665	4.148	parts per 100,000.
Albuminoid as nitrogen ...	0.367	0.068	0.166	" "
Oxygen absorbed, 4 hours ...	4.157	0.914	1.843	" "
Chlorine ...	9.45	9.14	9.71	" "
Nitrates as nitrogen ...	—	4.529	1.265	" "
Nitrites as nitrogen ...	—	0.165	0.284	" "
Dissolved oxygen ...	—	5.8	4.4	c.c.'s per litre.

The above results show that clinker gives much better results than gravel; but the question is, What is the cause of this? To find the reason I have carried out some experiments in the laboratory.

The first thing investigated was the physical properties of clinker and gravel. It is quite obvious that a piece of clinker has more surface area than a piece of gravel of the same size, but the problem is how to measure the difference in surface area. After trying a number of experiments, I finally based a method on the principle that if a solution of a substance of known strength covers a surface, and a known volume of a solvent is allowed to act on it, the resultant solution will be of a strength proportional to the amount of the substance covering the surface. The solution used for covering the surface was salt (sodium chloride), and the solvent, water.

If a known volume—say, 1 cub. ft.—of clinker is soaked in a known strength of salt solution, on drawing off the excess there remains a certain amount on the surface, and also an amount held by capillary attraction between the different particles. If a known volume of water acts on this and the salt estimated, the amount of salt added to the water must be proportional to the area of surface covered with the salt solution plus that held by capillary attraction.

During my experiments I kept on having discordant results until I found that the amount absorbed by the materials experimented with must be taken into account.

I will not trouble you with the details that led me finally to decide on the following method of procedure:—

A known volume of material of known grade is taken, and allowed to soak for forty-eight hours in a salt solution of a strength that 1 cubic centimetre = 10 milligrammes chlorine. The salt solution is then drawn off without disturbing the material, allowed to drain twenty minutes, and the same volume of water as that drawn off of salt solution added, allowed to stand ten minutes, drawn off, refilled again, and

immediately drawn off, allowed to drain twenty minutes, and the amount of chlorine estimated in the solution. This estimation gives the volume of salt solution on the surface of the material, and also that held by capillary attraction. To estimate the absorbent powers of the material, a volume of water equal to the volume obtained from the last running off is added, and allowed to remain for forty-eight hours, when it is drawn off and the chlorine estimated.

It will be seen that there are three properties estimated—*i.e.*, in the first estimation, surface retention and capillary retention; in the second, the absorbent powers. I consider the first estimation will give a truer index of the qualities of the material for filtration purposes if the surface and capillary retentions are taken together, and I include the two under the name of "surface retention."

The formula to obtain the volume in cubic centimetres of the surface retention is

$$x = \frac{a(c-d)}{b-c}, \text{ when}$$

- x* = volume in cubic centimetres of the salt solution retained on the surface by capillarity.
- a* = volume in cubic centimetres of water added.
- b* = chlorine in milligrammes per cubic centimetre in salt solution.
- c* = chlorine in milligrammes per cubic centimetre in water after addition to material.
- d* = chlorine in milligrammes per cubic centimetre in water before addition to material when tap water is used.

The formula for obtaining the volume absorbed is

$$\bullet \quad x = a \frac{(c-d) - fc}{b}, \text{ where}$$

- x* = volume in cubic centimetres of the salt solution absorbed.
- a* = volume in cubic centimetres of water added.
- b* = chlorine in milligrammes per cubic centimetre in salt solution.
- c* = chlorine in milligrammes in water after the addition in surface retention estimate.
- d* = chlorine in milligrammes in water before addition if tap water is used.
- e* = chlorine in milligrammes per cubic centimetre in water after standing with the material forty-eight hours.
- f* = the volume in cubic centimetres obtained of the surface retention plus the difference, if any, between the volume run off finally from the surface retention estimation and that added for the same.

The following shows the results of some experiments regarding the water capacity of the interstices, expressed as per cent of water capacity:—

TABLE II.

Grade of Material	$\frac{3''-1\frac{1}{2}''}{1\frac{1}{2}''-1\frac{1}{2}''}$	$\frac{1\frac{1}{2}''-1\frac{1}{2}''}{1\frac{1}{2}''-1\frac{1}{2}''}$	$\frac{1\frac{1}{2}''-1\frac{1}{2}''}{1\frac{1}{2}''-1\frac{1}{2}''}$	$\frac{1\frac{1}{2}''-1\frac{1}{2}''}{1\frac{1}{2}''-1\frac{1}{2}''}$
Material, clinker (1) ...	46.3	50.6	48.2	48.6
Material, clinker (2) ...	49.0	52.0	51.3	50.0
Material, gravel ...	34.2	35.1	34.8	35.7

- (1) This clinker was graded without crushing.
- (2) This clinker was graded from crushed masses. The vessel used in the above experiments was circular in plan, holding 1,500 cubic centimetres. If one of much larger capacity had been used, the results would probably have been much closer.

It can be shown mathematically that a given capacity will contain the same total mass of spheres providing that the total of the diameters of a row equals the length of the side on which they lay. For example, a cube-foot vessel will contain exactly twenty-four 1/2-in. spheres in line on any one side, or a total of 13,324. These spheres will take up 52.36 per cent of the volume, and the same per cent volume is taken up by 1 in. or 3 in. or even a sphere of ft. diameter.

From the results obtained on clinker and gravel there is every reason to assume they do not differ as regards the mass in unit of volume being the same for all grades of the same material. This is made use of for the comparison of one grade with another grade of the same material. When, in carrying out experiments, the masses differ, they can be brought to an average mass per unit capacity for that particular

* Extracts from paper read at a meeting of the Institute of Sanitary Engineers on Wednesday evening.

material. By expressing the result of an estimation as the percentage of the gross volume, the number of cube inches in a cube foot can be readily calculated.

After obtaining a method that would give a comparison as regards surface area or surface retention, there still remained the problem of putting the results obtained into an expression of surface area. The following experiment was carried out, the results of which I cannot claim as giving the actual surface area, but I believe it gives a very near approximation.

I took four grades of stone marbles, such as boys use, grading them by means of round holes in a steel plate. Each grade was estimated by the above method for surface retention and absorption, the following being the results:—

TABLE III.

Failed to pass O hole, dia. =	1/2	3/4	1	1 1/4
Passed O-hole, dia.	1/2	3/4	1	1 1/4
Number of marbles	116	350	990	310
Volume per marble in c.c.'s	2.33	2.0	1.6	1.2
= Dia. of each (of an inch) ... ..	.648	.616	.572	.518
= Surface area of each (sq. inches)	1.32	1.19	1.03	.843
Surface area of the total number of marbles in sq. inches	32272	116.5	5097	26133
C.c.'s of surface retention	68	133	17.5	88
Sq. inches of surface area per c.c. retained	285	313	288	267

The mean is 29.5 sq. in. per cubic centimetre, retained on the surface, which equals 512.8 sq. in. per cube inch retained.

Having obtained the surface area per cube inch of water retained on the surface, it only requires a simple calculation to obtain the surface retention of any material, after estimating the surface retention by the above method, when the result is expressed as per cent of the gross capacity.

The following are results obtained on two different qualities of clinker and on gravel as dug at Beddington:—

TABLE IV.

SURFACE RETENTION EXPRESSED AS PER CENT OF GROSS CAPACITY.	Clinker (1).			Gravel.		
	Mass capacity per cent	50	50	35	35	35
Grade:—						
1/2" - 3/4" (Mean dia. = 5/8")	10.0	9.4	7.5	88,612	83,294	66,459
3/4" - 1" (Mean dia. = 7/8")	9.4	9.0	5.5	83,294	79,751	48,736
1" - 1 1/4" (Mean dia. = 1 1/8")	8.0	7.6	4.3	70,880	67,315	38,105
1 1/4" - 1 1/2" (Mean dia. = 1 1/4")	7.8	6.9	3.5	69,117	61,112	31,014
EXPRESSED AS SURFACE RETENTION AREA PER CUBIC FOOT.						
1/2" - 3/4"	88,612	83,294	66,459			
3/4" - 1"	83,294	79,751	48,736			
1" - 1 1/4"	70,880	67,315	38,105			
1 1/4" - 1 1/2"	69,117	61,112	31,014			

These results, when plotted as curves against the curve for the surface area of spheres of the same diameter which a cube foot would contain, show that the estimation for diameters below 1/2 in. are, in the case of clinker, too low, and for gravel too high. The curves also show that they follow the surface area curve fairly closely considering the irregular-surfaced material worked upon; but if the mean is taken of a number of estimations the result is fairly accurate, and can be made use of for estimating the surface retention of other sizes by calculation. For example, in the estimation of a material of 1/2 in. diameter, the surface retention is found to be equal to 23,000 sq. in. more than would be in a cube foot of spheres of the same diameter, and as the curves are the same distance apart at all points, this extra area per cube foot need only be added to the surface area of spheres that a cube foot would contain of any other diameter to obtain the surface area of the material of the same diameter as the spheres.

Reverting to Table I., the difference can now be shown to be due to the larger surface area in the clinker half of the filter.

Taking as the units of impurity in the tank's effluent and the filtrate, the sum of the albuminoid nitrogen and the oxygen absorbed in four hours, less the oxygen equivalent of the nitrogen in the nitrites, the units are:—

Tank's Effluent.	Clinker	Gravel
4.517	Half Effluent.	Half Effluent.
	.794	1.674

Calculating the surface area from Table IV., the areas are expressed as per square foot of the total depth.

Clinker half: 291,000 sq. in.
Gravel half: 438,000 sq. in.

Equal to a ratio of 2.1 to 1.

Comparing this ratio with that of the units remaining in the effluent—i.e., 1 to 2.1, which is just the reverse of the surface area ratio, appears to show that the amount of impurity in an effluent is in proportion to the surface area in the filter.

As regards the reduction of the impurity by passing over the surface, there must be taken into consideration the fact that as the water passes downwards it gradually becomes less impure, so that after passing over one surface area it gives to the next a water which has less impurity than it received, so it is quite obvious that the same per cent purification cannot be effected by the second area of surface, assuming they have both the same surface area.

I have found that the difference is in proportion to the strength of the liquor each area receives. This being so, a calculation can be made of the impurity in the liquor after passing over a further 138,000 sq. in. in the clinker half, and also after passing over the last 15,000 sq. in., the calculation being: The reduction, on passing over 138,000 sq. in. is 2,843 units, and the strength of the liquor passing to the next 138,000 sq. in. is 0.37 of the original tank's effluent. This would give a further reduction after the second area of 1,952 units, and leave a liquor with a strength of 0.622 units to pass over 15,000 sq. in. This, calculated in the same way, would finally give a result that was less by 3.92 units than the tank's effluent. This calculation is 5.2 per cent higher than the reduction of units obtained in the clinker half, and considering the many experimental errors that can come in, this percentage difference is small.

From this experiment one comes to the conclusion that the surface area of the material is the factor which governs the comparison between one material and another as regards its suitability as a medium in a filter.

MANCHESTER BUILDING TRADES EXHIBITION.

The eighth Manchester Building Trades Exhibition was opened on Tuesday by the Lord Mayor of the city, Alderman McCabe. The exhibition, which is installed in the City Hall, Deansgate, will remain open until the 14th inst., and comprises some eighty stands, among the firms showing being Messrs. A. Winston & Co., Limited (London), Walter Cooper (Manchester), Burrows & Garland (Blackburn), F. W. Bromley (Manchester), J. H. Heathman & Co. (London), Bell's United Asbestos Northern Agency (Manchester), Vulcanite, Limited (Manchester), the British Portland Cement Manufacturers, Limited (London), Sano, Limited (Manchester), Harold Heydon & Co., Limited (London), D. Anderson & Son, Limited (London), Cakebread, Robey & Co. (London), the Stimex Gas Stove Company, Limited (London), the Ironite Company, Limited (London), G. R. Speaker & Co. (London), the British Fibrocement Works (Erith, Kent), the Manchester Ship Canal Portland Cement Manufacturers, Limited (Ellesmere Port), the Gelatinous White Company, Limited (London), and the Contract and Works Supply Company (Manchester).

A. WINSTON & CO., LIMITED.

Stands 12 and 13 are in the occupation of Messrs. A. Winston & Co., Limited, 12 Regent-street, London, W., and display scientific instruments—levels, clinometers, barometers, thermometers, field and opera glasses, and optical goods in general.

WALTER COOPER.

At Stand 15 are to be seen examples of the patent twin bridges for furnaces introduced by Walter Cooper, 21 Water-street, Manchester, chimney pots and steels being other features of the exhibit.

BURROWS & GARLAND.

Malacca cane drain rods, fitted with ordinary or lockfast joints, flexible steel drain rods, specially adaptable for house drainage, and wire-wrapped malacca sewer rods, for municipal work, form the exhibit of Messrs. Burrows & Garland, 9 King William-street, Blackburn, at Stand 19.

F. W. BROMLEY.

The "Dreadnought" specialities of F. W. Bromley, Urnston, Manchester, make an interesting show at Stand 20, the articles exhibited including the firm's patent standard concrete mixer, with tank and power side loader on truck, stone and concrete breaker, mounted on under carriage, and shafts, patent 3-speed 1 up and 1 down hand hoist, a 10-cwt. power hoist for various works, diaphragm hand pumps, steel and wood concrete barrows, rod benders, shearing

machines, latest steel split pulleys, "Dreadnought" textile belting, "Alligator" steel belt lacing, Stephenson bar dressings for all beltings, and super-flexible steel scaffold lashes.

J. H. HEATHMAN & CO.

Messrs. J. H. Heathman & Co., Parson's Green, London, have a display of their ladders at Stands 21 and 22.

BELL'S UNITED ASBESTOS NORTHERN AGENCY.

The exhibits of the above-named firm, whose offices are at 8A South Parade, Deansgate, Manchester, include Poilite roofing tiles, asbestos sheets for walls and ceilings, and for electrical works, veneered sheets for railway and tramcar construction, and compressed sheets for switchboards and electrical purposes generally.

VULCANITE, LIMITED.

One of the chief features of the display of this firm, whose Manchester offices are at Trafford Park, is a model swimming bath, waterproofed with patent vulcanite lining. On one side of the bath a large opening has been left in the glazed brick lining, leaving the vulcanite exposed in order clearly to demonstrate its waterproof qualities. Patent vulcanite lining has been used for waterproofing swimming baths, roof tanks, reservoirs, &c., in nearly every country in the world. Another interesting feature of the exhibit is "Bituna," pure bitumen damp-course, and many other specialities of the firm are also on view.

BRITISH PORTLAND CEMENT MANUFACTURERS, LIMITED.

The stall of the British Portland Cement Manufacturers, Limited, 4 Lloyd's-avenue, London, E.C. (Stands 31, 32 and 33), is of an educative description, as showing the ever-increasing uses for Portland cement. The small building is built of concrete cavity blocks, made with a winged block making machine. The building is lined with Poilite sheeting, which is a composition of asbestos and cement made by Bell's Asbestos Company, Limited, while the roof is tiled with the same material. On this stand will be seen such articles as reinforced concrete fence posts and fencing, concrete drain pipes, columns, flower vases, and so forth, all showing the steady advance of concrete and reinforced concrete in the manufacturing and building of all appliances and structures on the farm and estate.

SANO, LIMITED.

"Sano," which is described as an ideal jointless asbestos flooring and wall covering, and as suitable for any class of building, is being shown by Sano, Limited, 25 Brazemose-street, Manchester, at Stand 34. It is claimed for "Sano" that it is hygienic, waterproof, dustless, fireproof and durable, and that it can be easily cleaned with soda and hot water. It will not crack or bulge, it can be laid in any colour or design, and all colours are guaranteed permanent. "Sano" has been laid in schools, hospitals, offices, warehouses, showrooms, bathrooms, lavatories and factories. It is put down in two thicknesses, the top layer being $\frac{3}{4}$ in. thick, and the underlay or cushion also $\frac{3}{4}$ in., making a total thickness of $\frac{3}{4}$ in.

HAROLD HEYDON & CO., LIMITED.

Messrs. Harold Heydon & Co., Limited, varnish and japan manufacturers, Stratford, London, E., exhibit at Stand 35 their speciality—"Melana" damp-proof enamel.

D. ANDERSON & SON, LIMITED.

From their numerous and varied manufactures Messrs. Anderson, whose works are at Belfast and at Old Ford, London, E., have selected for exhibition their wood preservative, "Sideroleum," the "Rok" roofing, "Rokalba" roofing—which is "Rok" covered with asbestos, and so rendered fireproof—"Stoniflex" roofing, sarking and lining felts, and "Zerolite" insulating papers, among other things.

CAKEBREAD, ROBEY & CO.

Drain machines and drain rods, fitted with either ordinary or Lockfast patent joints, are shown at Stand 43 by Messrs. Cakebread, Robey & Co., Wood Green, London, N., among the appliances being their "Swivel Collar" joint and the "Standard" smoke test machine. The special feature of the firm's drain-testing plugs is their easy action owing to a wheel carriage revolving between the thumbscrew and the top plate.

STIMEX GAS STOVE COMPANY, LIMITED.

A "Stimex" patent hygienic gas range, cookers, and hot-water circulators are displayed by the Stimex Gas Stove Company, Limited, 169 Balham High-road, London, S.W., at Stands 47 and 48.

IRONITE COMPANY, LIMITED

The Ironite Company, Limited, whose managers are Messrs. S. Thornely Mott & Vines, Limited, 1 Victoria-street, S.W., are calling attention to their waterproofing process by means of an exhibit at Stand 49. "Ironite" is claimed to render, at a very low cost, cement, bricks, concrete, stone, chalk, slates, rough cast, coke and breeze, in new or old structures, such as tunnels, tanks, reservoirs, cellars, pits, bridges and walls, absolutely damp-proof against heavy water pressure. It is, moreover, stated to be a cheap, effective and permanent waterproofing for flat roofs and an excellent preservative for wooden fencing and all kinds of woodwork.

G. R. SPEAKER & CO.

The exhibit of Messrs. G. R. Speaker & Co., 29 Mincing-lane, E.C., at Stands 52 and 53, shows a wood and steel framed building covered with Speaker's "Eternit" slates, and lined throughout with Speaker's "Eternit" sheets, employing the different methods of fixing.

BRITISH FIBROCEMENT WORKS.

The British FibroceMENT Works, Erith, Kent, show at Stands 54 and 55 a simple type of building roofed with their patent "FibroceMENT" asbestos slates in two styles and colours, and lined internally and externally with their patent "FibroceMENT" fireproof asbestos sheets, skirtings and mouldings. Their agent for the Manchester district is Mr. John Stafford, 515 Corn Exchange Buildings.

MANCHESTER SHIP CANAL PORTLAND CEMENT MANUFACTURERS, LIMITED.

At Stand 56 are to be seen concrete block and other machines, and samples of concrete blocks made by the Cyclops Concrete Equipments Company from several kinds of aggregates with "England" brand Portland cement. The Shap Granite Company exhibit samples of their products made from their aggregate with the "England" brand of Portland cement, while there are also shown samples of raw materials from which the cement is made, and samples of the materials at the different stages of manufacture.

GELATINOUS WHITE COMPANY, LIMITED.

High-class sanitary distempers are the productions of the Gelatinous White Company, Limited, Southall, W., who are represented at Stand 60. Their "Filocol" paste, in five standard shades of white, is put forward as a substitute for whitewash. It is specially constructed so that it does not rub off or peel, though it can be easily washed off. "Filocol" is also made in a variety of art shades for frieze and wall decoration. Dry "Filocol" is supplied in powder form. "Filocol" paste can be made from this material with the simple addition of hot water in equal weight.

CONTRACT AND WORKS SUPPLY COMPANY.

The above-named firm, of 41 Corporation-street, Manchester, who exhibit at Stand 65, are the agents for various well-known productions, including Ceresit waterproofing material, "Premier" and "Rock" Portland cements, Kirton-Lindsey blue lias lime, "Apex" salt and enamelled bricks, sinks, &c., "Vitriuite" stoneware bacteria tiles and the "Oanco" patent pipe joint.

Tar-painting by Hand.—The coming season promises to be a record one for tar-painting by hand with the Waithman reservoir tarring apparatus attached to Johnston's patent double furnace tar-boilers. Among numerous orders received by Messrs. Johnston Brothers, of 79 Mark-lane, E.C., for these appliances may be mentioned those from the Berkshire County Council for two boilers, the Derbyshire County Council for six boilers, the Durham County Council for two boilers, the Hampshire County Council for five boilers, and the Worcestershire County Council for four boilers. Durham, Hampshire and Worcestershire purchased several of these boilers last year, so that these repeat orders are a proof of the success of these appliances. All these boilers are to be fitted with the double Waithman apparatus. Many boroughs, urban and rural district councils have also placed orders for boilers and apparatus with the same firm.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2.

THE QUALIFICATIONS OF ENGINEERS.

To the Editor of THE SURVEYOR.

SIR,—I was much interested in seeing it reported in your issue of 30th ult. that at their last meeting the council of Municipal and County Engineers decided that, for the present, they were not prepared to recommend that their institution should join the Roads Improvement Association in the effort to provide means whereby "potential road engineers should receive special training in modern methods of road construction and maintenance." Further, that this proposed abstention did not proceed from any idea that such training was not a most desirable, indeed, a most necessary, item in the qualification of one who was designed to occupy the post of a high-ways engineer, inasmuch as this very matter was at present receiving most careful and particular attention from their council.

What leads an *ignotus* such as the writer to venture some remarks on a subject to which so many eminent members of the calling are giving so much consideration is the reading of the item in the "Minutes of Proceedings" in THE SURVEYOR of the 6th inst., in which you review the address delivered on Monday evening, 2nd inst., at the meeting of the Society of Engineers by the newly elected president, Mr. H. C. H. Shenton. The portion to which I would now ask particular attention is your reference to his remarks on the organisation of the engineering profession.

The efforts towards this, which, both in the address and the critique, are so tersely and correctly termed "individual and spasmodic," will, I feel thoroughly convinced, remain as individual and spasmodic as ever (if not, indeed, increasingly so), to the end of the chapter, unless the hindrances to the attainment of an end so desirable are rightly estimated and faced, and honestly and courageously combated. What are the hindrances? Well, Sir, I certainly could not undertake to schedule and describe them all; but may I once more instance a point to which I referred in a communication to which you kindly gave place in THE SURVEYOR of November 5, 1909? Nowadays, any man may, without law-breaking, write "C.E." after his name. I am not certain, but I should think that if the same man were unauthorisedly to write himself an M.Inst.C.E., or, without due enrolment, claim membership in the Institution of Municipal and County Engineers, the Institution of Municipal Engineers, the Institute of Sanitary Engineers, or the Surveyors' Institution, he could be proceeded against by law. But he can with impunity style himself "C.E.," no matter how groundless his claim.

After long-continued consideration of the subject, I have been led to conclude that the fundamental mistake lies in the fact that, from the oldest and most honoured society connected with the calling to the latest formed, the executive of each, in the regulation of admission to its membership, claims the right to receive and recognise as members men who have, in the judgment of the executive, shown that they possess a competent knowledge of engineering practice, but who have never seen their way to go through a training to which, strange to say, they accord a foremost place in their syllabus of qualifications—*i.e.*, a successful passage through the instruction of a properly constituted engineering school. That is to say, they will recognise a list of engineering schools, to a diploma from which they accord a high place in their list of qualifications, but reserve the right to elevate to the rank and privileges of membership any one whom they please.

Now, Sir, can anyone imagine what the Medical Society would say if one of its associated schools should seek to give its imprimatur to a "bone-setter," however skilful, or to a chiropodist, or even to an "L.D.S.," or to a chemist who had had years of experience in compounding the prescriptions of eminent medicos, and, indeed, of successfully prescribing himself? Would it not be irregular in the extreme? It would certainly be a very different thing from the action of a University Senate in conferring a degree *honoris causa*, for that distinction is one the recipient of which never possesses to the

extent of affecting the existence and welfare of others as an "M.D." would. . . Human life, and all safeguarding it, are much too sacred considerations to be made the subject of complimentary etiquette.

Then why should not the strictest regulation guard the entrance to a profession which I think I may truly say should include in the course of preparation for it the highest qualification attainable?

A little more than a year ago I was greatly struck by a query put at a Metropolitan meeting by a member of one of our older engineering institutions, who wanted to know of what use to an engineer was the study of chemistry. I think I may safely leave comment on such a query to anyone who has had the patience to read so far in these remarks.

But, Sir, may I seek to contrast such considerations with what was said to me by a young member of the profession (now, I believe, an A.M.Inst.C.E.) who entered it in what I firmly assert is the only state in which anyone should *now* be allowed to—*i.e.*, well educated? He entered, distinguished himself in and came successfully through one of our finest training schools (the London University Engineering School). He then went to a prominent engineer for a course of experience, and, not readily finding work at home, went to one of our Colonies. Finding progress rather slow in that particular Colony, he came home, and has just succeeded in getting a post in another Colony—and one which is more suited to his undoubted capability. In a farewell chat he told me that one thing his growing experience was increasingly pressing upon him was that nowadays, and of all men, an engineer cannot be too highly educated. In this opinion I entirely concur. No man can be exhaustively taught engineering, even in the most comprehensive engineering school course. After he has got a diploma, he will find that his education for the profession is but begun, and he will only go on to experience the great truth of what the late Dr. Haughton (of "Galbraith and Haughton") said in the hearing of the writer when beginning the first of one of his annual series of lectures on geology to the students of the Engineering School and the senior sophisters in Trinity College, Dublin—*viz.*, "You will make a great mistake, gentlemen, if you think you have come here to be instructed in the various branches of knowledge and learning which are put before you. All we can hope to do in the short course of a university career is to teach you how to learn for yourselves."

Over half a century has passed since I heard that utterance. The effect it produced has remained with me till to-day. At that time I think the Trinity School of Engineering was foremost among engineering schools. Since then others have come along, and I suppose now there are none more distinguished than the one with which I understand the Institution of Civil Engineers is more particularly associated—*i.e.*, the London University Engineering School.

But even as there are various schools for training the embryo medico, all worked efficiently by a central and representative council, why cannot we have various schools for training the young engineer, all as efficiently controlled by a central and representative council? Let me once more say it—let us unite and go for a legal recognition which will make unqualified practice illegal.

In his address Mr. Shenton said that "the Society of Engineers is at the present time devoting considerable attention to the subject referred to—*viz.*, the organisation of the profession and the well-being of the engineer—and will spare no pains in the future to promote this object, &c." If Mr. Shenton and his council can devise and bring into operation the means by which the institution and all other genuine engineering associations can harmoniously work to attain such a grand result as the proper qualification for, and protection of, the engineering profession, they will deserve the highest meed of praise and gratitude from its members. This result must be attained by a united action. No one society, however eminent, can *now* claim the right to dominate the situation.

In my communication to you in the beginning of January, 1907, I spoke of a possible course to be taken, if the matter could at any time be arranged, and particularly with the view of providing for the due recognition of the situation and rights of those who should be then qualifying as articled pupils, or were just about to be articled, and had for some time been preparing for it, and whose arrangements would

have been rendered useless were Government to accredit only those who had passed through, or should in future pass through, a university course. Let me now recall it—to suit the present date. Suppose an Act were now passed to make imperative the passing through an engineering school course as a part of an engineer's training. No one would be injured or interfered with were the Act to provide that such a restriction would come into operation on, say, August 1, 1918, and that anyone who had been duly articulated to a competent engineer, and received his certificate, could claim the approval of the examining council, even although he had not had a university school training. To the constitution of this examining board the councils of the institution, and of such other associations as would be approved by the Act, would necessarily contribute, and the board, if it were found advisable, could also include some professors of engineering from the different engineering schools recognised by Government.

It may be said, Why should not everyone qualified to do so join the institution, and then let all seek protective recognition? The expense of doing so is, to many, too great to warrant their doing so unless certain of the success of the institution in gaining the protection which alone would make it worth doing. While it is true that anyone of sense would not grudge £10 to begin with, and £3 3s. (or £4 4s.) per annum if it assured the right to qualified men only to practise, it is quite as true that, as things now go, to many well qualified men membership in the institution is, like the advantages of membership in a good club, a luxury. No; let us get admission to the profession properly regulated by legal enactment, and I feel certain that the ranks of the institution, and possibly other societies connected with the craft, would in time be swelled to an extent that would now be deemed improbable. A very few years would raise the scientific attainments of the members to a pitch which would place engineering first of all among the educated callings. Members of the profession would be still better able to specialise in road construction, or any other branch of engineering, from having had, *ab initio*, a sound training in general principles and knowledge, even just as medical men specialise in one or other direction, as gift or opportunity leads them to, but having *first* had the general training required by law—and, indeed, by necessity.—Yours, &c.,

MODERATUS.

February 17, 1914.

WARNINGS FOR DANCER POINTS ON ROADS.

To the Editor of THE SURVEYOR.

SIR,—I should like to make the following suggestions to road engineers:—

Those who have ridden by night in a motor car having the powerful lamps which are now in general use will have observed the curious effect produced by the reflection of the light in the eyes of dogs, cats, and other animals. From a distance of 100 yds. or 200 yds. the eyes glare like lamps with intense brilliancy. Also the light reflected by the small red reflectors carried by cyclists and others in place of tail lights is indistinguishable from the light thrown by a powerful red lantern.

It certainly seems that reflectors might be made to serve a very useful purpose, for if they were erected at points on the road where sharp turnings, cross-roads, or other dangerous features occur they would afford ample warning to the motorist. No person will drive recklessly into an unknown obstacle, and a red light is sufficient to cause any motorist to advance with caution. A single reflex lamp fixed in a proper position on the danger-post would be visible at night from a considerable distance to an approaching motorist. It would serve the same purpose as a fixed light, such as the acetylene lamp already used in some places, and as the cost would be a few pence, the economy, as compared with the acetylene lamp, is evident. Further, it would be possible to fix reflex lamps of such colours and in such positions as to indicate clearly the nature of the warning. For instance, the triangle could be indicated by three lamps, and green, white, or red lights could be used.

It is also questionable whether it would not be advantageous to apply the same principle elsewhere. For instance, it is sometimes very difficult to find the position of a yacht's mooring in the dark. One or two reflectors attached to the mooring buoy would be as useful as a permanent light, for with an ordinary

acetylene light flashed over the water in all directions the position of the buoy could be ascertained with great ease. It might even be possible to place similar reflectors on the buoys round our coasts, so that a vessel with a searchlight could avoid making any mistake as to the name of the buoy it happened to be passing. This might be particularly useful to yachtsmen, for it is possible to pass close to a buoy in the dark and to mistake it for another; also in these days when it is possible to obtain powerful acetylene lamps there would be small difficulty and considerable advantage in being provided with a lamp of the proper power to throw a light to a great distance.

The possibility of using reflectors for the purposes mentioned is perfectly clear. When riding in a car with ordinary lights the eyes of a cat seated on a wall 200 yds. away, or of a dog in the road, or even those of a rabbit, will glare to such a degree as to be mistaken for the lights of some vehicle at a distance. Also, there is the accepted instance of the reflex lamp used by the cyclist. It is therefore perfectly clear that proper reflectors could be placed at any required elevation for the purposes described.—Yours, &c.,

H. C. H. SHENTON.

28 Victoria-street, S.W.

March 4, 1914.

WHY TAR-SLAG BINDS WELL.

To the Editor of THE SURVEYOR.

SIR,—Your contributor, Mr. Reginald Ryves, in his article in your last week's issue, has ably dealt with points I have raised respecting slag used for tar-macadam purposes.

I hold the views that a chemical action of a high degree takes place between the slag and tar, and that no other known roadstone has properties enabling similar action to take place. Sandstones, limestones, &c., are dealt with, and your contributor states that the superiority of slag over these stones is mainly, if not wholly, due to its better wearing qualities. I venture to disagree with him. Slag untarred is a poor material to use, especially on clayey and wet subsoils; under reasonably heavy traffic it would not give a longer life than a first-class sandstone or limestone.

I fail to see that "small scale" roughness is such an important factor. Several types of limestones, sandstones, quartzites, syenites, &c., possess surfaces which appear to be ideal for tarring surfaces, but if any of these materials are examined after two or three years' wear under heavy traffic it will be found that the tar has lost a great deal of its original properties, and in the case of syenites, &c., it will hardly stain one's hands when small particles taken from interstices of the crust are rubbed between them. On the other hand, an examination of a slag-macadam will show that the tar retains its life for a very long period—over seven years, to the writer's knowledge—and that little change appears to have taken place.

In dealing with atmospheric pressure, Mr. Ryves assumes that slag is invariably heated before being tarred. I have laid tar-macadam with "hot" and "cold" stone, and have failed to find the slightest difference in the wear of the materials. I could show your contributor sections coated with clean slag which was simply dry-rolled and grouted in with gas-works tar. These sections have outlived several coatings of tarred granite and tar-painted macadam! An inspection would convince him that the theory he raises is not of much account.

The following simple experiments may be of interest:—

- (1) Cold slag mixed with boiling tar, after examination, showed that no absorption had taken place.
- (2) Heated slag mixed with hot tar gave results similar to the above.
- (3) Cold slag immersed in boiling tar for five minutes showed a brownish discoloration for a depth of about $\frac{1}{2}$ in.
- (4) Heated slag immersed in boiling tar for five minutes showed a brownish discoloration for a depth of about $\frac{3}{8}$ in.

I venture to express the opinion that the discoloration mentioned in (3) and (4) would not have any bearing upon the ultimate wearing properties of the slag.

In the above tests the slag was heated to a temperature much above what would be considered reasonable or safe for coating purposes.—Yours, &c.,

CRETACIOUS.

March 2, 1914.

SEWAGE DISPOSAL BY DILUTION.*To the Editor of THE SURVEYOR.*

SIR,—I have read Mr. Stowell's letter in your issue of February 27th.

The Eighth Report of the Sewage Commission deals exclusively with sewage or sewage containing trade wastes; the "Summary of Conclusions" (p. 17) refers solely to sewage or sewage liquors, and reference is not made to quality of river water in these conclusions, because dilution is the main consideration.

My object in answering Mr. Stowell's letter was to draw attention to the fact that the commission expressly recommend dilution, and *not* quality, of river water as the chief factor.

It must be carefully borne in mind that the commission's recommendations refer to the whole country and not to the particular watersheds in which Mr. Stowell is personally interested. Mr. Stowell not unnaturally applies these recommendations to his own rivers, where special conditions obtain.

It may be that in such a case application could be made to the proposed central authority for quality of water to be taken into account in that particular watershed, or at any rate in some parts of it.

But Mr. Stowell's special conditions do not affect the general recommendations, as might have been inferred from his letter of February 13th.

Even in the case of the rivers in Mr. Stowell's watershed, there might in certain instances be justification for disposal by dilution, where small communities are concerned.

One could imagine, for example, a small town on the banks of a large river being forced to carry out a complete system of treatment for the discharge of a very good effluent into a foul river water (which might possibly always remain foul), and such enforcement in my view would be an unnecessary waste of public money.

There has perhaps in the past been a tendency to press somewhat unduly upon the smaller and weaker communities, while neglecting the larger authorities.—Yours, &c.,

G. BERTRAM KERSLAW.

West Wickham, Kent.

March 2, 1914.

THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.*To the Editor of THE SURVEYOR.*

SIR,—On reading through the letter of "Member of the Institution" in your issue of February 20th, I cannot help being struck with the truth of what he states, and feeling that our institution is not doing for its members what it might do.

This especially applies to young members who are among the big crowd who, after passing examinations, or being elected members, find on applying for posts that more often than not the successful candidates are not members of our own or of any institution. . . .

Certainly this is enough to make one think whether it is worth while continually to pay membership fees. At the same time, is it not possible that public authorities, if approached in a proper manner, could be prevailed upon to give preference to our members and associates? Would not a circular letter, setting forth the advantages to be gained by appointing such officers, be a step in the right direction and give some encouragement to those who have to pay, besides, possibly, resulting in some cases of preference being shown to members of our body?

It is not the writer's intention to lay any blame at the feet of the present or of any previous council, but to add a few words to the reasonable complaints which have been made, and thereby endeavour to arouse the institution from its lethargy, and, by being up and doing, prove the use of our existence.—Yours, &c.,

ROAD SURVEYOR.

March 2, 1914.

Coleford and West Dean Water Supply.—In the House of Commons on Monday the President of the Board of Agriculture stated, in reply to a question, that an appeal for a contribution out of the Land Revenues of the Crown towards the cost of a scheme for supplying West Dean and Coleford with water had been received, and that he had been asked to see a deputation from the Gloucestershire County Council on the subject. He hoped to be able before long to give the deputation an interview.

THE SCOTTISH ROAD EXPERIMENTS.**MEETING AT FALKIRK.**

In connection with the Scottish road experiments the Road Committee of the Institution of Municipal and County Engineers (Scottish District) met in the District Offices, Falkirk, on Friday, February 27th, Mr. J. Walker Smith, convener, presided. There were also present all the road surveyors who intend to lay down trial lengths of road surface work in connection with the experiments in question.

With the exception of Inverness and Lunithgow districts, who had only recently agreed to take part in the experiments, plans and estimates were produced from all the other districts taking part in the trials, and these were carefully gone over and adjusted. The convener gave explanations on points of construction, supervision, and of inspection by the officers of the Road Board, and stated that so soon as he had all the applications and estimates in his hands he would forward the whole to the Road Board for approval, and obtain authority to proceed with the work.

The meeting thereafter proceeded to Carmuir, and inspected the portion of the Glasgow road on which the Eastern District Committee of the County Council of Stirling propose to lay down the trial length. Samples of the notice boards denoting the various kinds of treatment were erected on the road margin, and their size and style were discussed and approved.

The meteorological station, in connection with the section which was set up on ground adjoining the road, was also inspected. The enclosure is 27 ft. by 21 ft. In the centre a portion, 15 ft. by 9 ft., is laid with tar-macadam on which the following instruments are installed: Stevenson screen with thermometers for maximum and minimum readings, dry and wet bulb readings, solar and terrestrial radiation thermometers, rain gauge and sun recorder. There is also on the road itself a surface-box with thermometer for taking the temperature at 1 in., 2 in. and 3 in. below the road surface.

Mr. Ballantine, road surveyor, accompanied the party and showed them over the road and works, while Mr. Ronald explained the purpose and method of reading the various weather-recording instruments, in which all were keenly interested.

LONDON ARTERIAL MAIN ROADS.**DATES OF LOCAL CONFERENCES.**

It will be remembered that in November last a conference of metropolitan, borough and urban authorities, convened by the then president of the Local Government Board, Mr. John Burns, was held for the purpose of discussing the question of arterial main roads, and incidentally town planning, and that among the suggestions put forward by Mr. Burns was one for the holding of local conferences, whose duty it would be to decide the character, the varying methods, and, above all, the alignment of local roads. General agreement was expressed with this idea, and we now learn that the first of six sectional conferences—London having been divided into that number of areas for the purpose—will be held at the Local Government Board offices on Monday next, at 2.30 p.m., the remaining conferences being fixed for March 10th, 11th, 16th, 17th and 18th respectively.

Association of Engineers-in-Charge.—At the St. Bride's Institute, Bride-lane, Fleet-street, E.C., on Wednesday, March 11th, at 8 p.m., a paper on "The Storage of Coal with some Applications of Reinforced Concrete," will be read by Henry Adams, Esq., M.INST.C.E., M.I.MECH.E., F.S.I. Mr. W. Noble Twelvetrees, M.I.MECH.E., will occupy the chair.—The annual dinner of the association will take place on March 21st.

Cardiff Surveyor's Problem.—The amount voted for street cleaning at Cardiff during the ensuing financial year is £21,700, and the city engineer, Mr. W. Harpur, told the Finance Committee that it will require some arithmetical gymnastics to make the money go round. He explained that street upon street—miles, in fact—had been added to his work, involving more cleansing and house-refuse collection, and yet he could not get any more money for it. He had even been ordered to collect refuse from the hotels on bank holidays.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

The premium for February is awarded to—
 Mr. H. V. OVERFIELD,
 Town Hall,
 West Bromwich,

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

381. Town Planning.—An area of 1,000 acres, chiefly undeveloped, in an urban district, is to be included in a town planning scheme. The approximate number of owners, occupiers and lessees is 250. Assuming that the referencing is to be done by the staff of the urban district council surveyor's office, state the information which should be sought, and the best method of ascertaining and recording it. Give an estimate of the cost of the work if done by professional referencers. Compare the advantages and disadvantages of the two methods, both in the above case and in the case of an area of 1,500 acres in the same district, which includes a considerable extent of partially developed building estates, and is to form the nucleus of a later scheme. (Tozun.)

382. Fire Hydrants. Fire hydrants, 2½ in. in diameter, are taken from a 4-in. and a 12-in. main. What will be the ratio of discharge in the two cases, assuming that the initial pressure is the same in each main? (X. X., Hounslow.)

383. Crain Silo.—It is required to construct a grain silo, the bins of which are 64 ft. in height and 8 ft. square in cross-section. What lateral pressure at the base should be provided for? (X. X., Hounslow.)

384. Timber.—Sketch the cross-section of an oak tree and show the different modes of conversion. How does oak compare with elm for use inside or outside a building?

385. Chimney Design.—Design a brick chimney shaft 130 ft. in height from ground level; the internal diameter at the base being 40 ft. (P. S., Plumstead.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

379. Testing Pipes.—What tests should stoneware pipes be subjected to before they are accepted for use? What defects are often thereby disclosed? (B. W., Tadcaster.)

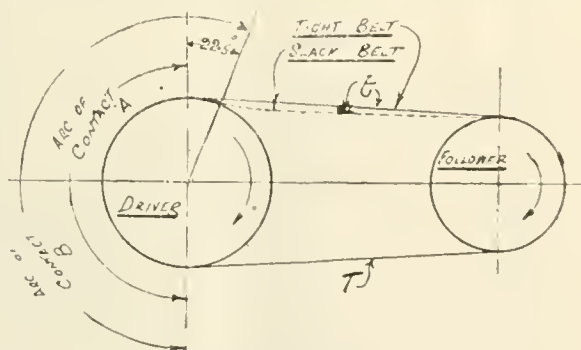
Stoneware pipes being used chiefly for the conveyance of foul liquid matter, should, above all things, be impervious to water and able to resist the action of chemicals in sewage. Stoneware is manufactured from clay of the lias formation, containing silicates and aluminates mixed with powdered stoneware and glass; the silicates, &c., enable the clay to stand the high temperatures to which the pipes are subjected in baking, while the powdered stoneware prevents excessive shrinkage. The great heat used in the baking causes the whole mass to become thoroughly vitrified, tough, durable and impervious; and to ensure the pipes being absolutely impervious they are salt-glazed by throwing common salt on them during the baking, which spreads a glassy film over the whole surface of the pipes. Good glazed stoneware pipes should be straight, true in section, and free from flaws. A good test is to break a piece of the pipe; a fracture of stoneware should present a clean, white pasty appearance with a tough texture, and should give

a hard, clear ring on being knocked. A fracture with a yellow, granular appearance, together with a dull sound as the result of a knock, indicates fireclay, which is often substituted. This material is not nearly as good as stoneware, and may further be tested by putting the clean edge of a fracture to the lips—if fireclay, the lips will stick to the fracture, owing to moisture being absorbed; but if the pipe is stoneware there will be no effect. Inferior clay may be tested by picking the glazing; if it shells off easily the clay underneath may be assumed to be of poor quality. (H. B., Palmouth.)

The mechanical tests usually specified for stoneware pipes are the water and bearing tests. The pipes are filled with water and are required to stand a pressure of 15 lb. per square inch without showing signs of sweating, as that would denote that they were absorbent and porous. About 5 per cent of the pipes are usually tested in this way. Their resistance to bursting should then be ascertained by testing them to destruction under water pressure. They should withstand a pressure of 50 lb. per square inch before bursting. Lastly, the resistance to destruction from without should be tested. A 2-ft. length of pipe should be laid evenly on the ground, when it should support an evenly distributed weight of 2 tons before crushing. About 2 per cent of a parcel of pipes is generally taken for each of the destructive tests. So much for the tests as to strength. The whole of the consignment of pipes should be generally observed to see that each one is straight, cylindrical, perfectly smooth inside, free from blisters and fire-cracks. The glaze should be uniform, and broken pieces of pipes should show a fine, close grain, metallic appearance, thorough and uniform vitrification. A pipe when struck should give a clear, sharp, ringing sound. A ready test for a stoneware pipe is to chip off a piece and apply the broken portion to the tongue, when, if there is a sensation of suction, denoting absorption of moisture from the tongue, the pipe is composed of fireclay or earthenware, and should be rejected. If, on the other hand, there is no suction, it may be taken as being stoneware. (H. G. L., Dunfermline.)

[Further interesting replies to this question are held over until next week.—Ed.]

380. Belt Cearing.—A belt running at 1,500 ft. per minute transmits 80-horse power. Find the difference of tension of the two sides of the belt. (T. R.)



$$\text{Radians in Arc "A"} = \frac{180}{57.3} = 3.1416$$

$$\text{Radians in Arc "B"} = \frac{202.5}{57.3} = 3.5340$$

In all belt-driving there is a considerable pull or tension on both sides of the belt, and these two tensions T and t differ when motion is given from one shaft to another. The difference T—t between these tensions is the driving tension D, and D = V, where V = velocity in feet per minute =

W, where W = foot-lbs. of work done per minute, and
 $W \div 33,000 = \text{h.p. transmitted.}$

$$\therefore D^2 \times V = W, \text{ and } W = 80 \times 33,000$$

$$\therefore D^2 = \frac{80 \times 33,000}{1,500} = 1,760 \text{ lb.}$$

$$\therefore \text{Difference of tension of the two sides of the belt} \\ = 1,760 \text{ lb.}$$

The following notes on the subject may be useful: When fixing a flat belt it is evident that the belt must be tightly stretched over pulleys in order to get sufficient friction between belt and pulley. Hence there must be tension (t) on the slack side, and the greater t is, the greater may be the difference $T-t$ for a given angle of lap. As a matter of fact, $T-t$ increases approximately in proportion to the tightness t of the belt. If the tightness of the belt is kept the same, and the angle of contact be increased, the friction will rapidly increase.

The following law will be found useful when dealing with belts:—

$$\text{Log} \frac{T}{t} = e^{\mu \theta} \text{ where } T = \text{tension on tight side of belt}$$

$\text{,, } t = \text{,, ,, slack ,,}$
 $\text{,, } e = \text{base hyperbolic logs}$
 $\text{,, } \mu = \text{coefficient of friction between belt and pulley}$
 $\text{,, } \theta = \text{angle of lap in radians}$

(Base of hyperbolic or Napierian logs = 2.7183. They may be converted into common logs by multiplying by .4343.)

The coefficient of friction can safely be taken at .375, as a constant.

Now let us assume that the greatest working tension on a leather belt is 320 lb. per square inch of section; width of belt = 9 in.; thickness of belt $\frac{1}{2}$ in., $\mu = .375$; lap 180° ; velocity of belt 1,000 ft. per minute. We require to find T , t , and the horse power transmitted:—

$$\text{Following the above law, } \text{log} \frac{T}{t} = e^{\mu \theta}$$

$$\text{Log} \frac{T}{t} = .4343 \times .375 \times 3.1416 = .5115$$

$$\text{Anti log } .5115 = 3.247$$

$$\therefore \frac{T}{t} = 3.247$$

$$\text{Now } T = 9 \times .25 \times 320 = 720 \text{ lb.}$$

$$\therefore \frac{720}{t} = \frac{3.247}{1}$$

$$\therefore t = \frac{720}{3.247} = 221.7 \text{ lb.}$$

$$\text{Driving tension} = T - t$$

$$\therefore T_D = 720 - 221.7 = 498.3 \text{ lb.}$$

$$\text{The velocity of belt} = 1,000 \text{ feet per minute}$$

$$\text{Driving tension} = 498.3 \text{ lb.}$$

$$\therefore \text{H.P. transmitted} = \frac{1,000 \times 498.3}{33,000} = 15.1$$

(R. J. McK., Heywood.)

Ventilation.—Cushendall Church, Co. Antrim, is being supplied with Shorland's patent concealed extract ventilators by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

"Ice-like" Road Surfaces.—The failure of manufacturers to produce an effective non-skid pneumatic tyre for motor cars is the subject of an article in last Tuesday's *Times*. The writer, however, points out that this is not so much the fault of the tyre maker as of the road builder, adding: "The modern highroad with its ice-like surface and the modern London street have become a hundred times more dangerous than the old muddy highways. Cross-country roads and secondary roads have not changed, but it can be only a question of time before they too are made dustless, mudless, and, from the point of view of the non-skid user, slippery as glass. That most progressive county of Kent is an apt case in point. Nowhere in the United Kingdom are roads of all grades so magnificently preserved. Kent is the ideal motorists' county, but it is well to exercise the greatest caution in driving a light car fitted with steel-studded tyres within its boundaries."

ASSOCIATION OF KENT SURVEYORS.

MEETING AT MAIDSTONE.

A meeting of the Association of Kent Surveyors took place on Saturday last at Maidstone. The members assembled at the electric light station, over which they were shown by Mr. T. L. Bunting, the borough engineer, an inspection of the public baths following. The meeting took place in the Board Room at the offices of the Maidstone Board of Guardians and Rural District Council. Those present were Messrs. A. E. Nichols, T. A. Busbridge, W. B. Smith, H. W. Longdin, W. L. Bradley, F. T. Elliott, T. G. Taylor, R. Craig, J. Hookins, C. Jones, J. W. Cooper, W. Banks, J. L. Redfern, J. A. Mitchell, T. W. Pullen, J. Randerson, D. E. Foster, W. Goodsell, E. M. Hendry, T. F. Bunting, J. S. Roper, F. G. Sargent, E. R. Lewis, F. W. Greig and F. Harris.

The chairman of the Maidstone Rural District Council, the Rev. J. R. Leigh, occupied the chair, and gave a hearty welcome to the members of the association on behalf of the rural district council and himself. Mr. A. E. Nichols, borough engineer of Folkestone, thanked Mr. Leigh for his kind expressions, and took the opportunity of congratulating the guardians and councillors of the Maidstone Rural District Council on their excellent offices.

Mr. T. A. Busbridge, surveyor to the Rural District Council of Maidstone, introduced the question of

EXTRAORDINARY TRAFFIC ON ROADS.

Mr. Busbridge said the subject was, to his mind, an all-important one, especially to surveyors of rural districts. The extraordinary usage of district roads other than main roads by mechanical traction, such as motor buses, lorries, tractors, and so forth, for commercial purposes, together with other through traffic, entailed a serious burden on the local rates, and rendered necessary some relief either from the Road Board or the county council by grants in aid or a system of "assisted roads." Most of them were only too well aware what rapid strides this new mode of traffic had made and was likely to make in the near future, and that many of their district roads were subjected to traffic which, until a comparatively short time ago, was unknown, and therefore not provided for. The consequence was that the roads were unable to carry it, unless entirely new and up-to-date methods were resorted to, and that meant that bituminous-bound roads with, in many instances, new foundations, must take the place of the old water-bound road. He believed it was generally admitted that the initial cost of the reconstruction of a road with a bituminous-bound coat very considerably exceeded the cost of a water-bound coat, although he believed it was agreed that it was the cheaper method in the long run. Now this initial cost was the item that was affecting them at the present time, because, although they felt bound to advise their various councils to delay no longer in making the necessary conversion of many of the roads under their jurisdiction, they were diffident about doing so owing to the extra cost it would incur. It entailed a serious burden on the local rates, a burden which many of their councils did not feel justified in imposing. Knowing that, and knowing also that the present-day traffic must necessarily considerably increase the cost of road maintenance, he ventured to think that the time had now arrived when some relief, either from the Road Board or the county council, should be granted in cases where rural district roads were subjected to this new class of traffic.

Mr. T. L. Bunting, borough engineer of Maidstone, said they had the same difficulty in Maidstone, as certain roads had become of equal or more importance than the main roads by reason of this increased traffic. Motor-bus services radiated from Maidstone to the surrounding villages and towns, using roads which were not main roads. Mr. W. L. Bradley, surveyor to the Tonbridge Urban District Council, said the time had no doubt come when some alterations must be made in the system of road maintenance, and that the trunk roads should be supported by an Imperial charge. Mr. J. L. Redfern, borough engineer of Gillingham, considered that the rural district councils had a grievance owing to this increased traffic. It was necessary to try experiments to ascertain what up-to-date system of road making suited a particular district, and the rural district councils had not the money to do it. Mr. W. Goodsell (Eastry) said flint had been used in his district, but it was useless now. Mr. J. W. Cooper, surveyor to the Hoo Rural District Council, said that in his district some of the parishes

The Surveyor

And Municipal and County Engineer.

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were already burdened with rates of 9s. 2d. in the £. Mr. W. B. Smith, surveyor to the Romney Rural District Council, said he had 4 miles of sea road for which they had obtained a grant. Mr. A. E. Nichols, chairman of the association, thanked Mr. Busbridge for introducing the subject, and said that in Folkestone the cost of roads had decreased owing to foundations being put in where necessary in the past, and a liberal tar treatment. He had an instance of one road which had required remetalling every two or three years, but with the surface treated with plenty of good hot tar it had now gone eight years.

DINNER AND A PRESENTATION.

Dinner afterwards took place at the Queen's Head Hotel, the chair being occupied by Mr. A. E. Nichols, supported by Mr. H. P. Maybury, chief engineer to the Road Board (late president of the association), and Mr. H. T. Chapman, county surveyor of Kent (the new president).

Mr. Nichols said that the occasion was, in a way, a sorrowful one, as they were parting with their late president. Possibly they had not always agreed with him, or got all they wanted, but they had always found him ready to give the most careful consideration to the matters that came before him. He had been a personal friend, and it was his pleasant duty, on behalf of the association, to present Mr. Maybury, in remembrance of his being the first president of the association and of his appointment as chief engineer to the Road Board, with a solid silver salver on which was inscribed the names of seventy members. The members congratulated him on his appointment, and those who had appointed him on the wisdom of their choice. Mr. Nichols said he desired to take the opportunity of formally introducing the new president, Mr. Chapman, with the hope that the members would be as loyal to him as they had been to Mr. Maybury.

Mr. Maybury said he never thought the Kent surveyors would make him feel uncomfortable, but they had done so on this occasion. He valued the appreciation of his work, but not more than the good opinion of the surveyors of Kent. Whatever differences of opinion there might have been, they were never personal, and always amicably settled. The association was doing good work, and he had been much struck with the success it had attained; in his opinion, it was beneficial to the county and to the individual. He wished the association continued success.

Mr. Redfern proposed the health of the new president, and welcomed him to the county. Mr. Chapman

would have a difficult work to perform in following such an able man as Mr. Maybury, who had gained for the Kent roads a world-wide reputation for excellence. He had no doubt, however, that under Mr. Chapman that good reputation would continue.

Mr. Chapman thanked the members for their cordial reception. In Somerset they had a similar association, and knew the good work that could be done. He realised the difficult task of following Mr. Maybury, but he would do his utmost to follow in Mr. Maybury's steps, and as president would do his utmost to promote the welfare of the association and that of the individual members.

The health of the chairman was proposed by Mr. Maybury, and after some musical items a very enjoyable evening terminated.

ROAD MAKERS AND ROAD USERS IN CONFERENCE.

LONDON SUBURBAN SURVEYORS ENTERTAINED.

An informal discussion on road topics took place on Wednesday evening at a dinner given by the Roads Improvement Association and the Royal Automobile Club to county and district surveyors within a radius of 15 miles of London, but outside the area of the London County Council. The object of the function was to bring representative road users into closer touch with the executive officers of local authorities, and the points raised in the course of the conversation—which was opened by an admirable speech from Sir George Gibb—included questions connected with the administration of local roads, the steps that are being taken to improve them, and the difficulties confronting the various surveyors. In particular, information was sought as to the attitude of councils in regard to the cost of maintenance, the engagement of properly trained men for repair work, the quality of stone employed, the results obtained from the use of tar or bituminous compounds, the reduction of camber, and the desirability of preparing standard specifications for the resurfacing and reconstruction of roads upon modern lines. Allusion was made to the complaints of ratepayers as to the increasing cost of the highways, but it was pointed out that, as shown by figures given in the House of Commons by Mr. Herbert Samuel, President of the Local Government Board, and quoted in the *Motor*, the increase in the expenditure on main roads over a period of twenty years was only £1,800,000, against which had to be placed the net proceeds of motor taxation, £1,400,000. The excess expenditure on main roads was thus very nearly met, though there still, of course, remained to be considered the question of subsidiary roads, upon which the outlay had been very large.

Four county and some seventy urban and rural officials—metropolitan engineers were purposely excluded as the matters touched upon had reference more to country roads than to town streets—were among the company present, and it was freely acknowledged at the close of the evening that some exceedingly useful results had been attained from the gathering—which was presided over by the Hon. Arthur Stanley, M.P.

The question of the future training of the highway engineer was discussed in the course of the proceedings, without, however, any definite conclusion being arrived at.

ROAD BOARD APPOINTMENTS.

QUESTIONS IN THE HOUSE.

On Monday, in the House of Commons, Mr. Bridgeman asked if it was the usual practice in the Government offices to acknowledge the receipt of applications for important appointments and to state whether such applications are to be considered or not; and why the Road Board did not follow this practice?

Mr. Montagu said the reply to the first part of the hon. Member's question, so far as he was in a position to answer it, was in the affirmative. As regarded the second part of the question, he had no reason to believe that the Road Board intended to disregard the general practice.

Mr. Bridgeman: If I call the hon. gentleman's attention to a case, will he use his influence to see that the usual practice is followed?

Mr. Montagu: Certainly; but I would remind the hon. Member that in cases where there are a large number of applications it may sometimes be very difficult, though every effort is made.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bridlington T.C. (February 24th. Mr. F. H. Tulloch). £1,301 for the purchase of property for widening a narrow and dangerous part of St. John street. The inspector expressed surprise that the council had not taken up several small loans which had been sanctioned by his board. He noticed that at the same time the council had an overdraft on the treasurer. It was explained that the overdraft was only made until such time as loans could be secured, and that the sanctions had been presented to the treasurer before he permitted a temporary overdraft. The inspector said that being so, it appeared that the council had, to some extent, taken advantage of the sanctions.

Carlisle T.C. (March 4th. Mr. W. M. Cross).—£29,940 for electricity extensions, £884 for the purchase of property and construction of a new street connecting Queen-street, Rigg-street, and Broad-guards, and £735 for the purchase of property and improvements at Twentymans-court, Finkle-street. In regard to the electricity extensions, Mr. Purse, the engineer, stated that during the past twelve months the electric light consumers had increased from 632 to 721, and were almost daily increasing.

Finchley U.D.C. (March 2nd. Mr. W. H. Collin).—£99,493 for the provision of working-class dwellings. It was stated that since 1901 the population of the district had increased by 22,000, but the accommodation had not increased accordingly. Of the 300 houses it was proposed to build, 240 were to contain two bed-rooms, two sitting-rooms, a kitchen, and a bathroom, and would let at a rent of 8s. 6d. per week. The remaining sixty would have one sitting-room less, and a reduction of 1s. a week in the rent would be made. It was estimated that the scheme would show a profit of about £5 a year.

Manchester T.C. (February 18th. Mr. Edgar Dudley).—£11,500 for the purchase of Hulme Cavalry Barracks, and the laying out of the site as a recreation ground.—Mr. T. de Courcy Meade, city surveyor, said his estimate of the value of the site was within £100 of that made by the corporation valuer. There were three chief rents on the property, but he did not know whether it was proposed to redeem them. It was further explained that the population of the city was 714,333, and of Hulme 63,177. Hulme had 132 persons to the acre, and Manchester generally 33 per acre. Manchester had 1,276 acres of parks and open spaces, but Hulme had $\frac{1}{4}$ acre. Afterwards an inquiry was held into an application by the Paving Committee to borrow £18,266 for works for private streets improvement.

Melton Mowbray U.D.C. (February 23rd. Mr. R. H. Becknell).—£2,150 for the provision of a refuse destructor on the site of the old sewage works.—The surveyor, Mr. E. Jeeves, stated that the distance of the site from the furthest part of the district was $\frac{2}{3}$ miles, and it was about $\frac{1}{4}$ mile from the market-place. The town refuse was now collected by their own men in carts, and tipped on to the site of the old sewage works. The quantity collected would be about 54 tons per week. The nearest house to the site in the urban district was 600 yds., and the nearest outside 700 yds. Mr. Dawson, of the firm of Messrs. Dawson & Mansfield, Manchester, explained the details of the destructor, and said there were two cells of 20 sq. ft. each. They were hand fed, and the burning capacity of each was about 10 cwt. per hour.

Poole T.C. (February 20th. Mr. W. M. Cross).—£4,069 for works of road improvement and surface-water drainage. Evidence was given by the town clerk, Mr. C. Lisby, and the borough surveyor, Mr. S. J. Newman, it being explained that the road improvement schemes had become necessary through the growth of vehicular and other traffic.

Tewkesbury T.C. (February 17th. Mr. W. H. Collins).—£8,000 for the purpose of building working-class dwellings.—The borough surveyor, Mr. W. Ridler, gave a detailed description of the houses, which will have three bedrooms, and a bath fixed in the kitchen under the table. The area of the garden attached to each house would be $\frac{2}{3}$ of a square chain. He was hopeful that the rent might be something under 5s. 6d. per week.

APPLICATIONS FOR LOANS.

- Billericay R.D.C.**—£9,000 for sewerage works.
- Brighton T.C.**—£16,000 for electric mains, motors, and heating appliances.
- Cannock R.D.C.**—£180 for sewer extension.
- Chelmsford T.C.**—£1,000 for sinking a trial borehole.
- Colne T.C.**—£8,900 for the construction of a new road.
- Grays U.D.C.**—£1,100 for road widening.
- Keighley T.C.**—£600 for motors to be let out for hire.
- Knaresborough U.D.C.**—£950 for road widening, and £300 for sewage disposal works.
- Littlehampton U.D.C.**—£710 for public lavatories.
- Maidenhead T.C.**—£2,500 for road repairs.
- Newbury T.C.**—£1,700 for gas mains extensions.
- Norwich T.C.**—£12,800 for the extension of the municipal buildings.
- Todmorden T.C.**—£800 for road improvements.
- Wakefield R.D.C.**—£10,842 for sewerage works.
- Walthamstow U.D.C.**—£5,900 for an additional boiler, overhead tankers, and conveying plant at the electricity works.

LOANS SANCTIONED.

- Bermondsey B.C.**—£4,560 for paving works, repayable as to £1,880 in fifteen years, and the balance in seven years.
- Durham R.D.C.**—£2,172 for sewerage and sewage disposal works.
- Larne R.D.C.**—£2,000 for a new road at Ballyhill.
- Melford R.D.C.**—£750 for the erection of four houses.
- Stoke-on-Trent T.C.**—£550 for the proposed High-street West improvement.
- Twickenham U.D.C.**—£5,300 for resurfacing work with asphalt macadam.
- Wandsworth B.C.**—£9,635 towards the cost of the improvement at High-street and East Hill, Putney.
- Wealdstone U.D.C.**—£7,000 for sewerage works.
- West Ham T.C.**—£5,000 for a site for a sanatorium.

FORTHCOMING INQUIRIES.

		MARCH.	£
10.	Blackpool. For public baths extension (Mr. F. H. Tulloch)		2,700
10.	Bucklow. For the purposes of sewage disposal (Mr. P. M. Crosthwaite) ...		2,542
10.	Dover. For repaving works, and the provision of tennis courts (Mr. M. K. North)		2,965
10.	Luton. For sewage works extension (Mr. F. O. Stanford)		7,500
10.	Stafford. For the purposes of the gas undertaking (Mr. A. G. Drury) ...		13,700
11.	Bootle. For the provision of pleasure grounds (Mr. F. H. Tulloch)		1,371
11.	Bromley. For works of sewerage (Mr. F. O. Stanford)		5,465
11.	Burley-in-Wharfedale. For water supply purposes (Mr. P. M. Crosthwaite)		1,100
11.	Hastings. For works of paving (Mr. M. K. North)		4,890
11.	Hebden Bridge. For sewage works extensions (Mr. A. W. Brightmore) ...		2,900
11.	Plymouth. For private street works (Mr. W. O. E. Meade-King)		3,121
11.	Stourbridge. For water supply purposes (Mr. A. G. Drury)		5,000
12.	Houghton-le-Spring. For the provision of workmen's dwellings (Mr. H. S. Stewart)		11,738
12.	New Windsor. For public baths extension (Mr. F. O. Stanford)		3,562
12.	Southend. For depot and street purposes (Mr. M. K. North)		2,700
12.	Stretford. For private street works (Mr. F. H. Tulloch)		5,773
13.	Birmingham. For council house extension and the provision of pleasure grounds (Mr. A. G. Drury)		76,713
13.	Clitheroe. For the erection of working-class dwellings (Mr. H. S. Stewart) ...		7,000
19.	Wells. For the provision of workmen's dwellings (Mr. H. S. Stewart)		1,500

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—East Ham £5,200, Goole, £16,000, Norwich £12,800, Pudsey £8,659; housing and town planning—Risca; roads and materials—Bucks, Lanarkshire, Swansea; sewerage and sewage disposal—Benfieldside, Ince-in-Makerfield £17,500, Rotherham £15,045, South Shields £40,000; water, gas and electricity—Atherstone £15,000, Birmingham £36,595.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Aberdeen T.C.—The Public Health Committee of the council have decided to advertise for a site on which to build a sanatorium.

Birmingham T.C.—The Education Committee propose to effect extensions at the Burlington-street school, Aston Manor, at an estimated cost of £3,700.

Bridlington T.C.—The council on Wednesday decided to enter into a provisional agreement with the New Spa Company, Limited, to acquire their undertaking at the price of £16,000, subject to the council obtaining the necessary Parliamentary powers.

Criccieth U.D.C.—Committees have passed recommendations for the provision of public conveniences, shelters, and other improvements.

Durham C.C.—The extensions it is proposed to carry out at the county hospital are estimated to cost £4,500.

East Ham T.C.—It has been agreed to build a block for diphtheria patients at the isolation hospital, at an estimated cost of £5,200.

Finsbury B.C.—It is proposed to carry out alterations and improvements at the town hall at an estimated cost of £991.

Goole R.D.C.—The council on Wednesday agreed to contribute £2,000 towards the scheme promoted by the West Riding County Council for the erection of a bridge over the river Aire at Carlton, at an estimated cost of £16,000.

Grays U.D.C.—The surveyor, Mr. A. C. James, has been instructed to make inquiries as to the provision of cottage baths.

Newtown U.D.C.—A smithfield is to be built on a municipal site near the railway at an estimated cost of £4,411.

Norwich T.C.—The council on Friday last adopted the plans of the city engineer, Mr. A. E. Collins, for the extension of the municipal offices on the site of the old fish market, at an estimated cost of £12,800.

Pudsey T.C.—A scheme has been adopted for the erection of a public swimming bath, fire brigade station, and the provision of workmen's dwellings, at an estimated cost of £8,659.

Stafford T.C.—The council have adopted a scheme of the borough engineer, Mr. W. Plant, for alterations and additions to the borough hall at an estimated cost of £2,500.

Staffs C.C.—The Education Committee recommend the erection of a school at Arncliffe at an estimated cost of £1,800.

Stoke Newington B.C.—It has been agreed to proceed with the scheme for the provision of public wash-houses in Milton-road, at an estimated cost of £1,900, together with certain municipal offices to cost £400.

West Ham T.C.—The borough engineer, Mr. J. G. Morley, has received instructions to prepare plans for a sanatorium and hospital, for which a site has been purchased.

Worthing T.C.—The borough surveyor, Mr. F. Roberts, has received instructions to prepare a scheme for the extension of the bandstand, and for the erection of a shelter on the parade.

HOUSING AND TOWN PLANNING.

Chailey R.D.C.—The housing question was raised last week as the result of the deliberations of a special committee appointed to consider the subject. The clerk said it was suggested that areas should be formed

and systematically worked by the council, and these areas were to be suggested by the medical officer. It was felt that the inspector of nuisances ought to be assisted by a temporary assistant in working these areas. It was decided to adopt the course proposed by the committee.

Chard T.C.—The council on Monday decided to complete the purchase of Old Town Farm for the purposes of the proposed housing scheme.

Holborn B.C.—It has been decided to purchase a site in Neal-street and Short's-gardens for a housing scheme.

Market Bosworth R.D.C.—The Housing Committee recommend a scheme for the provision of twenty houses at Destord.

Risca U.D.C.—The council have agreed to a scheme for the erection of 200 additional houses under the Housing of the Working Classes Act.

York T.C.—It was agreed on Monday to purchase about 50 acres of land near Tong Hall-lane and Howorth, at £125 per acre, for the housing scheme contemplated by the council.

PARKS AND OPEN SPACES.

Liverpool T.C.—Tenders have been accepted for carrying out the adopted plan of bowling greens, music stand, and shelter-houses on the Ruperi-lane barracks site, for the preparation of the lower Breck-road recreation ground, and for shelter huts for the men in charge of the various gymnasias throughout the city. Regarding the Walton Hall estate, the Parks and Gardens Committee have resolved to offer three premiums for planning the whole estate exclusive of over 49 acres which are to be retained as park land.

Manchester T.C.—The council on Wednesday agreed to purchase 24 acres of land in Levenshulme, at a cost of £457 an acre, for the purpose of playing fields.

Todmorden T.C.—It has been decided to institute refreshment rooms and a museum in the large mansion in Centre Vale Park. Tenders have been accepted for the erection of a bandstand, three shelters, and a bowling green pavilion, and for the construction of two large bowling greens.

REFUSE COLLECTION AND DISPOSAL.

Grieff T.C.—The burgh surveyor, Mr. A. W. Allison, has prepared an exhaustive report on the question of the collection and treatment of the town's refuse, and as a result the council have resolved to discontinue the contract system and to purchase horses, establish plant, and manage their own scavenging under the supervision of the burgh surveyor.

Paddington B.C.—It was recently agreed by the council that the chairman and vice-chairman, together with the surveyor, Mr. E. B. B. Newton, M.A.N.S.R.C.E., should be appointed to attend a conference on the question of the disposal of horse refuse. Mr. H. Wood hoped the delegates would make a full report, and take special notice of the matter of dust destructors. The cost of removal of refuse was increasing. In four years in the Queen's Park area the increase was £1,300.

ROADS AND MATERIALS.

Antrim C.C.—The council last week agreed to a scheme for improving the main road from Belfast to Antrim for about 5 miles, by a steam rolled coating with tar-sprayed surface, at a cost not exceeding £3,200, one-half of which will be defrayed by the Road Board.

Bampton U.D.C.—The contracts for Nos. 1, 3 and 4 divisions of the roads are to be terminated, and the work undertaken by direct labour, under the supervision of the surveyor, Mr. Rogers.

Benfieldside U.D.C.—The council have decided to lay tar grouting in certain thoroughfares, and to purchase a Phoenix rapid tar boiler of 160 gallons capacity; also to contract with the Edison Company for the use of a steam road roller for eighty days or more at a cost of 21s. 5d. per day, and to invite the Ness Company, of Darlington, to supply the necessary prepared tar for grouting purposes at 66s. per ton.

Bucks C.C.—It has been agreed to carry out a scheme for reconstructing portions of the London and Oxford main road and the Watling-street main road so as to render them capable of withstanding the constant traffic of heavy motor lorries and traction engines. The council have approved a scheme of the Road Board showing an estimated outlay of £30,072 in reconstruction, and £2,793 in additional plant. The Road Board assistance will be £15,000 as a grant to road work, and loans, free of interest and repayable in four years, of £7,700 for road work and £2,793 for plant, making a total of £25,493, which is £7,372 less than the outlay. The average excess expenditure by the council in obtaining Road Board grants is now £7,000 per annum. In addition to the foregoing, the Road Board will make grants up to £1,000 for the coming year towards improvements effected by district councils.

Cardiff T.C.—The city engineer, Mr. W. Harpur, has received instructions to prepare a detailed estimate for covering Kingsway with asphalt macadam from the present limit of the asphalted portion to the park end of Priory-street, at an estimated cost of £864. He also advised that Park-place be similarly treated, from Queen-street to the National Museum, at an estimated cost of £1,200.

Cheltenham T.C.—The Streets Committee recommend a paving scheme for a portion of Albion-street, at an estimated cost of £1,000.

Durham R.D.C.—It is proposed to make up ten private streets at an estimated cost of £4,741.

Manchester T.C.—In connection with the proposed town planning scheme for the southern suburbs it is proposed to construct a new trunk road, several miles in length, to run through Withington. It will lead from Upper Brook-street, and will go in a direct line to Cheadle and Wilmslow, almost parallel to the London and North-Western line, which turns off near Slade-lane and goes to Wilmslow. There are two schemes for this road, one for each side of the railway route. Either will be a shorter way than is at present possible, either by Stockport-road or Palatine-road.

Northampton T.C.—The Road Board have sanctioned a grant of £3,000 towards the Houghton-road improvement, the estimated cost of which is £7,400.

Paddington T.C.—The council have approved an estimate of £970 for new bituminous macadam in Stanhope-place and Westbourne-terrace, for inclusion in the 1914-15 estimates.

Pershore R.D.C.—A considerable amount of road construction is being proceeded with, and the council are making use of Messrs. R. S. Clare & Co.'s pitch-mac for grouting purposes.

Perthshire C.C.—A report has been submitted to the Highland District Committee stating that the Road Board had sanctioned a grant of £2,000 towards an improvement scheme, the total cost of which will be not less than £4,000.

Poplar B.C.—The Road Board have written to the council stating that they are prepared to make a further grant of £3,000 towards the cost of reconstructing East India Dock-road and Bow-road. In the first instance they made a grant of £10,000.

Elland U.D.C.—It was agreed on Wednesday to obtain further tenders for the improvement of the promenade.

Exeter T.C.—It has been agreed to lay down wood paving in St. Sidwell's-street.

Finsbury B.C.—It has been agreed to carry out paving works during the ensuing half year at a cost of £2,449, to be met out of the special paving fund.

Folkestone T.C.—It has been agreed to lay Lithofalt paving blocks in Sandgate-road and Cheriton-road, at an estimated cost of £3,512.

Hampstead B.C.—It has been agreed to carry out paving works in Belsize-road, Englands-lane, Finchley-road, Winchester-road, and Abbey-road.

Lanarkshire C.C.—Sir George Gibb, chairman of the Road Board, in a letter to the District Committee of the Lower Ward, indicates that the total grant for the whole county would probably be about £13,000 to £13,500, which is equal to about 50 per cent of the cost of the works it is proposed to carry out. He also states that the board did not now insist upon the distinction between scheduled and non-scheduled roads, and that the limitation of grants for tar-spraying to three years for the same roads would not be insisted upon.

Stafford T.C.—Upon the advice of the borough engineer, Mr. W. Plant, who prepared a special report on the subject, an application was made to the Road Board for a grant towards the projected new road from Lammascotes to the Lichfield-road. The Road Board have decided to make a grant of £1,000, and the borough engineer has been thanked by the council for his services.

Stretford U.D.C.—For the second season, Tarco is being used for surface spraying requirements.

Swansea T.C.—The council have resolved to carry out road widening and tramway extensions involving a total expenditure of about £20,000.

Wallasey T.C.—A contract for approximately 22,000 gallons of Tarco for surfacing treatment has been placed by the council with Messrs. R. S. Clare & Co., Liverpool.

Yarmouth T.C.—The council have agreed to make up certain roads at a cost of £7,912; to widen the South Marine Parade from the Nelson Gardens to the pickling plots, at an outlay of £100; to spend the same sum in repairing the Riverside-road in the vicinity of Darby's Hard; and to pave with granite setts Barrack-road, Cross-road, near Barrel Factory, and Lady Haven-road, at a cost of £595.

SEWERAGE AND SEWAGE DISPOSAL.

Ashby R.D.C.—The tender of Messrs. Willett & Sons, Old Hills, Staffordshire, at £1,349, has been accepted for the Ravenstone sewerage scheme.

Benfieldside U.D.C.—The tender of Messrs. Wilson & Co., Newcastle-upon-Tyne, at £7,120, has been accepted for the new sewerage works at Shotley Bridge. The scheme, including the purchase of land for the sewage outfall works, will involve a total outlay of £10,195.

Hamilton T.C.—An extensive addition to the plant at the corporation gasworks has been agreed to. This will consist of an installation of vertical retorts, with conveyers for handling coal and coke, and belt-driven lift, the total cost of which is £21,265. The new plant will be capable of making 1,500,000 cub. ft. of gas per day.

Hove T.C.—It has been agreed to accept the offer of the Cedes Electric Traction, Limited, to instal their over-running railless electric traction system as an experiment; the system to be experimentally laid down in Goldstone-villas, George-street, and part of Church-road, and a double-decked car to be run, on condition that the council incur no cost or liability.

Ince-in-Makerfield (Lancs) U.D.C.—A sewage disposal scheme, for the provision of new outfall sewer works at Westwood, and for the relaying of the sewers in the district, at an estimated cost of £17,500, has been approved, and the plans forwarded to the Local Government Board.

Mullingar R.D.C.—The tender of Messrs. Grainger Brothers, Belfast, at £13,555, has been accepted for the carrying out of the new sewerage scheme.

Newcastle (Ireland) U.D.C.—The tender of Mr. John Callan, Castleblayney, at £5,800, has been accepted for the sewerage scheme.

Rotherham T.C.—The borough engineer, Mr. E. B. Martin, has been instructed to prepare a scheme for a new main outfall sewer from the sewage outfall works to Effingham-square. The approximate cost is £15,045.

Saffron Walden T.C.—It has been agreed to place ventilating columns at certain dead ends of the main sewers at an estimated cost of £62.

South Shields T.C.—The council on Wednesday agreed to adopt the water-carriage system, the estimated cost being £40,000.

Westhampnett R.D.C.—The tender of Messrs. F. Osman & Co., Southampton, at £3,299, has been accepted for the execution of the Felpham sewerage scheme.

WATER, GAS, AND ELECTRICITY.

Atherstone R.D.C.—The council have resolved upon a new water supply scheme which, it is roughly estimated, will cost about £15,000. Boring operations upon land purchased by the council have resulted in a trial yield of nearly 250,000 gallons per day, and it is calculated that this quantity will be sufficient to serve the whole district with water.

Athy U.D.C.—The council have approved of plans and estimates submitted by Mr. J. J. Bergin, engineer,

for installing a filter to deal with occasional discoloration and mud in the water supply from the Queen's County. An application for a loan of £800 to carry out the improvement is to be made to the Local Government Board.

Belfast T.C.—A sum of £10,000 has been voted from the profits of the gas undertaking in relief of the rates.

Birmingham T.C.—It is proposed to lay down leading water mains in certain districts in the south-eastern portion of the middle level zone, at an estimated cost of £36,595. A balancing reservoir will also be constructed in connection with the scheme at Yardley Wood.

Blackrock (Co. Dublin) U.D.C.—An electrical engineer is to be asked to advise the council as to the most suitable scheme for the electric lighting of the district.

Budleigh Salterton U.D.C.—The tender of Mr. J. C. Palmer, at £4,448, has been accepted for pipe laying in connection with the new water supply scheme.

Galwyn Bay U.D.C.—Now that the council have decided to erect a destructor for house refuse, and have bought a site adjoining the public cemetery at Bronnant, on the edge of the Mochdre Valley, they are considering whether they should not erect at the same time and on the same site a new electricity generation station. Mr. A. R. Tudman, the electrical engineer, has reported on a scheme for removing the generating plant from Ivy-street works to a new station adjoining the proposed destructor. The new station as designed would cost £21,000, including the cost of laying the feeder cables to the Ivy-street site, from which the current would continue to be distributed.

Donaghadee U.D.C.—Water mains extensions are to be carried out at an approximate cost of £140.

East Ward (Westmorland) R.D.C.—The tender of Mr. Isaac Frith, Kirkbythore, at £1,110 has been accepted for the Long Marton and Crackenthorpe water scheme.

Kanturk R.D.C.—The Local Government Board is to be asked to hold an inquiry with respect to a proposed water supply for Newmarket, which is described as necessary and urgent.

Tredegar U.D.C.—A letter was received on Monday from the Local Government Board intimating that sanction was given for the borrowing of £9,900 for the erection of a new gasholder, extensions of the gas mains, and other works, but laid down the condition that certain steel tubes should not be used. The gas manager, Mr. D. W. Davies, expressed surprise that the tubes mentioned should be banned, as they were the most suitable for their district. The manager was instructed to prepare a report for submission to the board upon the advantages of the steel tubes it was proposed to use. A scheme for supplying water to the higher levels of Tredegar, which the surveyor, Mr. W. L. Roach, said would remedy all present difficulties, was submitted to the council last week.

Walsall T.C.—The balance of profit upon last year's working of the tramway undertaking was £4,348.

MISCELLANEOUS.

Brighton T.C.—It has been decided by the corporation gradually to substitute bathing chalets for the old-fashioned machines on the beach. A start will be made this year on the western foreshore, the authorities providing the structures, at an estimated cost of £200, and leasing them to the proprietors of the machines displaced.

St. Ives T.C.—It has been agreed to provide canvas hose, couplings, hydrants, and hose reel for the fire brigade at a cost of £150.

Junior Institution of Engineers.—At the thirtieth annual dinner of the Junior Institution of Engineers, which took place at the Holborn Restaurant on Saturday last, Mr. Ernest King, responding to the toast of "The Institution," said that the total membership had now reached 1,272 by an almost unbroken record of progress. During the past year situations had been found for 102 members, and at present only six out of the total membership were out of employment. In the first five months of the present session the membership had increased by the extraordinary number of 101 nett, as against an increase of thirty-five for the whole of last session.

PERSONAL.

Mr. D. Megaw has been appointed county surveyor of Antrim.

Mr. G. A. Ballard, of York, has been appointed assistant borough surveyor of Guildford.

Mr. T. Scott, surveyor of highways to the Tadcaster Rural District Council, has been voted £30 towards the upkeep of a motor car.

Mr. Henry O'Reilly, of the engineering staff, Congested Districts Board, has been appointed county surveyor of Cavan.

Mr. J. S. Walton, borough surveyor of Falmouth, has resigned, having taken up a private appointment in the North of England.

Mr. J. Buckley, M.INST.C.E., borough surveyor of Dublin, has, we regret to state, suffered bereavement by the death of his wife.

Mr. Norman J. McLean, Belfast, has been appointed surveyor to the Lisburn Urban District Council, at a salary of £200 per annum.

Mr. Frank Laurens, assistant surveyor, has been appointed surveyor to the Whitstable Urban District Council, at a salary of £180 per annum.

Mr. R. Stephens, surveyor to the Chard Rural District Council, has had his salary increased to £280 to meet the expenditure on his motor car and office.

Mr. T. Harold Davies, surveyor to the Oswestry Rural District Council, has been voted an increased salary of £25 per annum, bringing his salary up to £175.

Mr. W. F. Loveday, borough engineer and surveyor of Stoke Newington, will represent the borough council at the Westminster conference on the disposal of refuse.

Messrs. J. Dyson, council offices, Northfleet, Kent, and W. E. Woollam, surveyor to the East Grinstead Urban District Council, have been elected members of the Royal Sanitary Institute.

Mr. L. M. Blanchard, assistant to Mr. H. Fox Hill, surveyor to the Ware Urban District Council, has been appointed to a vacancy in the Luton borough engineer's office.

Mr. R. H. Kilburn, surveyor to the Guisborough Urban District Council, has been appointed to represent the council at the forthcoming conference on housing and town planning to be held at Darlington.

Mr. E. F. Spurrell, borough surveyor of Holborn, with Councillor James W. Coad, have been appointed to represent the borough council at the conference on the disposal of refuse convened by the Westminster City Council.

Mr. Roland Arthur Thomas, surveyor to the Holywell Urban District Council, died, we regret to state, last week after a paralytic seizure. He was forty-two years old, and leaves a widow and young daughter. He had prepared the plans for the contemplated sewage and water works for Holywell.

Mr. J. Watkin Thomas, surveyor and engineer to the Gwyrfa Rural District Council, has had his salary increased from £150 to £200 annually, with an additional allowance of £20 a year towards the upkeep of his motor cycle. Mr. Thomas is now preparing a scheme for the provision of thirty-six workmen's dwellings, and for this work he has been promised an honorarium of £100.

Mr. Arthur H. Blanchard, M.A.M.SOC.C.E., professor in charge of the Graduate Course in Highway Engineering at Columbia University, on February 14, 1914, delivered illustrated lectures at the University of West Virginia, on the subjects: "Park Boulevards," "Bituminous Surfaces and Bituminous Pavements," "Wood Block and Stone Block Pavements," and "Modern Developments in Highway Engineering in Europe."

Mr. R. S. Murt has been appointed by the Cornwall County Council to take charge of the main roads in the Liskeard and St. Columb district, together with the Road Board work in the eastern division, at a salary of £150, rising by annual increments of £5 to £175, with a motor-cycle allowance of £50 a year; and Mr. M. Spencer Rogers has been appointed architectural and engineering assistant in the county surveyor's department at a salary of £130, rising by annual increments of £10 to £150.

Mr. J. W. Armstrong, who has been for thirty-four years in the borough surveyor's department of the

Tynemouth Corporation, is about to retire from his position as assistant surveyor, and was recently entertained at a gathering of the local municipal officers, at which Mr. J. F. Smillie, the borough surveyor, on behalf of the members of the various municipal departments, presented him with a solid silver water kettle and stand, and a solid silver cigarette case, together with a silver-mounted umbrella for Mrs. Armstrong.

Mr. Clement B. Skellern, a portrait of whom is given herewith, recently resigned from the surveyorship to the Buglawton Urban District Council, Che-hire. Mr.



MR. CLEMENT B. SKELLERN

Skellern was appointed to the position of surveyor and inspector of nuisances in November, 1880, and although seventy-four years of age, is full of energy. He still retains his position of inspector of nuisances, and his official friends hope to see him among them for many years to come. Mr. Skellern has served under seven chairmen, three county surveyors, and four clerks.

Mr. Thomas Shelmerdine, city surveyor and land steward of Liverpool, and Mr. Joseph Parry, water engineer, are both about to retire on superannuation under the standing order of the city council which came into force at the beginning of this year and acts automatically when the age of sixty-five years is reached. At the monthly meeting of the council on Wednesday it was agreed to place both gentlemen on the consultative staff for a period not exceeding two years in each case, and that each shall receive fees at the rate of £300 per annum.

Middleton Town Hall Scheme.—The Middleton Town Council on Wednesday referred to a committee a proposal to erect a new town hall on a site adjacent to the old Boar's Head Inn, at a cost of £18,000. It was stated that the new hall would be so designed as to harmonise with the architectural features of the inn.

Inland Waterways. In the House of Commons on Monday the President of the Board of Trade was asked whether, in the event of the local authorities within all areas likely to derive benefit representing their willingness to contribute out of the local rates a substantial proportion of the total fund required for the development of the inland waterways of the country, and in view of the increasing and insistent demand by agriculturists and traders for such development, the Government would proceed to constitute a waterways board, as recommended by the Royal Commission on Canals, with a view to a percentage only of the total cost being provided from Exchequer funds and spread over a period of years during which such development would be carried out? Mr. Burns said he was afraid he could not say more than that any specific proposals made by local authorities to contribute towards the cost of acquiring and improving canals as recommended by the Royal Commission, would receive very careful consideration.

QUERIES AND REPLIES.

We cannot undertake to reply to any queries which are not accompanied by the writer's name and address. These are required as a guarantee of good faith, and not for publication. Sketches accompanying queries should be made separate, on white paper, in plain black ink lines. Lettering or figures should be bold and plain.

903. Sewerage.—"Rural" asks: What are the maximum and minimum falls allowed by the Local Government Board for 6-in., 9-in., 12-in., 15-in. and 18-in. sewers?

FOR OTHER ADVERTISEMENTS

See End of Paper.

JOINT COMMITTEE.

LLANDUDNO AND COLWYN BAY THROUGH ROAD.

A Temporary Assistant is required to make revised Surveys and Plans, to take Levels and prepare Drawings, Specifications and Quantities for the above Works.

Preference will be given to one who has had experience and supervision of road construction works and retaining walls. Engagement will be for about 4 to 6 weeks, and there is a possibility of a suitable man being re-engaged as Clerk of Works during the construction. Salary £3 3s. per week for first engagement. Applicants to give full particulars of experience, age, and copies of two recent testimonials.

Applications to be sent in on or before 16th March, 1914, addressed to—

MR. W. T. WARD,
Deputy Engineer.

(1,398) Town Hall, Llandudno.

TILBURY URBAN DISTRICT COUNCIL.

APPOINTMENT OF CLERK OF THE WORKS.

PRIVATE STREET WORKS.

The above Council invite applications from suitable persons for the position of Clerk of the Works. Salary 45s. per week. Period of employment about three months. Forms of application may be obtained from Mr. S. A. Hill-Willis, the Council's Engineer and Surveyor, 47 Dock-road, Tilbury.

Applications, on the prescribed Form, and in the candidate's own handwriting, are to be delivered to the undersigned at the Council's Offices, Tilbury, not later than 5 p.m. on Monday, the 16th day of March, 1914.

(By order)

THO. A. CAPRON,
Clerk to the Council.

47 Dock-road,
Tilbury.

March 5, 1914.

(1,402)

BOROUGH OF COLCHESTER.

BOROUGH ENGINEER AND SURVEYOR.

The Council invite applications for the appointment of Borough Engineer and Surveyor, at a salary of £100, rising by annual increments of £20 (subject to satisfactory service) to £500, a horse and trap or other suitable means of locomotion being provided.

Applicants must not be under 30 or over 50 years of age, must have thorough practical and theoretical knowledge of (a) Building and Engineering Works, (b) Road Construction and Maintenance, (c) Laying of Sewers, (d) Sewage Disposal, and (e) the legal enactments relating to the duties of the Office, and should state fully their qualifications for the appointment in the applications.

A Form for attaching to the application, and list of duties, may be obtained from me.

Applications, endorsed "Borough Engineer and Surveyor," and accompanied by copies of three recent testimonials (one at least of which must deal with personal character in addition to professional capability), should be addressed to me, and must reach my Office by not later than 26th March, 1914.

Canvassing, directly or indirectly, will be considered a disqualification.

Dated this 5th day of March, 1914.

H. C. WANKLYN.

Town Clerk.

Town Hall,
Colchester.

(1,401)

BOROUGH OF FALMOUTH.

APPOINTMENT OF BOROUGH SURVEYOR.

The Town Council invite applications for the appointment of Borough Surveyor at a salary of from £150 to £200 per annum.

The selected candidate will be required to commence his duties as soon as possible, must devote the whole of his time to the duties of the office, and not engage in private practice.

Lists of duties and conditions on which the appointment will be made can be obtained from the undersigned, to whom all applications, endorsed "Borough Surveyorship," and accompanied by copies of not more than three testimonials, must be delivered not later than the 16th March next.

Canvassing, directly or indirectly, will be regarded as a disqualification.

E. E. ARMITAGE,
Town Clerk.

Municipal Offices,
Falmouth.
March 4, 1914.

(1,396)

BOROUGH OF ACCRINGTON.

CHIEF ASSISTANT AND GENERAL ASSISTANT, BOROUGH SURVEYOR'S OFFICE.

The General Works Committee of the Borough of Accrington invite applications from qualified persons from 25 to 35 years of age for the positions of Chief Assistant and General Assistant in the Borough Surveyor's Office. Salary £150 and £101 respectively.

It is essential that Candidates should be fully qualified, and have had the necessary education and Municipal training of a Borough Surveyor's Office, to fill the positions, including actual experience in the design and supervision of Tramways, Sewage Works, Private and Public Street Improvement Works, &c., and sufficient architectural knowledge for general engineering works.

Full particulars of the duties and conditions relating to the appointment, together with Form of Application, can be obtained on applying to the undersigned.

Applications to be on the prescribed Form (no other will be considered), and addressed to me, endorsed "Chief Assistant" and "General Assistant," and delivered at my Office not later than the 23rd day of March next.

WM. J. NEWTON, ASSOC. M. INST. C. E., M. S. A. L.
Borough Engineer and Surveyor.

Town Hall, Accrington.
March 6, 1914.

(1,393)

A COUNTY ENGINEER AND SURVEYOR

has vacancy in his Office for an Articled Pupil. Apply Box 1,388, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,397)

MARTLEY RURAL DISTRICT COUNCIL.
SUPPLY OF GRANITE AND SLAG.

The Council invite Tenders for the Supply of Granite and Slag, delivered at the Stations and Wharves throughout their District, during the year ending 31st March, 1915.

Forms of Tender can be obtained from the Surveyor, Mr. H. L. Richardson, St. Denis, Malvern-road, Worcester.

Tenders, endorsed "Tender for —," are to be sent to me, the undersigned, not later than the 31st March instant.

The Council do not bind themselves to accept the lowest or any Tender.

J. GILSON SHEILD,
Clerk.

14 Foregate-street,
Worcester.
March 4, 1914.

(1,395)

COUNTY BOROUGH OF NORTHAMPTON.
TO CONTRACTORS.

The Corporation of Northampton invite Tenders for Granolithic Paving, Fencing, &c., in the Extension of the Cattle Market, Northampton.

The Drawings may be seen, and Specifications, Quantities and Forms of Tender may be obtained, on application to Mr. Alfred Fidler, M. INST. C. E., Borough Engineer, Guildhall, Northampton, on deposit of £2, which amount will be returned on receipt of a *bona-fide* Tender.

Sealed Tenders, endorsed "Cattle Market Paving," addressed to the undersigned, to be delivered not later than 12 o'clock noon on Friday, March 20th, 1914.

The lowest or any Tender will not necessarily be accepted.

HERBERT HANKINSON,
Town Clerk.

Guildhall,
Northampton.
March 4, 1914.

(1,394)

CORK COUNTY COUNCIL.
TENDERS INVITED FOR MARINE IMPROVEMENT WORKS.

The County Council of the Administrative County of Cork invite Tenders for the Construction of a Causeway and Sluices across the Ringabella Estuary, near Crosshaven, County Cork, in accordance with the Plans and Specifications prepared by Mr. R. W. Longfield, County Surveyor.

The said Plans and Specifications may be inspected on any day between the hours of 10 a.m. and 5 p.m., and all information connected with the work can be obtained at the Offices of the undersigned.

Sealed Tenders, on the prescribed Form, addressed to the County Secretary, must be lodged in the Tender Box in his Office not later than 2 o'clock p.m. on Saturday, the 4th instant.

Each Tender must contain the names of two solvent Sureties prepared to enter into a Bond to guarantee the Contractor.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)
E. CALLANAN,
Secretary.

Court House,
Cork.
March 3, 1914.

(1,392)

METROPOLITAN BOROUGH OF ISLINGTON.
PAVING WORKS.

Tenders are invited for Paving with Wood Blocks and Granite Setts the macadamised portion of the Carriageway of Highbury Park, between Hamilton-road and Riversdale-road, and for making a Concrete Foundation for part of the Carriageway of Blackstock-road.

Conditions and Specification may be seen, and Forms of Tender and Bills of Quantities obtained, on and after Monday, the 16th instant, upon application to the Borough Engineer, Mr. J. Patten Barber, at the Town Hall, Upper-street, N., upon payment of Two Guineas, which will be returned upon receipt of a *bona-fide* Tender and the return of the whole of the documents issued.

Sealed Tenders, endorsed "Tender for Wood and Granite Paving," must be received by the undersigned not later than 4 p.m. on Tuesday, the 24th March, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

WM. F. DEWEY,
Town Clerk.

Town Hall, Upper-street, N.
March, 1914.

(1,399)

METROPOLITAN BOROUGH OF ISLINGTON.
PAVING WORKS.

Tenders are invited for Paving with Asphalt, on a concrete foundation already prepared, a part of the Carriageway of Blackstock-road.

Conditions and Specification may be seen, and Forms of Tender and Bills of Quantities obtained, on and after Monday, the 16th instant, upon application to the Borough Engineer, Mr. J. Patten Barber, at the Town Hall, Upper-street, N., upon payment of Two Guineas, which will be returned upon the receipt of a *bona-fide* Tender and the return of the whole of the documents issued.

Sealed Tenders, endorsed "Tender for Asphalt Paving," must be received by the undersigned not later than 4 p.m. on Tuesday, the 24th March, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

WM. F. DEWEY,
Town Clerk.

Town Hall, Upper-street, N.
March, 1914.

(1,400)

SOME RECENT PUBLICATIONS.*

THE INVENTOR'S ADVISER AND MANUFACTURER'S HANDBOOK OF PATENTS, DESIGNS AND TRADE MARKS. (9th Edition.) By Reginald Haddan. Price 5s. London: Harrison & Sons.

The aim of the author of this work has been to deal primarily with the commercial aspect of patents. Such a handbook will be specially appreciated by inventors, manufacturers, and others interested in patents as property, and the explanations which are given of the causes which sustain or detract from the value as well as the validity of patented inventions will be found of great practical interest. In scope the work covers the British law of patents, foreign and colonial patents, trade marks and designs, while in style it forms a happy medium between the popular guide and the technically abstruse textbook. A real inventor's adviser, it will save those who consult it time, labour and money.

SPON'S ARCHITECTS' AND BUILDERS' POCKET PRICE BOOK. Edited by C. Young, F.R.I.B.A., and S. M. Brooks, L.R.I.B.A. Price 2s. 6d. nett. London: E. & F. N. Spon, Limited.

In this the forty-first edition of this well-known work considerations of space have rendered it necessary to omit the diary which has been published with previous issues. The price book, however, has been added to in many particulars, and the whole has been thoroughly revised and brought up to date. The prices are arranged according to trades, and the work contains a wonderful amount of information for so small a volume—it can conveniently be carried in the breast pocket. Reference is facilitated by a full index, and we have no hesitation in once more recommending this book to all who are practically engaged in building work.

Ferro-Concrete for March is an exceptionally interesting number. "Ferro-concrete v. Timber" is the title of a short article making clear the important saving of public money resulting from the adoption of imperishable material at the pumping station of the Gloucester waterworks, the point being graphically demonstrated by an ingenious diagram. A remarkable demonstration of the coherence of monolithic construction is afforded by an article describing the behaviour of a reinforced-concrete granary building in Canada. Owing to subsidence of the ground, the structure settled at one side until it took an angle of nearly 30 deg. from the vertical, but without suffering injury of any kind, thus entirely eclipsing the record of the famous leaning tower of Pisa. The issue also includes a biographical sketch of Mr. H. Percy Boulnois, M.INST.C.E., giving an outline of the professional career of one who may almost be looked upon as the "father" of the municipal branch of the engineering profession.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A., Borough Surveyor, Great Yarmouth.

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District will be held at Wakefield on Saturday, March 21, 1914.

SOUTH-WESTERN DISTRICT.

A meeting of the South-Western District of the institution will be held at Torquay on March 21st.

PROGRAMME.

12 noon.—Meet at the new Town Hall, Torquay.

Business: To confirm minutes of last meeting; to receive communications, if any; to decide as to nominations for district officers for the ensuing year.

1 p.m.—Inspection of the recently completed pavilion described in Vol. 37 of the "Proceedings."

1.30 p.m.—Lunch (prepared by electricity) at the Pavilion café by the kind invitation of the Mayor and Corporation of Torquay.

2.45 p.m.—Proceed by tramcar for a visit of inspection of the recently completed town hall and municipal buildings.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

3.30 p.m.—Description by Mr. H. A. Garrett, Assoc.M. INST.C.E., borough surveyor, of the Torquay Pavilion—public restaurant operated by electricity—with discussion.

4.30 p.m.—Tea at the Pavilion café.

D. EDWARDS, ASSOC.M-INST.C.E.,
Hon. District Secretary.

Municipal Buildings,
Taunton.

EASTERN DISTRICT.

A meeting of the Eastern District is to be held at Chelmsford on April 18th.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on June 13th.

THE ANNUAL MEETING.

The date for the annual meeting of the Institution of Municipal and County Engineers at Cheltenham has been fixed definitely for June 24th, 25th, 26th and 27th next. It has been decided to make a special feature of town planning and of roads, and, if possible, to arrange for an exhibition of town plans.

EXAMINATION.

The April examination of the institution will be held in London, at the New Examination Hall, Queen's-square, W.C., on April 2nd, 3rd and 4th.

THOMAS COLE,
Secretary.

92 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

COUNCIL MEETING.

At a meeting of the council held in London on February 25th, the following applicants were recommended for admission:—

To Membership: Messrs. O. Frewin, surveyor, Newbury Rural District Council, and E. C. Young, engineer, Tientsin, China.

To Associate-Membership: Mr. E. W. H. Vallis, assistant surveyor, Langport Rural District Council. (Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

Highway Engineering.—Mr. E. A. Stickland, past-president, was appointed as delegate to represent the institution on the committee of the Roads Improvement Association.

Architect's Registration Bill.—A report on this Bill, which has been under the consideration of the General Purposes Committee, will be presented at the next council meeting.

B. WYAND,
Secretary.

39 Victoria-street, S.W.

FORTHCOMING MEETINGS.

Arrangements have been made for the following meetings: March 21st, Leeds; April, Birmingham; April 18, Hexham; May, Finedon and Wellingborough; May 16th, Hull; June 13th, Tisbury and Cumberland; July, Hunstanton; July 11th, Alwick; September 12th, Harrogate; October 10th, Sunderland; November 7th, Newcastle; December 12th, Newcastle.

Next Council Meeting.—The next meeting of the council will be held at Leeds on Saturday, March 21st.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

WATER INSPECTOR.—March 7th.—Corporation of Wakefield. 34s. per week.—Mr. C. C. Smith, waterworks engineer.

CLEANSING FOREMAN.—March 7th.—Corporation of Brighouse. 35s. per week.—Mr. J. H. Rothwell, town clerk.

SURVEYOR'S JUNIOR ASSISTANT.—March 7th.—Corporation of Halifax. £78 per annum.—Mr. Percy Saunders, town clerk.

ASSISTANT INSPECTOR OF NUISANCES.—March 9th.—Corporation of Llanelly. £104—£130.—Mr. H. W. Spowart, town clerk.

ASSISTANT SURVEYOR.—March 9th.—Stourbridge Urban District Council. £69 per annum.—Mr. F. Woodward, surveyor.

WATERWORKS ENGINEER.—March 10th.—Dumfries and Maxwelltown Waterworks Commissioners. £160 per annum.—Mr. B. McGowan, clerk, Dumfries.

CLERK OF WORKS.—March 10th.—Chester-le-Street Rural District Council. £2 10s. per week.—Mr. R. V. Dickinson, clerk.

INSPECTOR OF NUISANCES.—March 10th.—Port Sanitary Authority, Newcastle-upon-Tyne. £180—£200.—Mr. R. S. Holmes, clerk, 145 Pilgrim-street.

INSPECTOR AND ASSISTANT INSPECTOR OF WORKS.—March 10th.—Paisley School Board. £150—£200; £100—£140.—Messrs. MacRobert & Hutchison, clerks, St. James-place.

ASSISTANT WATERWORKS ENGINEER.—March 11th.—Corporation of Madras, India. £33 6s. 8d. per mensem, with an allowance of £2 per mensem. Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, London, S.W.

INSPECTOR OF NUISANCES.—March 11th.—Hayes (Middlesex) Urban District Council. £100 per annum.—Mr. C. Dudley-Lewis, clerk.

FOREMAN.—March 11th.—Corporation of Leamington. 32s. per week.—Mr. L. Rawlinson, town clerk.

ASSISTANT HOUSING INSPECTOR.—March 13th.—Corporation of Huddersfield. £85 per annum.—Dr. S. C. Moore, medical officer of health.

CLERK OF WORKS.—March 11th.—Beckenham Urban District Council. £3 3s. per week.—Mr. F. Stevens, clerk.

SURVEYOR AND INSPECTOR.—March 11th.—Corporation of Penryn. £70 per annum.—Mr. M. H. Truscott, town clerk.

LEADING FOREMAN.—March 16th.—Corporation of East Ham. £4 4s. per week.—Borough Engineer, Town Hall.

MARKETS SUPERINTENDENT.—March 16th.—Chester City Council. £130—£150.—Town Clerk.

REFUSE DESTRUCTOR MANAGER.—March 17th.—Kensington Borough Council. £160 per annum, with house, coals and lighting.—Mr. W. Chambers Leete, town clerk.

INSPECTOR OF NUISANCES.—March 19th.—Corporation of Wolverhampton. 35s. per week.—Manager, Team Department, Crown-street.

SURVEYOR AND INSPECTOR.—March 23rd.—Holywell Urban District Council. £105 per annum.—Mr. J. Kerfoot-Roberts, clerk.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

WATERWORKS FOREMAN.—Government of Nigeria (for the Lagos waterworks). £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

CLERK OF WORKS.—Cheshire County Council. £3 3s. per week.—Mr. W. Holland, county surveyor, The Castle, Chester.

ASSISTANT QUANTITY SURVEYOR.—Corporation of Sheffield. £150—£180.—Mr. F. E. P. Edwards, city architect.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

HAWARDEN.—March 16th.—Plans and estimates for laying out a plot of land for the erection of workmen's cottages, for the Hawarden Rural District Council.—Mr. F. Barrett, sanitary inspector, Hawarden.

BELFAST.—March 20th.—Designs for an art gallery and museum, for the corporation.—Mr. R. Meyer, town clerk.

BURTON-UPON-TRENT.—March 24th.—For children's cottage homes, for the Board of Guardians.—Mr. C. F. Chamberlin, clerk.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

MOLD.—Plans for a fire station and caretaker's house, for the urban district council.—Mr. D. Thomas, surveyor, Town Hall.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

ELY.—March 7th.—For the erection of sixteen workmen's dwellings, for the urban district council.—Mr. S. Wearing, architect, 15 Upper King-street, Norwich.

BEDFORD.—March 7th.—For the erection of buildings in connection with two pumping stations, and screening chamber, together with the construction of approach roads and areas, formation of site, and other works, for the corporation.—Major Tulloch & Haworth, 28 Victoria-street, Westminster, S.W.

SOMERSET.—March 7th—18th.—For the erection of a school, for the Education Committee.—Messrs. Samson & Colthurst, 51 High-street, Bridgwater.

NOTTINGHAM.—March 9th.—For the erection of public baths, for the corporation.—Mr. A. Dale, city architect, Guildhall.

HEBBURN.—March 9th.—For the extension of the hospital, for the urban district council.—Mr. H. Paterson, surveyor.

GRIMSBY.—March 9th.—For the erection of public conveniences, for the corporation.—Mr. H. G. Whyatt, borough engineer and surveyor.

SWANSEA.—March 9th—20th.—For foundation works for a new asylum, for the Swansea and Merthyr Asylum Visiting Committee.—Messrs. George T. Hine & H. Carter Pegg, 35 Parliament-street, Westminster, S.W.

DROYLSDEN.—March 9th.—For the alteration of existing building into stables and depot, for the urban district council.—Mr. C. Hall, engineer.

BASINGSTOKE.—March 9th.—For the erection of a generating station, for the corporation.—Mr. F. R. Phipps, borough engineer.

LAMPETER.—March 10th.—For the construction of a new covered reservoir with inlet and outlet mains, for the corporation.—Mr. J. Ernest Lloyd, town clerk.

BISHOP'S CASTLE.—March 10th.—For additions and alterations to the Smithfield, for the corporation.—Borough Surveyor.

PORTLAND.—March 10th.—For the erection of a public convenience, for the urban district council.—Mr. R. S. Heushaw, engineer and surveyor.

OLDHAM.—March 11th.—For the erection of a public wash-house, for the corporation.—Borough Surveyor.

BELFAST.—March 12th.—For the construction of a bridge, for the Gas Committee.—Mr. J. D. Smith, engineer and manager, Gasworks.

GRAVESEND.—March 12th.—For the construction of public conveniences, for the corporation.—Borough Surveyor.

LEICESTERSHIRE.—March 13th.—For the erection of pavilion and extensions at sanatorium, for the county council.—Mr. T. I. McCarthy, architect, Central Chambers, Coalville, near Leicester.

GOWER.—March 13th.—For the erection of isolation hospital buildings, for the Gower and Oystermouth Hospital Committee.—Mr. H. A. Ellis, architect, 10 Fisher-street, Swansea.

SWANSEA.—March 14th.—For the erection of cemetery chapel, entrance lodge, and latrines, for the corporation.—Mr. E. E. Morgan, borough architect.

SMALLBURGH.—March 14th.—For the erection of six cottages, for the rural district council.—Mr. F. Davies, clerk, North Walsham.

ELY.—March 16th.—For the erection of a pair of cottages, and painting the county hall, for the county council.—County Surveyor, Ely.

ST. HELENS (Lanes).—March 17th.—For the erection of a boathouse and landing stage, for the corporation.—Borough Engineer.

HUDDERSFIELD.—March 20th.—For the erection of various buildings and other works at hospital, for the corporation.—Mr. K. F. Campbell, borough engineer.

HUDDERSFIELD.—March 20th.—For the erection of forty-nine working-class dwellings, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

HAMPSHIRE.—March 25th.—For the construction of a brick and concrete three-arched bridge, for the counties of Berks and Southampton.—Mr. H. Barber, clerk, Hampshire County Council, The Castle, Winchester.

CHESHAM.—March 25th.—For the erection of twenty workmen's dwellings, for the urban district council.—Mr. Percy C. Dornier, engineer and surveyor.

SOUTHAMPTON.—March 28th.—For constructing concrete foundations, fencing and other works, for the county council.—Mr. A. L. Roberts, architect to the Education Committee, The Castle, Winchester.

SWANSEA.—March 31st.—For the construction of masonry and concrete approaches and piers, for a steel girder bridge of 111-ft. span, also for the supply of steelwork for the said bridge, for the corporation.—Mr. H. Howard Humphreys, 28 Victoria-street, Westminster.

BURNLEY.—April 4th.—For the completion of the construction of an impounding reservoir, with catchwaters, aqueducts, and meter-houses, for the corporation.—Messrs. James Diggle & Son, engineers, Hind Hide-street, Heywood, Lanes.

KEIGHLEY.—April 11th.—For the construction of a storage reservoir, filter beds, clear water basin, and other appurtenances, for the corporation.—Mr. Ratcliffe Barnett, engineer.

WEST WARD (Westmorland).—For carrying out four contracts in connection with the water supply scheme in separate tenders, or one whole tender, for the rural district council.—Mr. James Taylor, clerk, 1 Bruswick-road, Penrith.

Iron and Steel.

BEDFORD.—March 7th.—For the provision and erection of four sets of steam engines and centrifugal pumps, together with all necessary pipe work, for the corporation.—Major Tulloch & Haworth, 28 Victoria-street, Westminster, S.W.

CHEPPING WYCOMBE.—March 11th.—For the supply of galvanised inspection chamber covers, stop-cocks and bibcocks, and wrought-iron steam tubes, for the corporation.—Mr. T. J. Rushbrooke, borough surveyor and water engineer.

COVENTRY.—March 16th.—For the supply of cast-iron pipes, lead pipes, solder, and hydrant and valve boxes, for the Waterworks and Fire Brigade Committee.—Mr. J. E. Swindlehurst, water engineer.

MADRAS.—March 24th.—For the supply of 2,000 cast-iron manhole covers and frames, for the corporation.—Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster.

Roads.

CLOWN.—March 7th.—For the supply of broken slag and granite, for the rural district council.—Mr. J. T. Pears, surveyor, Hollin Hill, Clown, Chesterfield.

SHEPTON MALLET.—March 7th.—For the supply of materials, street watering, and cleansing and maintenance, for the urban district council.—Mr. D. Hinchcliffe, surveyor.

EAST SUFFOLK.—March 7th.—For the supply of road materials, for the county council.—Mr. W. Jervis, county road surveyor, County Hall, Ipswich.

BELFORD.—March 7th.—For quarrying, breaking, carting, and laying road materials, for the rural district council.—Mr. T. W. Dodd, surveyor.

MOTTRAM.—March 7th.—For the supply of rock setts, for the urban district council.—Mr. S. Hudson, surveyor.

NEATH.—March 7th.—For making up certain streets, for the rural district council.—Mr. D. M. Davies, engineer.

FAVERSHAM.—March 7th—10th.—For the supply of best hand-broken Guernsey granite and flints, for

the rural district council.—Mr. J. G. Chittenden, district surveyor.

WILLINGTON.—March 7th.—For the supply of road metal and cartage, for the urban district council.—Mr. J. H. Gardner, surveyor.

STOCKTON.—March 7th.—For the supply of road metal and cartage, for the rural district council.—Mr. W. Heslop, highway surveyor.

SELBY.—March 7th.—For the supply of road materials, for the rural district council.—Mr. J. Townend, clerk.

SOUTH SHIELDS.—March 7th.—For laying concrete on footways and back streets, for the corporation.—Mr. L. Roseveare, borough engineer and surveyor.

STAFFS.—March 7th.—For the supply of cartage and road materials, for the county council.—Mr. J. Moncur, county surveyor, Stafford.

CORNWALL.—March 7th.—For the supply of materials, hauling, and team labour, for the county council.—Assistant County Surveyor, Clinton-road, Redruth.

BELPER.—March 7th.—For the supply of highway materials, for the rural district council.—Mr. R. C. Cordon, engineer and surveyor, Dullfield, near Derby.

HAYES (Middlesex).—March 7th.—For making up certain streets, for the urban district council.—Mr. D. C. Fidler, engineer and surveyor.

DRIFFIELD.—March 7th.—For the supply of whinstone and granite, broken slag, sea cobbles, sea gravel, and tarred chippings, for the rural district council.—Mr. T. Casson Beaumont, surveyor.

BROWNHILLS.—March 9th.—For spraying about 35,000 super. yds. of roads, for the urban district council.—Mr. J. H. Shaw, surveyor.

RYE.—March 9th.—For the supply of materials, for the rural district council.—Mr. L. Amon, highways clerk.

WREXHAM.—March 9th.—For the supply of road-stone, for the rural district council.—Mr. R. C. Roberts, clerk.

WING.—March 9th.—For the supply of 1,200 tons of granite, 1,200 tons of slag, sand, and gravel, for the rural district council.—Mr. M. G. Gurney, surveyor, Linslade, Leighton Buzzard.

LEAMINGTON.—March 9th.—For the supply of 3,000 tons of road stone, for the corporation.—Road Surveyor.

MORLEY.—March 9th.—For the supply of broken granite macadam, chippings, Yorkshire flags, and kerbs, for the corporation.—Mr. F. Turner, borough engineer and surveyor.

COLCHESTER.—March 9th.—For the supply of Derbyshire stone lime, granite kerbing, granite setts, broken granite, Kettering iron slag, broken Kentish ragstone, Kentish sifted red flints, Portland cement, and sewer and drain pipes, for the corporation.—Mr. A. E. Slater, acting borough surveyor.

BOLTON-UPON-DEARNE.—March 9th.—For the supply of broken granite, granite chippings, broken slag, slag screenings, flags, kerbs, setts, channelling, asphalt, pipes, shovels, and brooms, for the urban district council.—Mr. J. Ledger Hawksworth, clerk.

LEEDS.—March 9th.—For flagging and macadamising, for the corporation.—City Engineer.

STEYNING EAST.—March 9th.—For the supply of flints, for the rural district council.—Mr. G. W. Warr, surveyor, Town Hall, Southwick.

MANSWICK.—March 9th—14th.—For providing and laying on highway materials, for the rural district council.—Mr. H. W. Walton, clerk.

ARMAGH.—March 9th.—For the supply of one light compound steam motor tractor, two end-tipping wagons, and one portable stone-breaker, for the county council.—Mr. R. H. Dorman, county surveyor, Armagh.

EASTLEIGH.—March 10th.—For making up certain streets, for the urban district council.—Mr. W. Wallace Gandy, engineer and surveyor.

UPPINGHAM.—March 10th.—For the supply of broken granite and screenings, for the rural district council.—Mr. F. Oakley, clerk.

ST. THOMAS.—March 10th.—For the supply of materials, for the rural district council.—Mr. J. S. Madge, assistant surveyor, Brooklands, Heavitree, near Exeter.

MAIDSTONE.—March 10th.—For the supply of Guernsey granite, Cornish elvan, or stone of a similar nature, Cherbourg quartzite, tarred ragstone concrete, Portland cement, and ballast (Thames or Colne), for the corporation.—Mr. T. F. Bunting, borough surveyor.

SCULCOATES.—March 10th.—For the supply of stone, Hornsea gravel, land gravel, tarred slag, and asphalt, for the rural district council.—Mr. A. Culkin, surveyor, 113 Alliance-avenue, Hull.

WATFORD.—March 10th.—For watering the roads and scavenging, for the rural district council.—Mr. F. Wilson, clerk.

MOUNTAIN ASH.—March 10th.—For the supply of broken mountain limestone, gravel, broken native stone, and haulage, for the urban district council.—Mr. W. G. Thomas, surveyor.

PONTEFRAC.—March 10th.—For the supply of highway materials, for the rural district council.—Mr. G. W. Hobman, clerk.

NORTON.—March 10th.—For the supply of materials and team labour, for the rural district council.—Mr. J. E. Moulding, clerk.

SWANSEA.—March 10th.—For private street works, for the corporation.—Mr. G. Bell, borough surveyor.

DOCKING.—March 10th.—For the supply of materials and team labour, for the rural district council.—Mr. W. W. Hopking, surveyor, Great Bircham, Norfolk.

GLENDALE.—March 10th.—For carting and laying on approved whinstone, for the rural district council.—The Surveyor, Wooler.

CAERPHILLY.—March 10th.—For the supply of granite chippings suitable for tar-spraying, for the urban district council.—Mr. A. O. Harpur, surveyor.

ENFIELD.—March 10th.—For laying about 12,950 yds. super. of tarred slag macadam, for the urban district council.—Mr. Richard Collins, surveyor.

REIGATE.—March 11th.—For the supply of granite macadam, basalt and flints, granite kerb, Kent ragstone, tar-paving, artificial stone paving, gravel, concrete beach, pea beach, compo. grit, Portland cement, and Beddington grit, for the corporation.—Mr. Fred. T. Clayton, borough surveyor.

SPOKE-ON-TRENT.—March 11th.—For making up certain streets, for the corporation.—Borough Surveyor.

LOFTUS.—March 11th.—For the supply of broken whinstone and slag, for the urban district council.—Mr. J. B. Wormleighton, surveyor.

HESTON.—March 11th.—For the supply of tar and Tarvia, for the urban district council.—Mr. J. G. Carey, Council House, Hounslow.

HARTSMERE.—March 11th.—For the supply of about 2,500 tons of 1½-in. granite, and 1,550 tons of pit stones, for the rural district council.—Mr. Harold Warnes, clerk, Eye, Suffolk.

RYTON.—March 11th.—For making up certain streets, for the urban district council.—Mr. J. P. Dalton, surveyor.

CHICHESTER.—March 12th.—For the supply of 5,000 gallons of refined tar, for the corporation.—City Surveyor.

DUNDEE.—March 12th.—For the supply of 200 tons of whinstone setts, for the Harbour Trustees.—Mr. J. H. Thompson, general manager and engineer.

GLASGOW.—March 12th.—For pavior's work, for the corporation.—Mr. D. McColl, superintendent of cleansing, 38 Cochrane-street.

STAINES.—March 12th.—For the supply of quartzite, broken macadam and chippings, ragstone, limestone chippings, tar-macadam, and Tarvia, for the rural district council.—Mr. G. W. Manning, surveyor.

CHESTERTON.—March 12th.—For the supply of 5,000 tons of broken granite, for the rural district council.—Mr. J. Dunn, surveyor, Brunswick House, Cambridge.

CAISTOR.—March 13th.—For the supply of granite and slag, for the rural district council.—Mr. A. A. Padley, clerk.

DORCHESTER.—March 13th.—For the repair of district roads, for the rural district council.—Mr. J. J. Estridge, highway surveyor.

EASTRY.—March 13th.—For the supply of surface and approved dug flints, and steam rolling, for the rural district council.—Mr. F. S. Cloke, clerk.

STAINES.—March 13th.—For the supply of granite, tarred macadam, and granite chippings, for the urban district council. Mr. E. J. Barrett, engineer and surveyor.

DURHAM.—March 13th.—For the supply of whinstone slag, tar-macadam, pitch, tar, creosote oil, and cartage, for the rural district council.—Mr. G. Gregson, surveyor.

BUCKS.—March 14th.—For the supply and delivery of best quality granite or other hard stone, not smaller than 6 in. or larger than 12 in., or close dense slag, free from ventholes or honeycomb, and unloading and hauling, for the county council.—Mr. R. J. Thomas, county surveyor, County Hall, Aylesbury.

GOOLE.—March 14th.—For the supply of stone, tar-macadam, asphalt, and ashes for the rural district council.—Mr. G. England, clerk.

DONCASTER.—March 14th.—For the supply of dross and granite, for the rural district council.—Mr. W. R. Crabtree, surveyor.

SEDGFIELD.—March 14th.—For the supply of whinstone, slag, tar-macadam, concrete flags, and sanitary pipes, for the rural district council.

LEXDEN AND WINSTREE.—March 14th.—For the hire of one or two steam rollers, for the rural district council. Mr. John Ennals, surveyor, Lexden, Colchester.

DROXFORD.—March 16th.—For the supply of granite or hard stone, for the rural district council.—Mr. A. V. Carter, surveyor.

DARTFORD.—March 16th.—For the supply of road materials, for the rural district council.—Mr. J. Hookins, surveyor, Garty, Dartford.

CHURCH.—March 16th.—For making up certain streets, laying granite macadam, rolling, and tar-spraying, for the urban district council.—Mr. W. E. Wood, surveyor.

WAKEFIELD.—March 16th.—For repaving work, for the corporation.—Mr. J. P. Wakeford, city surveyor.

BRIDGE.—March 16th.—For the supply of hard flints and gravel, and carting, for the rural district council.—Mr. S. Gladden, highways surveyor, Littlebourne, Canterbury.

SWANSEA.—March 16th.—For the widening and improvement of Duivant-road, for the rural district council. Mr. G. Powell Thomas, highway surveyor, Station-road, Forestfach.

EASINGTON.—March 16th.—For the making up and paving of certain streets, for the rural district council.—Mr. Gilbert Waterhouse, surveyor.

WEYMOUTH.—March 16th.—For the repair of district roads, for the rural district council.—Mr. R. H. Luckham, surveyor.

POCKLINGTON.—March 16th.—For the supply of best blue stone and slag, for the rural district council.—Mr. T. Robson, clerk.

NELSON.—March 16th.—For the supply of granite macadam, limestone macadam, limestone paving chippings, pitch, creosote oil, flags, kerbs, grit setts, and cement, for the corporation.—Mr. W. Shackleton, borough engineer and surveyor.

CHORLEY.—March 16th.—For the supply of broken granite, limestone, slag, rubble, chippings, grit setts, flags and kerbs, for the rural district council.—Mr. P. Whalley, district surveyor.

LLANFRECHFA UPPER.—March 16th.—For road metalling and hauling, for the urban district council.—Mr. G. Jones, surveyor, Richmond-road, Pontnewydd.

ROCHFORD.—March 16th.—For making up a road, for the rural district council.—Mr. H. T. Sidwell, surveyor.

HEBDEN BRIDGE.—March 16th.—For tar-spraying, for the urban district council.—Mr. T. Waddington, surveyor.

BIRMINGHAM.—March 17th.—For road and sewerage works at Lordswood-road, and new road between Balden-road and Lordswood-road, Harborne, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

GARFORTH.—March 17th.—For making up certain thoroughfares, for the urban district council.—Mr. W. G. Smithson, 2 Basinghall-square, Leeds.

ACTON.—March 17th.—For the supply of a tar-spraying machine, tar-spraying work, and coating

certain roads with bitumen, for the urban district council.—The Surveyor.

THURNSCOPE.—March 17th.—For the supply of broken granite, granite chippings, broken slag, slag screenings, flags, kerbs, channelling, and asphalt, for the urban district council.—Mr. T. Bull, surveyor.

WEALDSTONE.—March 17th.—For the supply of well-matured slag, for the urban district council.—Mr. Herbert Walker, surveyor.

REIGATE.—March 18th.—For tar-washing about 170,000 yds. super. of roads, to include cleaning, tarring, and gritting the tar surface, for the corporation.—Mr. Alfred Smith, town clerk.

REIGATE.—March 18th.—For the supply of about 16,000 gallons of Tarmac in barrels, for the corporation.—Mr. Fred. T. Clayton, borough surveyor.

ELY.—March 18th.—For the supply of 4,080 tons of granite and 1,110 tons of gravel, for the rural district council.—Mr. F. W. Firby, district surveyor.

CARSHALTON.—March 18th.—For treating about 111,000 yds. super. of road with bituminous, dust-preventing material, for the urban district council.—Mr. C. P. Lovelock, clerk.

CHESTER-LE-STREET.—March 18th.—For the supply of whinstone, broken slag, tarred slag, broken limestone, brooms and shovels, for the urban district council.—Mr. F. J. Gray, clerk.

CHELMSFORD.—March 20th.—For labour, haulage, supply of broken granite, broken Kent flints, and hire of steam road rollers, for the rural district council.—Mr. F. E. H. Powell, surveyor.

BISHOP'S STORTFORD.—March 20th.—For the supply of tar in accordance with the Road Board Specification for tar No. 1, for the urban district council.—The Surveyor.

NEWBURY.—March 21st.—For the supply of carting of road materials, for the rural district council.—Mr. O. Frewin, district surveyor.

GATESHEAD.—March 21st.—For the supply of road materials, for the corporation.—Mr. N. P. Pattinson, borough engineer.

BILSTON.—March 23rd.—For the supply and delivery of broken stone, for the urban district council.—Mr. Vincent Turner, engineer and surveyor.

KING'S LYNN.—March 23rd.—For tar spraying roads, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

COVENTRY.—March 23rd.—For the supply of broken road stone, granite kerbs, granite setts, stoneware pipes, castings, and workmen's tools, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

ORMSKIRK.—March 23rd.—For the supply of road materials, for the urban district council.—Mr. H. W. Chadwick, surveyor.

GATESHEAD.—March 24th.—For cement path work, for the corporation.—Mr. N. P. Pattinson, borough engineer.

NUNEATON.—March 24th.—For the supply of broken granite, for the rural district council.—Mr. C. Blakeway, clerk.

KING'S LYNN.—March 27th.—For the supply of road materials, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

HARROGATE.—March 27th.—For the supply of whinstone, limestone, kerbing, channelling, flagging, setts, shovels, picks, and concrete and artificial stone flagging, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

BARMOUTH.—No date.—For the supply and laying of tar-macadam and steam rolling, for the urban district council.—Mr. T. R. Parry, surveyor.

Sanitary.

CASTLEREA.—March 7th.—For sewerage work, for the rural district council.—Mr. C. Mulvany, engineer.

DARTFORD.—March 7th.—For laying stoneware and iron pipes, with manholes, for the rural district council.—Mr. J. E. Goreham, engineer, 65 Hightfield-road, Dartford.

BALLDON.—March 9th.—For the construction of detritus tanks, alterations to settling tanks, percolating filters and sludge filters, for the urban district council.—Mr. J. N. Nicholson, 19 Tanfield Chambers, Bradford.

STOKE-ON-TRENT.—March 9th.—For the supply of press cloths, lime, chemicals, coal and slack,

petroleum for power purposes, and lubricating oils, for the corporation.—Mr. W. H. Makepeace, sewage engineer, Leek-road, Stoke-on-Trent.

WARSOP.—March 9th.—For the removal of house refuse, for the urban district council.—Mr. L. A. Westwick, surveyor, White Hart Chambers, Mansfield.

LANARK.—March 10th—April 6th.—For the construction of outfall and intercepting sewers, for the District Committee of the Middle Ward.—Mr. W. L. Douglas, district engineer, Hamilton.

FLEET.—March 10th.—For the collection of house refuse, road watering, and the supply of tar, for the urban district council.—The Surveyor.

WATFORD.—March 10th.—For the removal of house refuse, for the rural district council.—Mr. J. Robinson, inspector.

SANDERSTEAD.—March 10th.—For scavenging work, for the Parochial Committee.—Mr. E. J. Gowan, clerk, Katherine-street, Croydon.

BEDLINGTON.—March 10th.—For cleansing privies and ashpits, for the urban district council.—Mr. R. M. Laverick, inspector.

BIRMINGHAM.—March 10th.—For the construction of brick and pipe sewers, for the corporation.—Mr. H. E. Stigoe, city engineer and surveyor.

LOFTUS.—March 11th.—For the diversion and relaying of main sewer, for the urban district council.—Mr. B. J. Wormleighton, engineer and surveyor.

HOWDEN.—March 12th.—For scavenging, for the rural district council.—Mr. H. Green, clerk.

PENGE.—March 12th.—For the removal of house and trade refuse, for the urban district council.—The Surveyor.

MERTHYR TYDFIL.—March 14th.—For providing, laying and jointing a 30-in. main sewer, comprising about 4½ miles of concrete tubes and 173 yds. of 30-in. steel tubes, for the corporation.—Borough Engineer.

CHESHAM.—March 14th.—For the reconstruction with cast-iron pipes of about 712 lin. yds. of 12-in., 977 yds. of 9-in., and 935 yds. of 6-in. existing stoneware pipe sewers and house connections with manholes and flushing chambers, for the urban district council.—Mr. Percy C. Dormer, engineer and surveyor.

BENFIELDSIDE.—March 14th.—For the removal of refuse, for the urban district council.—Mr. T. Knox, surveyor, Shotley Bridge.

KEIGHLEY.—March 16th.—For scavenging work, for the rural district council.—Mr. T. Burton, inspector.

READING.—March 16th.—For the construction of sewerage and manholes, for the corporation.—Mr. J. Bowen, borough engineer and surveyor.

MITCHAM.—March 17th.—For scavenging and street watering, for the rural district council.—Mr. E. J. Cowen, clerk, Croydon.

NUNEATON.—March 18th.—For laying earthenware pipes, storm sewers, and road work, for the corporation.—Mr. F. C. Cook, borough engineer.

MOUNTAIN ASH.—March 24th.—For scavenging and team work, for the urban district council.—Mr. W. G. Thomas, surveyor.

MADRAS.—March 24th.—For the supply and delivery of 2,000 cast-iron manhole covers and frames, for the corporation.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

NANTWICH.—March 28th.—For the construction of sewage disposal works, including detritus, settling, storm-water, and stand-by tanks, laying stoneware pipe sewers, construction of 104 manholes, and other appurtenant works, for the rural district council.—Mr. Charles E. Davenport, engineer, 152 Hospital-street, Nantwich.

Stores.

TYNEMOUTH.—March 7th.—For the supply of road materials and general stores, for the corporation.—Mr. John E. Smillie, borough surveyor.

BARNES.—March 9th.—For the supply of broken Guernsey or Alderney granite, broken pit flints and Thames ballast, horse and cart hire, disinfectants, ironmongery, Portland cement, forage, litter, granite kerb, channel, paving slabs, oils, paints, and stoneware pipes, for the urban district council.—Mr. C. Bruce Tomes, engineer and surveyor.

BUCKLOW.—March 9th.—For the supply of blue Welsh Penmaenmawr setts, small stones, chippings, edging stones, socket glazed pipes, grit setts, hand-

broken Penmaenmawr stones, road grids, shovels, road brushes, copper slag, and cinders, for the rural district council.—Mr. George Leigh, clerk.

PRESTWICH.—March 9th.—For the supply of granite setts, English Portland cement, pitch, creosote oil, granite macadam, kerbs, flags, setts, hire of steam roller, stoneware pipes, coal, concrete flags, scavenging brooms, tools, iron castings, incandescent mantles, and disinfectants, for the urban district council.—Mr. Lewis A. Orford, clerk.

BATLEY.—March 9th.—For the supply of flagstones, setts, paviors, kerbs, sanitary tubes, pitch, creosote oil, natural pitch or bitumen, cement, broken granite, broken basalt, ironmongery, brushes, and engine oils, for the corporation.—Mr. Oscar J. Kirby, borough engineer.

DERBY.—March 9th.—For the supply of bricks, castings, cement, lime, disinfectants, earthenware, freestone, gritstone, granite, gravel, sand, limestone, pitch, tar and slag, for the corporation.—Mr. John Ward, borough surveyor.

ESTON.—March 10th.—For the supply of furnace slag, disinfectants, street brooms, gully scoops, shovels, team work, and horse hire, for the urban district council.—Mr. C. McDermid, surveyor.

COLNE.—March 10th.—For the supply of Lancashire and local setts, flags, kerbs, channels, Portland cement, granite macadam, limestone macadam, lime, ironwork, pitch, creosote oil, earthenware pipes, gullies, brushes, manholes, and lamphole covers, for the corporation.—Mr. T. H. Hartley, borough surveyor.

OLDHAM.—March 11th.—For the supply of granite setts, Rawtenstall setts, gritstone setts, Rawtenstall flags and kerbs, granite macadam and granite chippings, bricks, Portland cement, earthenware pipes, junctions, bends, cast-iron manhole and lamphole covers, gully grates, limestone chippings, pitch, creosote oil, sand, gravel, timber, spades, and shovels, for the corporation.—Mr. J. H. Hallsworth, town clerk.

EASTBOURNE.—March 11th.—For the supply of cast-iron goods, wrought-iron goods, tools, ironmongery, oils and colours, timber, broken granite, granite kerb and setts, bricks, pipes, junctions (stoneware), brooms, and brushes, for the corporation.—Mr. A. Ernest Prescott, borough surveyor.

EXETER.—March 11th.—For the supply of bricks, bass brooms, refilling stocks of sweeping machine, Portland cement, building lime and slates, cast-iron pipes, granite channelling, kerb, Yorkshire flags, concrete flags, painting and paperhangor's work, stoneware pipes, iron castings, stone, sand, timber, ironmongery, oils, plumber's material and labour, asbestos goods, and baskets, for the corporation.—City Surveyor.

EAST HAM.—March 14th.—For the supply of glazed stoneware pipes, gully fittings, Portland cement, grey stone, chalk, blue lias lime, lime for sewage precipitation, bricks, coal, coke, engineers' sundries, broken granite, crushed granite, granite setts, granite chippings, granite kerb, channelling, broken flints, cast-iron work, shovels, brooms, picks, handles, disinfectants, hire of horses, paving flags, sewer ventilating columns, uniforms, and redressing setts (labour only), for the corporation.—Mr. C. Eustace Wilson, town clerk.

BACUP.—March 14th.—For the supply of road materials and general stores, for the corporation.—Borough Surveyor.

WESTON-SUPER-MARE.—March 14th.—For the supply of ironmongery, tools, castings, iron and steel, paints, brooms, brushes, water fittings, stoneware goods, cement, lime, bricks, disinfectants, and stable utensils, for the urban district council.—Mr. H. A. Brown, engineer and surveyor.

GREAT CROSSBY.—March 16th.—For the supply of granite macadam and chippings, limestone chippings, tarred limestone macadam, Portland cement, stoneware pipes, disinfectants, pitch and tar, incandescent mantles and chimneys, glass for street lamps, horse provender, granite setts, extra cart hire, and horsing fire brigade, for the urban district council. Mr. Joseph A. Wright, surveyor.

SUTTON COLDFIELD.—March 16th.—For the supply of granite macadam, kerb, limestone macadam, setts, gravel, broken pebble stones, Yorkshire or Pennant kerb, Rowley setts, earthenware pipes, cement, lime, iron castings, iron, steel, timber, hard-

ware, oils, paints, and bass brooms, for the corporation.—Mr. W. A. H. Clarry, borough engineer and surveyor.

GAINSBOROUGH.—March 18th.—For the supply of broken granite or whinstone granite or whinstone setts, broken and block slag, slag chippings and dust, York setts, kerbs, channels and flags, concrete flags, stoneware and earthenware pipes, gullies, cast-iron pipes, tar-macadam, pitch and creosote oil, Portland cement, and coal, for the urban district council.—Mr. Sam. W. Parker, engineer and surveyor.

HEYWOOD.—March 21st.—For the supply of setts, kerbs, flags, earthenware pipes, bends, junctions, taper pipes, traps, gullies, pitch, creosote oil, limestone chippings (white), hand-broken granite, granite chippings, and Portland cement (English), for the corporation.—Mr. J. B. Nuttall, borough surveyor.

Miscellaneous.

BEDFORD.—March 7th.—For the provision and erection of electrically driven centrifugal pumps, comprising four single-phase 2,000-volt electric motors, coupled direct to four centrifugal pumps, together with float actuated automatic starting gear, high-tension and other switchgear, and electrical connections, for the corporation.—Major Tulloch & Haworth, 28 Victoria-street, Westminster, S.W.

BARNES.—March 9th. Offers are invited for a Merryweather double-cylinder "Greenwich" steam fire engine complete with all fittings.—Mr. G. Bruce Tomes, surveyor.

EAST STONEHOUSE.—March 10th.—For the haulage of house refuse and street sweepings, for the urban district council.—Mr. R. Robinson Rodd, clerk.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

BOSMERE.—Accepted for the supply of granite, picked stones, and pit stones, for the rural district council.—Mr. G. Fiske, surveyor, Ipswich:—

- London Granite Company, London.
- Lavender & Bateman, Sutton Bridge.
- Enderby and Stoney Stanton Company, Leicester.

HELMSFORD.—For the supply of tar-macadam, for the corporation.—Mr. P. T. Harrison, borough engineer and surveyor:—

	Per ton.
	s. d.
Tarmac, Limited, Wolverhampton*	18 2
J. Wainwright & Co., Limited, Shepton Mallet	18 3
Tarred Granites, Limited, London	26 8
Bristowe & Co., Limited, London	20 10
J. Smart & Son, London	18 5
J. Oakes & Co., Alfreton, Derbyshire	18 7
Chiffenden & Simmonds, Limited, Maidstone	20 4
F. G. Sheppard & Co., London	19 0
Northern Quarries Company, Limited, London	19 5
W. H. Bensted & Son, Maidstone	20 0
A. C. W. Hobman & Co., Limited, London	19 11
Lavender & Bateman, Sutton Bridge, Lines	18 9
Dosthill Granite Quarries Company, Limited, Tamworth	21 9
Arenig Granite Company, Limited, Shrewsbury	22 6

DRAYCOTT.—For the Draycott and Breaston sewerage and sewage disposal works. Messrs Elliott & Brown, Nottingham, engineers:—

R. C. Brebner & Co., Edinburgh	£13,104
W. Jowett, Prescott	12,084
W. Moss & Sons, Loughborough	11,635
Lane Brothers, Mansfield	11,530
H. H. Barry, Radcliffe-on-Trent, Notts	11,260
F. Perks & Sons, Long Eaton	11,010
A. H. Preece & Co., Nottingham	10,981
J. & J. Warner, Derby	10,973
G. E. Tomlinson, Derby	10,600

EDINBURGH.—For the demolition of old buildings and building retaining walls, and forming a playground, for the corporation.—Mr. A. H. Campbell:—

R. C. Brebner & Co., Edinburgh	£508
J. Turner & Co., Edinburgh	415
W. Dabson & Co., Edinburgh	436
R. Dryden, Edinburgh	406
J. Angus & Son, Edinburgh	380
Scott & Brown, Edinburgh	378
Melrose & Thomson, Edinburgh	360
Henderson & Wallace, Edinburgh	333

HAMMERSMITH.—For installing a Lancashire boiler at the trade school for girls, Hammersmith, for the London County Council:—

Tetlow Brothers, Oldham	£747
Clayton, Son & Co., Limited, Leeds	716
Galloways, Limited, Manchester	709
Tinker, Shenton & Co., Limited, Manchester	700
Spurr, Luman & Co., Limited, Wakefield	700
D. Adamson & Co., Dukinfield	692
Tinkers, Limited, Manchester	685
Yates & Thom, Limited, Blackburn	677
J. Thompson, Wolverhampton †	635

HERTS.—For the erection of a school, for the county council.—Mr. Urban A. Smith, county surveyor:—

	Asbestos tiles.	Slate roofing.
Blow & Peters, St. Albans	£3,039	£2,981
H. Pickrill, Wealdstone	2,812	2,793
C. Brightman, Watford	2,755	2,749
Ekins & Co., Hertford	2,710	2,720
Hacksley Brothers, Wellesborough	2,657	2,662
P. R. Paul, Waltham Abbey	2,629	2,601
Miskin & Son, St. Albans	2,624	2,611
E. Clark, Melton Mowbray	2,623	2,617
Bailey & Co., Ashwell	2,540	2,518
Henson & Son, Wellesborough	2,499	2,471
Norris & Son, Hertford	2,476	2,455
O. P. Drever, Kettering	2,334	2,320

HODDESDON.—For scavenging and street watering work, for the urban district council.—Mr. W. H. Flood, surveyor:—

	£	s.	d.
E. Childs, Hoddesdon	2	9	6
P. Tofts, Hoddesdon	2	8	0
STREET WATERING.			
H. Brazier, Hoddesdon	5	10	0
E. Childs, Hoddesdon	5	5	0
P. Tofts, Hoddesdon	4	10	0

KETTERING.—For the erection of public baths, for the urban district council.—Mr. T. R. Smith, surveyor:—

A. M. Bamford, Kettering	£4,650
Smith & Bunning, Kettering	4,631
J. Norris, Kettering	4,183
Phillips & Slow, Kettering	3,891

LEWISHAM.—Recommended for acceptance by the borough council.—Mr. E. van Putten, borough surveyor:—

Sewerage Jobbing Works.—J. T. Gloag, at 2½ per cent above the priced schedule.
 Dust Baskets.—A. E. Dellow, junr., at 13½ per cent below the priced schedule.
 Waterproof Sheets.—W. Peters & Sons, at 9s. 9d. each.
 Horse Hire, Dusting.—W. Joy, at 3s. 8d. per day for horse and harness in division 1; G. Stimpson, at 4s. per day for horse and harness in division 2; W. G. Penfold, at 3s. 8d. per day for horse and harness in division 3; A. J. Tucker, at 3s. 8d. per day for horse and harness in division 4.

Watering and Cartage.—W. Joy, at 8s. 9d. per day for horse, harness and man, and for horse, harness, cart and man in division 1; G. Stimpson, at 8s. 11d. per day for horse, harness and man, and for horse, harness, cart and man in division 2; A. Manchester, at 8s. 9d. per day for horse, harness and man, and for horse, harness, cart and man in division 3; A. J. Tucker, at 8s. 6d. per day for horse, harness and man, and for horse, harness, cart and man in division 4.

Public Health Department.—W. Joy, for horse, harness and man, at 10d. per hour.

Tar-spraying Roads.—Durable Road, Limited, at 1.6d. per yard for first coat covered with grit, and 1.4d. for second coat work; 1.95d. per yard for first coat covered with granite chippings, and 1.75d. for second coat work.

Tar Paving.—Constable, Hart & Co., Limited, for coarse and fine tar paving and Kent rag chippings, at 5 per cent above the priced schedule.

Road Material.—Fry Brothers, Limited, for broken Guernsey granite, at 15s. 8d. per ton in division 1; 16s. 2d. per ton in division 2; 15s. per ton in division 3; and 15s. 4d. per ton in division 4; and for dug flints in division 4, at 7s. per ton. W. G. Penfold, for dug flints in division 1, at 6s. 9d. per ton. W. Pearce, for dug flints in division 2, at 7s. 3d. per ton; and division 3, at 6s. 9d. per ton. Tilbury Contracting and Dredging Company, Limited, for broken Kentish ragstone, at 10s. 5d. per ton in divisions 3 and 4.

Thames Ballast.—W. R. Cunis, Limited, at 5s. 3d. per yard in divisions 1 and 4; and 4s. 5d. per yard in division 3. J. Weston & Sons, at 5s. 9d. per yard in division 2.

Thames Sand.—W. G. Penfold, at 6s. per yard in divisions 1 and 4; and at 5s. 6d. per yard in division 3. J. Weston & Sons, at 6s. 9d. per yard in division 2.

Crushed Thames Ballast.—W. R. Cunis, Limited, at 7s. 2½d. per yard in division 1; 7s. 11d. per yard in division 3; and 7s. 4d. per yard in division 1. W. Whiteway & Co., at 8s. per yard in division 2.

Pit Ballast.—G. R. Hutchings, at 4s. 9d. per yard in divisions 1 and 2. W. G. Penfold, at 5s. 3d. per yard in divisions 3 and 4.

Pit Sand.—F. W. Corke, at 5s. 6d. per yard in division 1, and at 5s. 9d. per yard in division 4. G. R. Hutchings, at 5s. 7d. per yard in division 2. J. & B. Martin (Crayford and Pawham), Limited, at 5s. 1½d. per yard in division 3.

Screened Clean 3-in. Shingle.—W. G. Penfold, at 7s. per yard in divisions 1 and 4; at 7s. 6d. per yard in division 2; and at 6s. 6d. per yard in division 3.

Croydon Gravel.—W. Whiteway & Co., at 7s. 3d. per yard for coarse Croydon gravel, and 10s. per yard for fine Croydon gravel in divisions 1, 3 and 4; and at 6s. 9d. per yard for coarse Croydon gravel, and 9s. 6d. per yard for fine Croydon gravel in division 2.

Removal of House and Trade Refuse.—J. & B. Martin (Crayford & Pawham), Limited, at 3s. 8½d. per load from Forest Hill railway station, and 2s. 11d. per load from Lee, Blackheath, Catford, Lower Sydenham and Brockley railway stations.

Stoneware Goods.—Denton & Co., Limited, at 35 per cent below the priced schedule, and 2½ per cent discount for monthly payments.

Ironwork to Sewers and Drainage.—J. Gibb & Co., Limited, at 23 per cent below the priced schedule.

Brooms and Brushes.—Pryke & Palmer, at 31½ per cent below the priced schedule.

Granite Kerb and Setts.—Fry Brothers, Limited, at 10 per cent above the priced schedule.

Asphalt Paths.—Bradshaw's Asphalt Company, Limited, for Portland cement concrete, at 12 per cent below the priced schedule; 14 per cent below for 1½-in. and 3-in. asphalt; and 13 per cent below for 1-in. asphalt.

Disinfectants.—Pryke & Palmer, for permanganate of potash, at 37s. 11d. per cwt.; and smoke rockets, at 4s. 2d. per dozen. Sanitas Company, Limited, for drain testers, at 45s. per gross. A. C. Young & Co., for carbolic acid, at 11d. per gallon. Adecocks, for carbolic powder, at 2s. 7d. per cwt.; and for flowers of sulphur, at 7s. 2d. per cwt. Forbes, Abbott & Lennard, Limited,

for soluble sanitary fluid, at 6½d. per gallon. United Alkali Company, Limited, for chloros, at 1s. 10d. per gallon. Formalin Hygienic Company, Limited, for Formalin (Schering's), at 1s. 3d. per lb. H. E. Olby, for glycerine, at 1s. per lb.; and for Cyllin, at 3s. 6d. per gallon. Middleton Brothers, at 3s. 6d. per gallon for 12al, less 2½ per cent discount.
 Portland Cement.—C. Pearce, at 37s. 11d. per ton.
 Lime.—A. H. Lavers & Co., at 13s. 6d. per yard.
 Artificial Stone.—W. Pearce, at 3s. 2d. per yard super.
 Tools.—A. J. Hewens, at 45 per cent below the priced schedule, and 2½ per cent discount for monthly payments.

For kerbing, channelling, and making up the roadway, and for paving the footways of Bellingham-road (part of), with artificial stone:—

	£	s.	d.
Fry Brothers, Limited	1,665	1	—
W. Pearce	1,679	3	10½
J. Mowlem & Co., Limited	1,724	—	—
H. Woodham & Sons	1,760	—	—
J. T. Gloag	1,769	—	—
Alexandra Paving Company, Limited	—	3	11½
Thames Stone Company, Limited	—	4	2
Atlas Stone Company, Limited	—	4	3
General Stone and Marble Co., Limited	—	5	6

LITTLEBOROUGH.—Accepted for the supply of 3,700 tons of 4-in. and 5-in. granite setts, for the urban district council.—Mr. G. H. Wild, surveyor:—

Penmaenawr and Welsh Granite Company, Limited, North Wales.
 Pwllheli Granite Company, Limited, North Wales.
 Festiniog Granite Company, Limited, North Wales.
 Brooks, Limited, Halifax.
 W. & I. Glossop, Hipperholme.

MANCHESTER.—For the supply of ventilating grids and other castings, for the corporation.—Mr. H. Prescott, manager, Drainage Department:—

Ferranti, Limited, Hollinwood, Lancashire, schedule of prices.

ST. AUUSTELL.—Accepted for building twenty-two houses, for the urban district council.—Architect, Mr. E. D. Groves, engineer and surveyor to the council:—

F. J. Stanbury, Devonport, £4,594.

STOKE NEWINGTON.—For the erection of washhouses, for the borough council.—Mr. W. F. Loveday, borough surveyor:—

W. Gladding & Co.	£1,869
E. & F. J. Wood	1,844
C. R. Price	1,829
E. Lawrence & Sons	1,799
S. Goodall & Son	1,799
W. H. T. Kellard	1,798
Patman & Fotheringham	1,783
W. M. Dabbs & Son	1,742
J. Garrett & Son	1,716
Stapleton & Sons	1,642
W. Shymur & Son	1,620
Harris & Wardrop	1,596
A. Monk	1,578
J. Sands	1,562
F. Webster & Son	1,558

TODMORDEN.—For the erection of a bandstand, three shelters, and bowling-green pavilion, for the corporation.—Mr. J. A. Heap, borough engineer:—

Halstead Brothers, Todmorden, £1,100.

WARMINSTER.—For the erection of an isolation hospital, for the Joint Isolation Hospital Committee.—Mr. C. H. Lawton, architect, Warminster:—

Linzey, Trowbridge, Wilts	£2,973
Dyer & Sons, Currey Rivel	2,945
R. Butcher & Son, Warminster, Wilts	2,913
Parsons Brothers, Westbury, Wilts	2,857

Architect's estimate, £2,946.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MARCH.

- 11.—Association of Engineers-in-Charge: Mr. Henry Adams, M.I.N.S.T.C.E., on "The Storage of Coal with Some Applications of Reinforced Concrete." St. Bride's Institute, E.C. 8 p.m.
- 12.—Society of Architects: Mr. A. E. Brown, B.S.C.(LOND.), on "Bricks and Brick Making." 8 p.m.
- 13.—Town Planning Institute: Mr. Raymond Unwin on "The Town Planning Proposals of the Urban Land Report." 92 Victoria-street, S.W. 8:30 p.m.
- 16.—Junior Institution of Engineers: Mr. W. A. Tookey, M.I.M.E.C.E., on "The Running of Gas Engines and Gas Producers." Institution of Electrical Engineers, Victoria-embankment. 8 p.m.
- 21.—Association of Engineers-in-Charge: Annual Dinner.
- 21.—Institution of Municipal and County Engineers: North-Eastern District Meeting at Wakefield.
- 21.—Institution of Municipal and County Engineers: South-Western District Meeting at Torquay.

APRIL.

- 3.—Royal Sanitary Institute: Meeting at Southampton. Discussion on "The Housing, Town Planning, &c., Act, and its Application to the County Borough of Southampton." 7 p.m.
- 20.—Institute of Sanitary Engineers: Mr. E. A. Lees, M.I.N.S.T.C.E., on "The Birmingham Waterworks." Caxton Hall, Westminster. 8 p.m.

MAY.

- 13.—Royal Sanitary Institute: Annual Dinner, Langham Hotel.

APPOINTMENTS OPEN.

WANTED, at once, a fully qualified Surveyor, or an Architect with a full knowledge of surveying, to take charge of some Garden City developments.

Applicants must be over 30 years of age, must be fully qualified to deal with all questions of Estate development, must have a thorough knowledge of plans, must be able to make surveys and measure up for certificates. Commencing salary £200 per annum.

Apply by letter only, stating age, full details of experience, and enclosing copies only of three recent testimonials, to

WELSH GARDEN CITIES, LTD.,
(1,361) 3 Dumfries-place, Cardiff.

**URBAN DISTRICT OF HOLYWELL.
APPOINTMENT OF SURVEYOR AND
INSPECTOR OF NUISANCES.**

The Urban District Council of Holywell invite applications for the appointment of a person to perform the duties of Surveyor and Inspector of Nuisances for the District.

The person appointed must be possessed of a Certificate of the Municipal Engineers' Institute, the Sanitary Institute, or some other similar examining body, and must devote the whole of his time to the duties of the office.

The appointment will be an annual one, and will be made on the distinct understanding that no pension or retiring allowance will be granted. A knowledge of the Welsh language is desirable.

The appointment will commence as from the 1st day of April, 1914, with a salary in respect of the office of Inspector of Nuisances (which will be subject to the sanction of the Local Government Board) at the rate of £70 per annum, and in respect of the other office at the rate of £35 per annum.

Canvassing is strictly prohibited, and any candidate found, directly or indirectly, canvassing any member of the Council will be disqualified for election.

Applications, with copies of three recent testimonials, marked "Inspector of Nuisances, &c.," must be delivered at the Offices of the undersigned, from whom can be obtained a Form of Application and a list of the duties appertaining to the offices, on or before Monday, the 23rd day of March, 1914.

J. KERFOOT-ROBERTS,
Solicitor, Holywell.
(1,391) Clerk to the Council.

**THE ROYAL BOROUGH OF KENSINGTON.
APPOINTMENT OF RESIDENT MANAGER
AT WOOD-LANE DEPOT.**

The Council of the above Borough require the Services of a Competent Manager to take sole charge, under the direction of the Borough Engineer, of the Council's Refuse Destructor, Clinker Block-making Installation, and the Works generally at the Wood-lane Depot, Shepherd's Bush. Candidates must be between 30 and 40 years of age, and should have had practical experience in connection with the working of installations of a similar nature, have a practical knowledge of steam plant, and be conversant with the general duties of a manager of works.

The salary attaching to the position will be at the rate of £160 per annum, rising by conditional annual increments of £10 to a maximum of £200 per annum, with house and allowance of coals and lighting.

The appointment will be subject to the provisions of the Kensington Borough Council (Superannuation) Act, 1907, under which percentage deductions are made from all salaries and emoluments.

Application must be made in the candidate's own handwriting on printed Forms to be obtained at my Office, and must be delivered to the undersigned, accompanied by copies of not more than three testimonials of recent date, not later than four o'clock in the afternoon of Tuesday, March 17th, 1914.

Personal canvassing of any Members of the Council will be a disqualification.

(By order)
WM. CHAMBERS LEETE,
Town Clerk.

Town Clerk's Office,
Town Hall,
Kensington, W.
February, 1914. (1,354)

SURVEYOR AND ENGINEER to a large Rural District Council (with main roads) has a vacancy for a pupil. Low premium.—Apply Box 1,382, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,345)

EX-PUPILS AND JUNIOR ASSISTANTS.

SURVEYOR'S ASSISTANT (21), 3 years Articles, desires appointment in Municipal Office, or Contractor executing Municipal Contracts. Experience levelling, surveying, draughtsmanship, building construction, architectural drawing, street works, waterworks. Excellent testimonials. Moderate salary. Free immediately.—Box 1,387, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,388)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

**CHESHAM URBAN DISTRICT COUNCIL.
ERECTION OF WORKMEN'S DWELLINGS.**

The Chesham Urban District Council invites Tenders for the erection and completion of Twenty Workmen's Dwellings, together with all Fencing, Drainage, &c., upon land situate in Brockhurst-road, within the Urban District of Chesham.

Plans, Sections and Specification may be seen upon application to the undersigned any morning between the hours of 9.30 and 10.30, or at other suitable time by appointment.

The person or firm whose Tender is accepted will be required to enter into a Contract and Bond in an approved Guarantee Society as surety for the due performance of the Contract, a copy of which may be seen at the office of W. J. Standing, Esq., Clerk to the Council, High-street, Chesham, to whom Tenders, sealed and endorsed "Tender for Erection of Workmen's Dwellings," are to be delivered by twelve o'clock noon on Wednesday, March 25th, 1914.

The Council does not bind itself to accept the lowest or any Tender.

PERCY C. DORMER,
Engineer and Surveyor.
Council Offices,
Chesham.
February 25, 1914. (1,381)

CITY OF BIRMINGHAM.

The Public Works Committee are prepared to receive Tenders for Road and Sewerage Works at Lordswood-road and new road between Balden-road and Lordswood-road, Harborne.

The Drawings and Specification may be seen, and the Bill of Quantities and Forms of Tender obtained, at my Office on payment of a deposit of £2, which sum will be returned on receipt of a bona-fide Tender.

Persons tendering must, at the time of tendering, and at all times during the execution of the Works, be paying all their workpeople not less than the trade union or standard rate of wages in the district where such workpeople are actually engaged in the execution of the work, and must be observing the hours and conditions of labour recognised by the Association of Employers and the local organised bodies of workers in the various trades in such district. The Tender of any person not paying the trade union or standard rate of wages, or not observing such hours and conditions of labour in his ordinary business will not be accepted. The Contractor will be held responsible for the observance of these conditions by any Sub-contractor employed by him.

Tenders, sealed and endorsed "Tender for Road and Sewerage Works, Lordswood-road, &c.," and addressed to the Chairman of the Public Works Committee, to be delivered at my Office not later than 17th March, 1914.

The Committee do not bind themselves to accept the lowest or any Tender.

HENRY E. STILGOE, M.INST.C.E.,
City Engineer and Surveyor.
The Council House,
Birmingham. (1,382)

COUNTIES OF BERKS AND SOUTHAMPTON.

CONSTRUCTION OF A BRICK AND CONCRETE BRIDGE AT NEWTOWN FORD, NEAR NEWBURY.

TO CONTRACTORS.

Persons desirous of Tendering for the Construction of a Brick and Concrete Three-arched Bridge at Newtown Ford, on the Winchester, Whitechurch and Newbury Main Road, may see Plan, Specification and General Conditions, and obtain a copy of the Bill of Quantities and all other necessary information, on application at the office of Mr. W. J. Taylor, County Surveyor, The Castle, Winchester, on and after Monday, the 9th day of March, 1914, between the hours of 9 a.m. and 4 p.m. (Saturdays, 9 a.m. and 12 noon).

A deposit of two guineas will be required for a copy of the Bill of Quantities, which will be refunded on receipt of a *bonâ-fide* Tender.

Deposits must be made by cheque, payable to the "Hampshire County Council," and crossed "Capital and Counties Bank," or particulars will not be sent.

Tenders, on forms supplied by the County Surveyor, must be endorsed "Newtown Bridge," and be delivered to me on or before 10 a.m., Wednesday, the 25th March, 1914.

The County Council do not bind themselves to accept the lowest or any Tender.

H. BARBER,

Clerk of the Hampshire County Council.

The Castle, Winchester.

February 26, 1914.

(1,379)

GAINSBOROUGH URBAN DISTRICT COUNCIL.

ANNUAL CONTRACTS, 1914-15.

The Urban District Council are prepared to receive Tenders for the Supply and Delivery of the under-mentioned Materials as may from time to time be ordered during the year ending 31st March, 1915:

1. Broken Granite or Whinstone Macadam.
2. Granite or Whinstone Setts.
3. Broken and Block Slag, Slag Chippings and Dust.
4. York Setts, Kerbs, Channels and Flags.
5. Concrete Flags.
6. Stoneware and Earthenware Pipes, Gullies, &c.
7. Cast-iron Pipes.
8. Tar-macadam.
9. Pitch and Creosote Oil.
10. Portland Cement.
11. Coal.

Specification and Forms of Tender may be obtained by written application addressed to the undersigned.

Sealed Tenders, endorsed "Tender for —," accompanied by Samples of the Materials to be supplied (except Nos. 4, 7, 8, 9, 10, 11), to be delivered at the Office of Mr. Decimus M. Robbs, Clerk to the Council, 6 Lord-street, Gainsborough, not later than Wednesday, 18th March next.

The Council do not bind themselves to accept the lowest or any Tender.

SAM. W. PARKER,

Engineer and Surveyor.

Council Offices,
Gainsborough.

February 20, 1914.

(1,318)

COUNTY BOROUGH OF BURNLEY.

TO CONTRACTORS.

The Burnley Corporation invite Tenders for the Completion of the Construction of an Impounding Reservoir, with Catchwaters, Aqueducts, Meter-houses, &c., at Hurstwood, near Burnley.

Plans may be seen, and Specification, Schedule of Prices, Form of Tender, and all other particulars obtained, on application to Messrs. James Diggle & Son, Engineers, Hind Hill-street, Heywood, Lancashire, on and after Monday, the 23rd February, 1914, on payment of a deposit of £5, which will be returned on receipt of a *bonâ-fide* Tender, accompanied by the Schedule of Prices fully priced out, but not otherwise.

Sealed Tenders, endorsed "Tender for Completion of Reservoir," must reach me not later than Saturday, the 4th day of April, 1914.

PEREGRINE THOMAS,

Town Clerk.

Town Hall, Burnley.

February 11, 1914.

(1,312)

WEST WARD RURAL DISTRICT COUNCIL, WESTMORLAND. WATER SCHEME.

The West Ward (Westmorland) Rural District Council invite separate Tenders or one whole Tender for:—

CONTRACT No. 1.

- 1½ miles (approximate) 3-in. diameter Mannesman Steel Tubes delivered and laid complete.
- 6½ miles (approximate) 5-in. diameter do.
- 7 miles (approximate) 6-in. diameter do.

With Specials, Valves, &c.

CONTRACT No. 2.

The Erection of Intake Works, Screening Chamber, Three Service Reservoirs, Break Pressure Tank, Valve Chambers, &c., on route of Contract No. 1.

CONTRACT No. 3.

- 3 miles (approximate) 3-in. diameter Mannesman Steel Tubes, delivered and laid complete.
- 4 miles (approximate) 4-in. diameter do.
- 33 miles (approximate) 3-in. Cast-iron Pipes, delivered and laid complete.

12 miles (approximate) 4-in. do.

1½ miles (approximate) 5-in. do.

¼ mile (approximate) 7-in. do.

With Specials, Valves, &c.

CONTRACT No. 4.

The Building of Break Pressure Tanks and Valve Chambers, &c., on route of Contract No. 3.

The whole of the Works to be carried out in accordance with Plans and Specifications prepared by Mr. Joseph Graham, Civil Engineer, 28 Castle-street, Carlisle.

Intending Contractors, upon deposit of £5 (cheque only), will obtain copies of Specification and Bill of Quantities with Form of Tender at the Office of the aforesaid Engineer, where the Drawings will be on view. The cheque will be returned to the Contractor upon the receipt of a *bonâ-fide* Tender and the return of all documents to the Engineer.

The Council do not bind themselves to accept the lowest or any Tender.

JAMES TAYLOR,

1 Brunswick-road,

Clerk.

Penrith.

February, 1914.

(1,372)

ACTON URBAN DISTRICT COUNCIL.

Tenders are invited for—

- (A) The Supply of a Tar-spraying Machine.
- (B) Tar-spraying certain Roads in the District.
- (C) Coating certain Roads in the District with Bitumen.

Full particulars may be obtained at the Offices upon application to the Surveyor to the Council.

Tenders, in sealed envelopes, appropriately endorsed, must be delivered, addressed to me as under, not later than 3 p.m. on Tuesday, the 17th March, 1914.

The Council do not bind themselves to accept the lowest or any Tender, and canvassing the Members of the Council, either directly or indirectly, will disqualify.

(By order)

WM. HODSON,

Clerk to the Council.

Council Offices,

Winchester-street, Acton, W

March 2, 1914.

(1,369)

BUCKS COUNTY COUNCIL.

ROAD MATERIALS AND HAULAGE.

Tenders are invited for the Supply and Delivery of best quality Granite or other Hard Stone Spalls, not smaller than 6 in. or larger than 12 in., or close dense Slag, free from ventholes or honeycomb, during the next twelve months, free on rail or wharf at—

Bletchley Station, or Penny Stratford

Canal Wharf	...	...	...	10,000 tons
Beaconsfield Station	...	...	...	4,000 "
Gerrard's Cross Station	...	...	...	3,700 "

Tenders are also invited for unloading and hauling the above for distances up to four miles. All other particulars can be obtained from the undersigned, to whom sealed Tenders are to be forwarded by the morning of March 14th, 1914.

R. J. THOMAS,

County Surveyor.

County Hall,

Aylesbury.

(1,380)

JOHNSTON BROTHERS, 79 MARK LANE, LONDON, E.C.

Johnston's Patent Boilers. Waithman Apparatus. Smart's Patching Boiler.



Johnston's Patent Double Furnace Boiler with Waithman's Tarring Apparatus.

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— LIMITED —

509 BRUNSWICK HOUSE,

WESTMINSTER, S.W.

Telephone: 2188 Victoria. Telegrams: Vermehrico, London.

NANTWICH RURAL DISTRICT COUNCIL. HASLINGTON SEWERAGE AND SEWAGE DISPOSAL WORKS.

The above Council invite Tenders from Builders and Contractors for the Construction of Sewage Disposal Works, comprising detritus, settling, storm-water and stand-by tanks, and filter-beds and humus tanks, together with the laying of about 113 lin. yds. of 12-in. and 274 lin. yds. of 9-in. iron, and 630 lin. yds. of 12-in., 533 lin. yds. of 10-in. and 3,460 lin. yds. of 9-in. stoneware pipe sewers, and the construction of 104 manholes and other appurtenant works.

Plans may be seen, and Specifications, Quantities, and Forms of Tender obtained, at the Office of the Engineer to the Council, Mr. Charles E. Davenport, ASSOC. M. INST. C. E., 152 Hospital-street, Nantwich, on the deposit of Two Guineas, which sum will be returned on receipt of a *bonâ-fide* Tender and the return to the Engineer of all documents received from him.

The Council do not undertake to accept the lowest or any Tender.

Sealed Tenders, endorsed "Haslington Sewerage," must be sent into me not later than four o'clock in the afternoon of Saturday, the 28th day of March, 1914.

H. T. ATKINSON,
Clerk to the Council.

Rural District Council Offices,
Nantwich.

March 3, 1914.

(1,390)

GREAT CROSBY URBAN DISTRICT COUNCIL.

The above Council are prepared to receive Tenders for the Supply of the following Materials during the year ending March 31st, 1915, in such quantities and at such times as may be ordered:—

1. Granite Macadam and Chippings.
2. Limestone Chippings.
3. Tarred Limestone Macadam.
4. Portland Cement.
5. Stoneware Pipes, &c.
6. Disinfectants.
7. Pitch and Tar.
8. Incandescent Mantles and Chimneys.
9. Glass for Street Lamps.
10. Horse Provender.
11. Granite Setts.
12. Extra Cart Hire.
13. Horsing Fire Engine.

Specifications can be obtained from Mr. Joseph A. Wright, Surveyor, Council Offices, Coronation-road, Great Crosby.

Sealed and endorsed Tenders to be delivered to the Council Offices by noon on Monday, March 16th, 1914, addressed to the "Chairman of the Council."

The lowest or any Tender not necessarily accepted.

JOSIAH DEAN,

Clerk to the Council.

February 21, 1914.

(1,359)

UNIVERSAL JOIST STEEL SHEET PILING

**IN ALL WEIGHTS,
HUNDREDS OF TONS IN
STOCK FOR SALE OR HIRE.
THE MOST EFFICIENT
PILING ON THE MARKET.**



**THE
BRITISH STEEL PILING
COMPANY,
Billiter Avenue, London, E.C.**

Telegrams: "PILINGDOM, LONDON." Telephone: AVENUE 5483.

THE WORLD'S BEST
BITUMEN
FOR ROAD WORK



MEXPHALTE FOR GROUTING

A granite road grouted with Mexphalte is superior in economy and durability to tar-macadam. It can be laid by local labour without expert supervision—it will give longer service under heaviest traffic, and provides a dustless, durable, and waterproof surface.

WRITE FOR SAMPLES, PRICES AND PARTICULARS.

**ANGLO-MEXICAN
PETROLEUM PRODUCTS CO., LTD.**
Finsbury Court, Finsbury Pavement, London, E.C.

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

MARCH 13, 1914.

No. 1,156.

Minutes of Proceedings.

Roads for Heavy Traffic: The West Midland District.

In last week's issue we reproduced Mr. H. M. Lawson's paper on "Road Construction and Maintenance," which was read and discussed at the Birmingham meeting of the Institution of Municipal and County Engineers; and a report of the discussion which followed the reading of the paper will be found in the present issue. The paper itself was mainly confined to road crusts and pavements for heavy traffic, and although other matters bearing upon the construction and maintenance of roads and streets were usefully discussed at the meeting, most of the speakers dealt chiefly with this main part of the subject. The practical value of this concentration of mind was enhanced by the fact that the principal speakers in the discussion represented towns and counties all of which lie within the boundaries of a relatively small area—West Bromwich, Birmingham itself, Lichfield, and Cheltenham being the towns represented; and two counties, Worcestershire and Shropshire. The speakers referred therefore to conditions within a moderate range of rainfall and temperature, and the chief subject discussed being that of main roads and streets, the considerable variety of geological conditions is of much less significance than it is when roads of all classes, or secondary and by-roads are being discussed. The following points seem to be specially worthy of attention: Mr. J. S. Pickering has had in Cheltenham the same experience as that of metropolitan borough engineers—namely, that by the use of sectional blocks some of the objections to the use of hardwood paving are removed. Mr. H. E. Stilgoe pointed out that contractors who are responsible for the maintenance of softwood paving like to use cement and sand for the final grouting of the joints, the rest of the jointing being of pitch. Mr. C. F. Gettings cited a case in which a road with motor omnibus traffic had to be coated four times a year. He is advising his Roads Committee that a change should be made, but the bare fact that the state of affairs exists even temporarily is of interest from more than one point of view, and it can hardly be supposed that this water-bound road crust is a good one with suitable foundations. It is to be noted, however, that on a country road leading to Birmingham Mr. Gettings found that from 80 to 120 motor omnibuses passed in a day. Mr. Parsons referred to the ill effects of heavy loads on rubber tyres, and his view as to this was supported by Mr. Lawson. We are inclined to suggest that frequent sweeping of the roads is one of the best means of combating excessive wear by solid rubber tyres, and occasional

heavy watering may be advisable on water-bound roads in dry weather. Mr. Stilgoe's remarks on the width of roads in residential areas should be carefully read; the landowners, he pointed out, gladly accepted the tree-planting provision, coupled with a reduced width of carriageway. As regards patching, it may be noted that Mr. Pickering uses tar-macadam for this purpose, and finds it satisfactory, and Mr. A. T. Davis referred to the same practice as being followed in Shropshire. On general grounds, we have deprecated any considerable acceptance of the principle involved, that of new cloth in an old garment, but we are obliged to admit that under present traffic conditions there are often considerable difficulties in the way of the effective repairing of a road crust with its own or similar materials. For lack of space we can but mention other points which are specially significant—the depth of setts, which Mr. A. D. Greatorex considers should be at least as great as the width; the use of Clee Hill tarred macadam alongside tramway rails in Birmingham; the value of tar-macadam for county roads in Shropshire; and the important principle involved in the payment of extra wages to spreaders and to the men in charge of heaters.

* * *

Steel Frame Buildings.

The operation of the London Building Acts (Amendment) Act, 1909, has had a drastic effect upon the practice in regard to the design of steel frame buildings, and the period which has elapsed since the date of its passage into law has been sufficient to reveal both its good points and limitations. The subject chosen by Mr. W. Cyril Cocking for the paper which he read at the last meeting of the Concrete Institute was therefore very appropriate, and in dealing with "Calculations and Details for Steel Frame Buildings from the Draughtsman's Standpoint" he had much to say that was of great practical value. In the first place he did well to emphasise the desirability of an early agreement with the district surveyor in regard to essential matters as to which that official has to exercise a discretionary authority. The adoption of this course would be beneficial to draughtsman, architect, builder and engineer alike, and would make for smooth working in the erection of any structure to which the provisions of the Act are applicable. Although, as might have been expected, the execution of the Act has not been free from difficulties during the early years of its operation, its ultimate success would appear to be assured by the fact that the modern tendency is to adopt its requirements in the design and construction of the steelwork of buildings which are

not subject to its provisions. This is all to the good, inasmuch as it indicates a tendency towards the standardisation of details. Mr. Cocking dealt at length with eccentric loading, the aim of eccentricity, and the end fixing of pillars, and suggested a conference between the Concrete Institute and the District Surveyors' Association with the object of arriving at a mutually satisfactory practical solution of these problems. Great value would naturally attach to any solution obtained in the manner proposed, and such a conference as suggested would have the further advantage of enabling district surveyors and structural engineers better to understand each other's position and point of view.

As will be seen from the extracts which appear in another column, not the least valuable part of Mr. Cocking's paper was that devoted to expositions of the calculations involved in steel frame building design. Not only did he lay proper stress upon the importance of order and method, but he also showed how a large number of approximations can be made for the purpose of saving labour and time. In conclusion, he urged that all constructional engineers and draughtsmen should support the Act of 1909, and that the institute should do everything in its power to foster a spirit of co-operation between the engineer who has to design and erect steel frame buildings and the district surveyor who is appointed to see that the requirements of the Act are faithfully observed and complied with. Although amendments may be thought desirable in certain quarters, it must be remembered that no concessions can be expected or obtained unless all concerned with the working of the Act combine together to make the very best of it in its present form. As an Act it is, on the whole, both fair and practical, and time has already shown that it has been the means of considerably improving the general design of steelwork from the point of view of good practice, economy, and theoretical design.

* * *

National Health Week.

It is now almost a year ago since the second annual celebration of National Health Week, and the success which was achieved then and on the former occasion was such as to justify abundantly the hopes of the originators of the movement. This year certain changes are to be made. The "week" has been postponed until the latter part of the year (November 15-21), and the responsibility for the central organisation has very appropriately been taken over from the Agenda Club by the Royal Sanitary Institute. There has been issued a preliminary circular in which it is pointed out that notwithstanding all the achievements of sanitary science during the past fifty years much still remains to be done before the health of the people can be regarded as even approximately satisfactory. The improvement of health conditions is fast approaching its limit on existing lines, and no further general advance can be expected until the people themselves have been aroused to a sense of their responsibilities; for the health of a community depends as much on the man himself as on his surroundings, and on personal hygiene and cleanliness as much as on the work of the sanitary authority. A "Health Week" has an important function to perform in addition to the steady continuous work throughout the year. Both are needed. There is at present no driving force behind this question of health. Any cause which depends for its vitality and force upon public opinion must have something definite on which that public opinion may crystallise, some opportunity for focussing attention and rekindling the enthusiasm of its adherents. The splendid work which is being done by health authorities loses much of its effect for want of an adequate response on the part of those for whom it is done.

A most pressing need therefore exists for emphasising the importance of personal attention to hygiene. The immediate purpose of Health Week is to make health during the week the chief topic of public concern. The ultimate objects to be kept in view are to secure the recognition of the fact that disease is a thing which can and should be prevented; to impart sound information as to public and personal hygiene, and to build up a public opinion which will not tolerate a high disease rate or an excessive infant mortality, and which feels as a personal reproach the sight of an ill-nourished or neglected child. These objects are so excellent that we have full confidence in commending National Health Week to our readers in the hope that the movement may have their sympathy and support as opportunity may occur.

* * *

Orders for Foreign Steel.

On more than one occasion recently we have warned our readers against giving orders for steel to foreign firms without having the clearest possible understanding both as to the amount being ordered and the total price to be paid. We are led to return to the subject by reason of the continued frequency of litigation arising out of such orders. An example of the kind of thing that is going on is afforded by the case of the *Stellorite Company of Paris v. The Mythe and Sandgate Gas Company*, a report of which will be found in another column. In this case it will be observed that the circumstances attending the order contained all the characteristics to which our former warnings have been directed. In the first place there was the confusion in the mind of the person giving the order as to the value of the foreign measure in which it was expressed. Next there was the order which had been given by a neighbour, which was held out as a bait. Then there was the delivery of a large quantity of steel and the presentation of an invoice for an amount far in excess of anything required or expected. Finally, upon the order being disputed, there was the offer of a rebate with a view of avoiding litigation. In the course of the proceedings some interesting information regarding the *Stellorite Company* was made public. It transpired that the firm, which has only been in existence for a year, consists of three partners—namely, Mr. Tom Hayman, who has only been a partner since July 24, 1913, having formerly been a traveller; Mr. John Hayman, who attends to the correspondence; and Mr. Weinberg. They do not manufacture their own steel, and at present employ only about fifteen men. The defendants succeeded in the action on the ground that the person who ordered the steel from the company had no authority to do so, but the learned judge said that in this case there was no evidence of trickery. This may have been so in the case under discussion, but when it is remembered that the *Stellorite Company* has become involved in many other cases of a similar character, we feel that we are abundantly justified in reiterating the warning which we have formerly given to our readers. A similar case, with the same company as plaintiffs, stands adjourned at the Faversham County Court, while a further action of the same character (*Le Météore v. Litchfield & Soundy*)—the real plaintiff being Emile Levy—recently occupied the attention of the High Court. Enough has been said to show that the practices referred to are widespread and that it behoves engineers to be on their guard.

* * *

Skidding Vehicles and the "Commercial Motor."

In a recent editorial the *Commercial Motor* criticises a "Minute" on the subject of "skidding vehicles in London streets," which appeared in our issue of February 6th. Unfortunately, our contemporary has beclouded the issue by attributing to us state-

ments which we did not make. A little care in the reading of our article would have shown that we realised that more data must be available before final opinions can be formed as to what cambers are suitable for different kinds of pavement, with a view to the facts regarding skidding. The sentence to which we take exception is: "We are obliged to disagree, and do so very emphatically, in respect to that expert's recent declaration that the skidding and sideslip of motor 'buses are more due to unsuitable wheel and tyre dimensions than to excessive angles of crossfall in street construction." Now the word "tyre" does not occur in our article, nor do we refer even indirectly to tyres, except in so far as the diameter of a tyre is necessarily proportionate to that of the wheel. Next, it is to be observed that, of the two sentences to which the reference may possibly be intended to apply, one was a statement that, *in a particular case*, the opinion that skidding was due to the bad condition of the road surface "cannot be accepted as necessarily correct," and the other is an expression of regret that a specially conspicuous position in a daily paper should have been given to the statements that the shape of our streets is too often unsuited to modern traffic, and that the camber is excessive. The expression "too often" obviously reflects upon the capacity of the borough surveyors, failing any reservation in that direction. Our article was, as it happens, worded with meticulous care, since the significance of the contemporaneous development of vehicles and of certain types of paving is not to be missed by those who carefully study these questions, and there is in it not a phrase nor a word which we would alter now. As regards our reference to the brakes fitted to motor vehicles, our contemporary's suggestion that it was a "casual assertion" does not dispose us to go into technical points, and we think that this suggestion might be withdrawn. We consider, too, that some expression of regret is due to ourselves for the mistakes made in attributing to us statements which we did not make. We believe these mistakes to be due to a misreading of our article, and we rely upon the courtesy of the editor of the *Commercial Motor* to put the matter on a footing which will make possible an amicable discussion of the data and facts relating to this important subject.

The Cardiff Water Supply Dispute.

A matter of considerable importance to municipal water undertakings is engaging at present the attention of the Cardiff Corporation. Cardiff is a city which contains a powerful fellow-corporation to the municipal authority in the Bute estate, whose interests are both financially and locally of a large and far-reaching nature. Some time ago a firm of timber merchants made application to the corporation for a supply of water for a special fire-extinguishing apparatus installed to protect their stock, and steps were taken by the Waterworks Committee to comply with the request. It transpired that in order to connect up with the premises it would become necessary to construct a waterpipe a short distance within the boundary of the Bute estate, and the controllers of this property—who in respect of several matters affecting Cardiff exercise monopolist powers—refused to give permission unless the city council agreed to pay £675 per annum for easement over a much larger area, which is stated to be, however, less than one-fifth of the docks. This the Waterworks Committee regard as an impossible demand, and the corporation have refused to satisfy it on the ground that it is unreasonably excessive. The subject is attracting the attention of a wider constituency than the strictly local one, and not without cause, for it thus appears that owing to the uncontrolled authority of the Bute estate the legitimate development of the municipal water undertaking is

seriously interfered with, while at the same time local industry is subjected to perils from which in ordinary circumstances it would be adequately safeguarded. Meantime, things have reached an *impasse*, though there is just a glimmer of light reflected from counsel's opinion, which the Waterworks Committee have caused to be obtained, and which is said to be favourable to the attitude adopted by the city council. The statutory obligation of the city council to supply water is clear enough, and it is not easy to see why this can or should be overborne by the immoderate demands of any other authority, whatever powers this may claim to exercise.

Municipal Electrical Trading.

Returning to the charge with unabated zeal, the Incorporated Municipal Electrical Association has published the draft Bill which it will introduce into Parliament during the current Session, with a view to obtaining a freer hand for electricity supply authorities in the carrying on of their undertakings. Hitherto the opposition of the electrical contractors has invariably prevailed against the efforts of the municipalities; the Bill has passed the House of Commons, only to meet with shipwreck in the Lords, on the same familiar rock—the trading clause—which enables local authorities to sell, fix, let on hire, maintain and repair all kinds of electrical fittings (including lamps, motors, radiators, cooking apparatus, and so forth), and to execute the necessary wiring. This time, however, an attempt has been made to conciliate the contractors by adding a provision that wiring shall only be done through the agency of a contractor, with other sections intended to prevent undue preference to any one contractor, to guard against price-cutting on the part of the municipality, to ensure that the trading department shall not be run at a loss, and that its doings shall be open to public scrutiny, and so on. It is clear that the association has gone a long way on the path of concession, and we trust that its efforts to settle the question on lines satisfactory to both parties will be rewarded with success. The Bill contains other provisions designed to remove unnecessary restrictions upon municipal enterprise, and to promote the extension of electricity supply, to which we have not space to refer in detail; if adopted by Parliament it should prove highly beneficial to the industry and to the community in general.

London Arterial Roads.

It would appear from the speeches of the two Cabinet Ministers who took part at the Local Government Board offices on Monday in the first of the six district conferences on the question of arterial roads for Greater London that the following points are essential in carrying out any scheme: First, that there must be some agreement between the various authorities concerned; secondly, that town planning schemes must be initiated in the various localities affected; thirdly, that the owners of land must fall in with the views expressed by Mr. Samuel that the construction of roads through or near their estates will improve the value of their land; and, fourthly, that there is no immediate hurry to construct these roads so long as provision is made for their carrying out in the future. With regard to the payment out of Imperial funds of the cost of main roads, it must not be forgotten that the monies of the National Exchequer have to come out of the pockets of the taxpayers, and the provinces may have something to say if immense sums are expended in the directions proposed. However, we congratulate both Mr. Samuel and Mr. Burns on the statesmanlike views they took on this important question, and we trust and believe that good results will follow the several conferences.

Calculations and Details for Steel-Frame Buildings from the Draughtsman's Standpoint.*

By W. CYRIL COCKING, M.C.I.

When it is deemed desirable to take full advantage of the relief afforded by erecting buildings under the 1909 Amendment to the London Building Acts, it is essential that the draughtsman should be given every support at the outset, both in the preparation of the design and calculations upon which the estimates are to be based, and in the preparation of the working drawings and details.

In order to give the draughtsman a fair start it is necessary that certain matters should be agreed upon between the architect or his deputy and the district surveyor before the architect's plans are sent out for competitive tenders from constructional firms.

The matters to be so discussed and agreed are chiefly the following:—

(1) **Dead and Super Loads.**—All firms competing should be provided by the architect with the fullest possible details and particulars of floor construction, roof coverings, ceilings, casings to beams and pillars, partitions, the proportion of masonry in external walls such as heavy cornices and ashlar work and all special loading, such as lift gearing, water tanks, heavy safes, travelling cranes or runways, &c.

(2) **Foundations.**—The maximum pressures allowed upon the soil; the fullest possible information should be given for the design of party-wall foundations; depths and extreme limit of spread for foundations to party-wall pillars.

(3) **Eccentric Loading.** The district surveyor's requirements for the treatment of eccentric loading on pillars.

(4) **Pillar End Fixing.** The district surveyor's decisions as to what shall constitute a fixed or hinged end for the purposes of preparing the pillar calculations.

(5) **Form of Calculations.**—The form in which the district surveyor requires the calculations and detailed drawings to be prepared for submission to him for his approval.

With the above information the engineer should be provided by the architect with a set of the finished $\frac{1}{2}$ -in. scale plans and sections, $\frac{1}{4}$ -in. scale sections through the external walls, mansard roofs, and any other special external and internal decorative features that are required to be preserved.

The adoption of the above suggestions would relieve the draughtsman of much unnecessary labour in altering and revising his calculations and drawings. At the same time the architect would benefit himself and his client by obtaining a cheaper and more satisfactory job. The builder would profit in that he would obtain quicker and more continuous deliveries of his steelwork, and the engineer would benefit because the competition would be keener and fairer.

Other considerations which should be impressed upon architects in general when agreeing to tender are, firstly, that the engineer should be allowed a reasonable time in which to prepare his scheme and tender, and, secondly, that, should he be successful in securing the contract, he should have at least two to four weeks' start in advance of the builder or general contractor in order to prepare his working drawings, and settle the exact position of the pillars, foundations, &c., and the fabrication of the steelwork required for the first deliveries.

The working of the London Building Acts, 1909, Amendment Act has, during the last three years or so, been more or less in what might be termed the experimental stage. Most constructional firms have had their experiences of the Act's working and limitations, and though, as might have been expected, everything may not have been smooth at first, yet I think that ultimate successful working is already assured by the fact that the modern tendency is to adopt the provisions and requirements of the Act to the design and construction of the steelwork for buildings that are not necessarily subject to the requirements of the Act. This is certainly a step in the right direction, and it is to be hoped that this tendency will continue, and the design of all steel structures become more uniform and tend towards the standardisation of details.

The calculations and details required to be made

for the purposes of the construction of a modern steel-frame building is a much more extended process under the 1909 Act than has been required hitherto. It is only of late years that special calculations have been considered necessary for taking into account the presumed effects of eccentric loading on pillars; in fact, these latter calculations would have been considered in the past as being in the highest degree pedantic.

EECENTRIC LOADING.

Let us consider for a moment the question of eccentric loading of pillars. What is the effect of eccentric loading? To my mind this interesting and important question is not so easily answered as one would suppose from a casual consideration.

Take the case of a pillar composed of a 10-in. x 5-in. I at 20 lb. and 2-8-in. x $\frac{3}{4}$ -in. plates. This, considered as possessing one end fixed and the other end hinged, is capable of supporting a central load of 534 tons on a laterally unsupported length of 11 ft., according to the stresses allowed by the Act.

[The author here showed how rapidly the stresses are increased theoretically by adopting the usual formula for eccentricity coefficient, and neglecting two very important conditions of fixture—firstly, the connection of the beam to the pillar, and, secondly, the amount of continuity between two superimposed pillars.]

Firstly, the very presence of the deep beam which the pillar supports, and the necessity of a fairly rigid connection, reduces to a considerable extent the effect of the eccentricity.

Further, the actual stresses induced in the pillar will depend, to a large extent, upon the depth and deflection of the beam, the width and moment of inertia of the pillar, and the rigidity of the connection of the beams to the pillar; also chiefly upon the continuity of the pillar at the level of the beam connections—factors which the before-mentioned formula conspicuously ignores.

As a matter of fact, the formula is not the correct one to use at all; it can only be correctly applied to such examples of structural engineering as a lamp-standard, or the standards such as are used for supporting the electric transmission cables of an electric tramway or railway.

As soon as we make the pillar continuous, or securely fix the ends, the stresses are entirely altered in their distribution, and, in my opinion, the effects of the eccentricity vary from one to one-half those computed by the usual formula according to the amount of continuity and fixture at the ends.

END FIXING OF PILLARS.

Another difficult point regarding which the draughtsman must exercise his knowledge and experience is the question of "end fixing" to pillars. What constitutes a fixed end? What can be termed a hinged end? Also, what relation does a flat end bear to either or both of the above?

These questions are very irritating to the conscientious draughtsman, because no matter with whom he may discuss the question, the end fixing seems to depend not upon ascertained facts from experiments, but chiefly upon personal opinion. Nevertheless, the opinion is generally held that the topmost connection of a pillar in the topmost storey and the lower connection of a pillar in the bottom story shall be considered as hinged ends, though the latter connection or base of the pillar could reasonably be considered as a "flat" end; also, it seems reasonable to assume that the pillars in external walls which only receive two or three way connections, shall be considered as having one end hinged and the other fixed.

The important question remains, When can a pillar be assumed to possess both ends fixed? My personal opinion is, that in a case where a pillar is continuous both above and below the connection at two consecutive floors, and receive at both floor connections or "ends" a four-way connection in which the heavier or deeper beams are connected to the pillar perpendicular to its weaker axis, such a pillar shall be considered as having both ends fixed.

CALCULATIONS.

The calculations for a steel-frame building should

* Extracts from a paper read at the last meeting of the Concrete Institute.

be prepared once and once only, and they should be sufficient in detail for submission to the district surveyor for his approval, also for the complete working drawings to be made therefrom without any addition or alteration. If the structure is one in which there are several floors of similar construction and loading, the calculation forms proposed by the District Surveyors' Association are eminently suitable; but if the structure is somewhat complicated by reason of the various floors being designed for different purposes, it will be sometimes more convenient to propose other forms, according to the requirements of the district surveyor or the custom of the draughtsman.

For beam calculations the dead loads and superloads should be kept separate for the purposes of computing the reactions, if it is desired to take advantage of the rebate allowed on loads on pillars for buildings other than the warehouse class; but unless there are several floors for which the rebate is appreciable, the results are incommensurable to the additional labour entailed.

When a beam is required to support a complex system of loading, a diagram of the loads should be made upon the beam sheet; such diagrams should be drawn to the same scale as the steel-framing plans.

When calculating the reactions due to the loading on a beam, it is advisable that the separate reactions of each item of loading should be calculated and indicated upon the loading diagram separately.

It is not necessary to calculate the loads to more than one place of decimals, but each item of loading should be set down in detail in order that it can be readily verified and checked. The values of the reactions should be calculated to the second place of decimals when the loading is of comparatively small dimensions.

In setting up diagrams of loading, it is important that all beams should be viewed from the same aspect on plan—namely, the bottom right-hand corner—that is, beams shown horizontal on plan should be set out looking from the lower side or bottom of the framing plan, and beams shown perpendicular on plan should be set out as they appear looking from the right-hand side of the plan. This may be thought a minor point, but by adopting a system such as I have just mentioned, a common mistake—that of putting the wrong reaction on the pillar sheet—can be guarded against.

For a beam supporting a complex system of loading the position of the maximum bending moment should be dimensioned from either one of the reaction points, and the calculations for such dimensions should be fully stated on the beam sheet.

The calculation of the maximum bending moment is an important operation, and should be set down in detail on the beam sheet.

When making calculations a number of approximations can be made for the purpose of saving labour and time. The following formulae should be found of some assistance:—

APPROXIMATIONS.

(1) Section modulus for **I** sections as beams. It will be found that if

W_s = weight of **I** section in lb. per foot-run,
 d = depth over flanges of section in inches, approximately $M = \frac{W_s d}{10}$.

(2) The safe load on 1-ft. span for **I** sections as beams, stressed from $7\frac{1}{2}$ to 8 tons per square inch, is, approximately, equal to $\frac{W_s d}{2}$.

(3) The area of a bar of steel in square inches whose weight in lb. per foot-run = W_s , is, approximately, equal to $A_s = \frac{3 W_s}{10}$.

This latter approximation gives an error of 2 per cent.

(4) The safe load in tons for **I** sections as pillars, both ends considered fixed, is, approximately, equal to the weight per foot-run in lb. upon a laterally unsupported length in feet equal to twice the width of flange in inches.

(5) For the stress of $7\frac{1}{2}$ tons per square inch allowed under the Act, the section modulus M is exactly equal to 1.6 times the bending moment in foot-tons, and for beams supporting a uniformly distributed load w tons per foot-run; then $M = 0.2wL^2$, where L is the span of beam in feet.

(6) For determining the approximate total weight of a beam the following formula may be used when the cross-section is unknown but the depth is assumed—

$W_B = \frac{8 BL}{1000}$ or $\frac{WL^2}{1000d}$, where—

W_B = approximate weight of beam in tons,
 B = maximum bending moment in foot-tons,
 d = depth of beam in inches,
 L = span of beam in feet,
 W = total uniform weight or load or equivalent uniformly distributed load in tons.

(7) The weight of a pillar can be approximated from the following formula:—

$W_p = \frac{WL}{C}$, where—

W_p = approximate weight of pillar in tons,
 W = central load, or equivalent central load, on pillar in tons,
 L = laterally unsupported length of pillar in feet,
 C = a constant. 2,500 for both ends fixed, and 2,000 for one end fixed and other hinged.

(8) The weight of a beam casing is, approximately, equal to $W_c = 0.00035bdL$, where—

W_c = approximate weight of beam casing in tons,
 b = breadth of beam casing in inches,
 d = depth of beam casing below ceiling in inches,
 L = span of beam in feet.

(9) The weight of a pillar casing can be calculated by the same formula as for beams, where—

W_c = approximate weight of pillar casing in tons,
 b and d = breadth and depth of pillar casing in inches,
 L = laterally unsupported length of pillar in feet.

(10) For calculating the effects of eccentric loading due to the application of the usual formula, the following approximate factors can be used to considerable advantage, the eccentric loads considered to be acting on the face of web or flange of section in each case:—

For **I** sections, web connection —
 Equivalent central load = $1\frac{1}{2}$ times eccentric load.

For **I** sections, flange connection —
 Equivalent central load = $2\frac{1}{2}$ times eccentric load.

For **I** sections, web connection —
 Equivalent central load = $1\frac{1}{2}$ times eccentric load.

For **I** sections, flange connection —
 Equivalent central load = $2\frac{1}{2}$ times eccentric load.

For **II** sections, where centres of webs of **I** beams is equal to one-half the width of flange plates; web connection —
 Equivalent central load = $2\frac{1}{2}$ times eccentric load.

For **II** sections, where centres of webs of **I** beams is equal to one-half the width of flange plates; flange connection —
 Equivalent central load = $2\frac{1}{2}$ times eccentric load.

PILLAR CALCULATIONS.

The pillar calculations are somewhat involved by reason of the allowances to be made for eccentricity, but if they are clearly tabulated, and certain useful approximations are adopted, the labour can be reduced to a considerable extent.

DEFLECTION.

The question of deflection is not one that need cause us any grave concern, for sec. 22 clause 7, of the Act clearly indicates that the question of deflection can be ignored, except in cases where the ratio of span to depth of beam is greater than 21. When this ratio is exceeded the calculation of the deflection must be made in order to ensure that the maximum deflection shall not exceed $\frac{1}{450}$ th part of the span.

Seeing that the greatest deflection for a beam of uniform section is obtained with a uniformly distributed load, it is quite sufficient for all practical purposes to treat a beam which has to support a complex system of loading as if it were loaded with the equivalent uniformly distributed load, and not to put oneself to an unnecessary amount of labour by delving into the innermost recesses of the calculus to find the exact calculated deflection, especially when one realises that the assumed distribution of the loading seldom actually occurs in practice, and also that certain conditions of end fixing, &c., are not considered.

SHEAR.

The maximum vertical shearing values for webs can be ascertained from the following formula:—

$s = 5.5td$,

where s = maximum vertical shearing value for web in tons,
 t = thickness of web in inches,
 d = total depth of web or **I** beam in inches.

The depth of an unstiffened web must not exceed sixty times the thickness of web. This is a very liberal ratio, and should be reduced somewhat for very thin webs.

The question of rivets acting in double shear is one that is apt sometimes to be overlooked, especially

when designing pillars and beams where web connections are made on both sides of the beam. The bearing values for the rivets through the webs of pillars and beams should always be inquired into, especially when using the lighter sections, such as 10 in. x 5 in. I at 30 lb. and 12 in. x 5 in. I at 32 lb., which have relatively thin webs.

FLOOR JOISTS ENCLOSED IN CONCRETE.

It is generally admitted that steel beams as fillers or floor joists encased in concrete provide a much stronger floor, strength for strength, than if the concrete were omitted. Therefore I think it only reasonable to make some allowance for this additional strength in design. At the same time it is necessary to bear in mind the restrictions as to stress and the proportion of depth to span required by the Act.

RIVET PITCH IN BUILT-UP AND COMPOUND GIRDERS.

The rivet pitch in the flanges of compound girders and plate girders is a very important matter, and should always be checked, especially in cases where the maximum bending moment on the beam occurs more towards one reaction than the other.

In some cases of heavy plate girders I have had to design it has been necessary to give the girder an extended bearing in order to make provision for the minimum number of rivets required to suitably connect the flanges to the webs.

In this country it is not the general practice to vary the pitch of the rivets in the flanges of a girder chiefly owing to practical works considerations; it is also an advantage to maintain the same diameter of rivet throughout the beam for the same reasons.

GRILLAGE BASES AND FOUNDATIONS.

The steel I beams composing a grillage base should be designed to support the maximum load on the pillar, the concrete being used only as a filling and protection.

The depths of the I beams should be relatively deep to minimise the deflection as much as possible, and the thickness of concrete underneath the lowest tier should be from 6 in. to 12 in., and not more. The area of the undersides of the flanges of the lowest tier of grillage joists should be sufficient so as not to put a greater pressure upon the concrete than 12 tons per square foot—that is, the surface area of steel required in square inches is equal to twelve times the load on foundation.

The weight of the concrete base should be taken into account when determining the dimensions of the concrete in order not to exceed the safe pressure allowed upon the soil. The I beams should be checked for shear, and in any case channel stiffeners or other efficient stiffeners should be inserted between the webs of the upper tier of I beams.

The several layers of I beams should be laid direct upon one another in order to transmit the load from the pillar direct to the concrete by the lowest tier. No advantage is gained by interposing a cement grout between the top and second layers, seeing that cement grout is considered as concrete for the purposes of administering the Act.

The maximum bending moment upon the whole of the grillage joists in any one layer is obtained from the following formula:—

$$\frac{W(L - L_1)}{8}$$

where W = the total load upon the grillage,

L = the length of the grillage joists in feet,

L₁ = the overall width of the stanchion base or grillage joists immediately above.

When the stanchion or pillar is being fixed, care should be taken to ensure the several layers of grillage joists bearing evenly upon one another.

In cases where the grillage or base of the pillar is eccentric to the axis of the pillar, the pillar should be considered as supporting an eccentric load, the arm of eccentricity being equal to the distance from the axis of the pillar to the geometric centre of the area of grillage or concrete base.

Provision should be made when the eccentricity is great to ensure that there shall be a sufficient and proper connection of the grillage joists to the base of the pillar in order to take up any tension that may be induced upon the opposite side of the pillar to that of the eccentric base.

It is generally assumed that sec. 22 (12) c of the Act, which states that "the foot of every such pillar shall have a proper base-plate riveted thereto with sufficient gusset-pieces to distribute properly the load on the foundations, and the gusset-plates shall have sufficient rivets to transmit the whole of the load on to the base-

plates," is more particularly to be applied to pillars the bases of which bear directly upon the concrete.

In pillars provided with a grillage foundation, it is considered good practice to provide sufficient rivets to take half the load on the pillar.

It is also considered quite sufficient to provide enough rivets to take half the load on either side of the joint at the spliced connections of a pillar.

MANSARD WORK.

In the design of mansard work and sloping beams provision should be made to take up the whole of the thrust by the steelwork. The feet of the rafters should be efficiently tied back to the internal framework of the building, and at the top the thrust should either be provided for by taking into account the bending moment due to the thrust upon the pillar supporting the rafter or sloping beam, or the steel scheme should be so arranged that the thrust is distributed over a large area of the floor or roof.

Any beam receiving the ends of rafters should be checked for the lateral bending moment imposed by the thrust in order that the combined stresses should not exceed the maximum stresses allowed.

WIND PRESSURE.

One cannot do better than recommend the suggestions made by the District Surveyors' Association for the treatment of wind pressure upon the complete steel frame. As a rule the cases are extremely rare in this country in which the stresses induced by horizontal wind pressure assume any magnitude. Wind pressure should always be considered, however, in the case of gable-end framing to tall buildings, such as factory buildings and workshops, especially when they are constructed of light materials such as corrugated sheeting or light concrete partitions.

SEWAGE DISPOSAL AT WORCESTER.

COMPLETION OF NEW WORKS.

The completion is reported by the *Times* of the works for the bacterial treatment of Worcester's sewage. The scheme, the author of which is Mr. Caink, the city engineer, has cost, in capital expenditure, about £100,000; the repayment of loan and interest, covering a period of thirty years, will exceed £6,000 yearly, and the running expenses will amount to £2,000 a year, thus involving a rate of at least 10d. in the £.

The sewage from the city proper is conveyed under the river Severn by means of a tunnel, at a point where it used to be turned into the stream; that from the suburbs on the western bank, which used to enter the river close to Worcester Bridge, is now diverted through meadows to a junction with the deep-level sewer connected with the tunnel, and thus the whole of the city sewage is conveyed to the works at Bromwich-Jane. After passing through a screening chamber it goes to the detritus well, 84 ft. deep, where the heavy inorganic solids fall by gravitation to the mouth of sludge lifts, devised by Mr. Caink, which bring them to the surface for disposal. It is then passed to the primary pumps, one delivering 2,000,000 gallons daily and the other 4,000,000 gallons. There is also a pump which discharges 6,000,000 gallons a day, and which is used for lifting storm water when the quantity flowing along the sewers exceeds the capacity of the other pumps.

The primary pumps discharge the sewage into a series of chambers containing gravel-disintegrating screens, and thence it is returned to the engine-house, where it is raised by secondary pumps into the distributing tower. From the tower it is sent into a series of six rotating sprinklers of the Candy-Caink type, and distributed over the primary bacterial filters. The latter are six in number, circular in form, 200 ft. in diameter, and 8 ft. deep (of fine gravel). The beds are underdrained by drain pipes and Stiff's tiles laid radially from the centres to effluent channels which encircle the beds near their circumference. Each filter is surrounded by a number of vertical air shafts, which communicate with the effluent channel. From the channel the air passes along the underdrain and upwards, taking the reverse course to that followed by the liquid. The sprinklers run upon rails carried upon arched-concrete tracks, and are said to be the largest successful self-propelled sprinklers in the world. After passing through the beds, the liquid is taken to a series of sand filters, 3 ft. deep, on a layer of gravel 1 ft. deep, and is finally discharged into the effluent channel in cascades, which assist, it is believed, in oxygenating it before it flows into the river. All the tanks and filters are in duplicate.

Institution of Municipal and County Engineers.

THE BIRMINGHAM MEETING: DISCUSSION OF MR. LAWSON'S PAPER.

The reading by Mr. H. M. Lawson, deputy road surveyor, Birmingham, of the paper on road construction and maintenance produced an excellent discussion at the West Midland District meeting held on Thursday of last week. The paper, it will be recalled, was reproduced in last week's issue. The meeting was presided over by Mr. A. T. Davis, county surveyor of Shropshire, and there were present Messrs. A. D. Greatorex (West Bromwich), J. S. Pickering (Cheltenham), H. E. Stilgoe (Birmingham), W. G. Ballard (Birmingham), W. B. Chancellor (Lichfield), H. J. Coleby (Atherstone), F. C. Cook (Nuneaton), hon. district secretary, S. Douglas (Kenilworth), C. F. Gettings (Worcestershire), J. L. Harpur (Brierley Hill), W. H. Jukes (Tipton), G. W. Lacey (Oswestry), W. G. Lane (Ludlow), R. C. Moon (Nuneaton), A. S. Parsons (Birmingham), H. Richardson (Birmingham) and G. H. Stevenson (Shifnal), members; R. Fletcher (Worcestershire), S. J. Goodacre (Nuneaton), W. J. Goode (Wellington), A. R. Gray (Birmingham), H. M. Lawson (Birmingham), W. N. Thomas (Birmingham), H. G. Torney (Birmingham) and E. W. Turner (Birmingham), associate-members; J. T. Fitch (Birmingham) and T. S. Griffin (Wolverhampton), students.

Mr. Cook announced a letter of apology from Mr. J. Moncur, county surveyor of Staffordshire.

The CHAIRMAN, with a view of enhancing the value of the paper before the meeting, asked Mr. Lawson if he could give the cost of set paving and of hard and soft wood paving.

Mr. LAWSON explained that his reason for not mentioning the cost of the pavements named was that they varied so much in different parts of the country. His experience with this class of paving was in the South of England, and the figures might be misleading. The price in Birmingham was: Hardwood, 18s. to 20s. per square yard; softwood, 14s. to 14s. 6d.

Mr. J. S. PICKERING (Cheltenham), who proposed a vote of thanks to Mr. Lawson for his paper, remarked that it covered a very wide surface, and it was impossible to deal exhaustively with it in the way of discussion. There were a number of points on which probably many of them might not be in agreement with the author, but in the main they would agree that if one practised what had been suggested in the paper, one would have a very high class of road construction generally. The author emphasised the importance of a solid and well-drained foundation. They all recognised the desirability of a solid foundation, and of draining the foundation, but he would like to ask Mr. Lawson how he would suggest the foundation should be drained. His own opinion was that the only way to drain the foundation was to have an outlet for the drainage, and that was generally impracticable, and though Mr. Lawson spoke of the importance of the matter, he did not give them any method of effecting the drainage. He noticed that some roads in the city of Birmingham were carried out by contractors, and were subsequently taken over by the city authorities. That seemed to him a very undesirable practice. He did not know under what particular circumstances that might occur. In most towns the roads were not made up until the buildings had been erected, or substantially so, in a street, and the local authority then carried out the work. Then, dealing with the actual construction of a water-bound road, he noticed that the alternative was given for the bottom layer of either clean clinker ashes or broken stone 6 in. in depth. He would like to ask why the alternative was given. If the clinker was the best material, that should be named, while if the broken stone was preferable, that should be specified. If broken stone was used in the bottom layer, was it not better to have one foundation solidly bedded rather than two layers as suggested by the author? Then again, Mr. Lawson told them how he differentiated between what he termed first-class and second-class roads. He noticed there was a little difference in the method of construction, and one would like to know when a road was called first class and when second class. After a water-bound road was completed the chippings spread over it, and the road rolled and consolidated, a further layer of $\frac{1}{2}$ -in. chippings was used. It was not stated whether that further layer of chippings was rolled. Perhaps Mr. Lawson would

tell them what was the object of these $\frac{1}{2}$ -in. chippings, because the interstices could be filled and the road properly made with one coat. He did not understand the meaning of the sentence "unless one has been careful in choosing a sufficiently tough stone (and in some cases the cost prohibits this), the stone is broken and crumbled in the process of consolidation by steam rolling; to obviate this, a little binding material in minimum quantity is spread over the metal and slightly watered." If it meant that a tough stone was necessary, but if it was costly something else must be used, and to obviate the disadvantage a softer material must be spread over it. The clause seemed to him rather difficult to understand. It occurred to him that if a particular stone was specified and was necessary it should be used whatever the cost. Then the author emphasised the importance of spreading the stone evenly. He would like to ask how he got that carried out if the work was done by contractors. He also emphasised the importance of repairing the roads immediately potholes occurred. He would like to ask how he carried out those repairs in a large city like Birmingham. It must be a very difficult matter to attend to every pothole when it appeared. The author had not suggested the use of tar-macadam for this purpose for patching, but he believed it was very frequently used with success. In Cheltenham he kept a light roller for patching, as he appreciated the economy of doing so. In a large city like Birmingham, where the statutory companies had the power to break open the streets, were they required in each case to put in a foundation if the road before opening did not happen to have one? The whole thing hung upon the meaning of the word "reinstatement." It meant, to his mind, putting the road in an equally sound position, and not merely putting back the material that was there. With regard to the damage by heavy traction traffic, the county surveyors were not only suggesting the advisability of weighbridges, but in many counties the weighbridges had been actually erected, and they had been the means of checking the excessive weights put upon these vehicles. Then was the law as to the speed of heavy tractors—which, he thought, was 2 miles per hour—carried out? It was in Cheltenham, and it had had very beneficial results. If it was carried out everywhere traction engines would cease to exist, and their disappearance would be for the benefit of the community at large. He rather disagreed with the suggestion that there should be a bedding of sand under Jarrath wood blocks. He thought it was better to lay them on the concrete bed. He also took exception to the suggestion that there could be no advantage in the use of sectional blocks. In his opinion, the sectional block was a great advance on anything before in the shape of hardwood paving. The reason that hardwood paving had not been so successful had been the wearing of arrises causing corrugation. That in sectional blocks was, to a large extent, avoided. He had lately put down an area where the contractors had undertaken to maintain the blocks for a period of fifteen years, not only against wear, but against any appearance of corrugation; so that they had a good opinion of the blocks. He did not understand the author's reference to the thickness of these sectional blocks and the bed of concrete. It was not necessary to put a thicker layer of concrete under the sectional block than under a block of 4 in. or 5 in. The suggestion as to the weepholes was quite new, and he had some doubt as to the efficacy of this to overcome flooding. The gullies were at too long distances apart, and he did not see how the two small holes could have the effect of draining a wood pavement. In his concluding sentence the author suggested that there was some doubt as to whether mechanically propelled vehicles should be used by road authorities. As the law stood at present, the roads must be made to carry the traffic upon them, and there was no reason why local authorities should not take advantage of any economical means of transit.

Mr. A. D. GREATOREX (West Bromwich), who seconded, said he would have liked to see in the paper some references to tar-macadam, and the experiences Birmingham had gained in that particular class of road making. He believed tar-macadam had been tried in Birmingham for several years. It would add to the interest of the paper if something could be

given of their experiences, as in that district so much had been done with tar-macadam.

Mr. C. F. GERRINGS (Worcestershire) observed that Birmingham had a system of paying a bonus to stone spreaders, and he would be glad if the author would explain the system adopted. He had endeavoured to carry out a similar system in county work, but owing to various conditions, which were rather difficult to control, such as long haulage, delays in railway transit, and so forth, he had abandoned it. In a large town like Birmingham with central depots, no doubt it would be much easier to adopt such a system than in a county with wider areas. With regard to motor bus traffic, he noticed the author said that the cost of maintenance had been trebled in some instances. Unfortunately, Worcestershire had had even worse experience, as it had been found necessary to coat a water-bound road four times in one year, whereas prior to the motor bus traffic it used to be coated once a year. Of course, this could only be accepted as a very expensive form of construction, and he had advised his committee to abandon it in favour of bituminous-bound material. The author referred to a road that had been strengthened and a wearing surface consisting of a carpet of asphalt applied. He would be glad if the author would give them some particulars as to the strength of the road before it was treated, stating what amount of strengthening was carried out, the thickness of surface material applied, together with cost, also some idea of the amount of traffic. Mr. Grestorex had referred to tar-macadam. It would be interesting if the author would give some information with regard to his experience of this class of material in the city of Birmingham. One of the Worcestershire trunk roads, which joined Birmingham on the north side, had a fairly heavy motor bus traffic, varying from 80 to 130 motor buses per day. The construction of this road consisted of water-bound granite. The only foundation was some 8 in. to 9 in. of gravel laying on marl. Certain companies had offered to put an asphalt or bituminous-bound surface on the present surface, at a cost of about £6,000 per mile. He was very doubtful as to whether this material would stand the traffic without a proper foundation being applied, such as was being adopted in an extensive Road Board scheme now being carried out in Worcestershire. He would appreciate any information that the author could give them of his experience in similar methods of construction.

Mr. H. E. STILGOE (Birmingham) said Mr. Lawson had had considerable practical experience with one of the largest firms of road contractors in this country, John Mowlem & Co., at Chelsea, where, under Mr. Higgins, he had some first rate practical experience. He mentioned this because he was certain that the various methods which Mr. Lawson had described in his paper were well worthy of consideration and respect. A great many of the author's opinions might vary from those of others among them. It was a good thing they had these opinions expressed, because they were able to see how far their own work might vary or be at fault. One or two of those opinions he ventured to say were bold ones, but they were very excellent. In the paper was given the standard sections of macadam streets. He ought to explain that in Birmingham, according to their by-laws for the laying out of new streets, they were able to demand that a street should be laid out to 50 ft. in width between the forecourts, and they had another by-law which allowed them under certain conditions to reduce that width, the particular alteration being that a specified width should be allowed between the houses. Acting upon that, they had recently added to the three cross sections shown in the paper, and in the case of a 42-ft. street they had reduced the macadam from a width of 26 ft. to 18 ft. This was a very important point, because, but for hard-and-fast by-laws, it was quite unnecessary to lay out streets all of one width. It meant a larger area of macadam to be maintained, probably where it was not wanted, and if they got arterial roads laid out with a sufficient width of macadam, they could reduce the macadam on what he might call the estate roads, which served only the confined area in which they happened to be. They had not reduced the width of their streets between the forecourts, but merely the macadam, throwing the extra width into the footways. These footways were paved only a portion of their width, the remainder being in gravel. They had specified that on people laying out streets to this reduced specification they should plant trees, and set back the

buildings 15 ft. from the road. They could have these conditions or leave them. The landowners had very gladly accepted them, and had come to them with their plans, and laid out the arterial streets where required, and filled in the side roads where they wanted them, so that the side roads would not carry heavy traffic. It was a step in the right direction. It was really proceeding on town planning lines without a town planning scheme. He knew all districts had not a by-law which they could alter. With regard to the cost of tar-spraying, he would point out that the reason the work had been carried out so cheaply in Birmingham—considerably under a penny per square yard—was this: They had large storage tanks at several of their depots, and these tanks adjoined the canal. In some cases they held 14,000 gallons of tar, and they pumped the tar straight out of the boats into the tanks, which were kept heated with steam coils from the refuse destructor. Having the distribution tanks placed in the best positions for serving the districts they were able to do the work very cheaply. Mr. Lawson mentioned that the Plascom was mixed with one-third proportion of Leighton Buzzard sand. They found they were able to reduce the cost of the work very considerably by doing this without weakening the material itself. Under the heading of sett paving, Mr. Lawson mentioned a method of laying the setts on the concrete before it became thoroughly hard. This was in contradistinction to the usual practice of allowing the concrete to be thoroughly hard and finished off to a fairly true surface, and then an ordinary sand bed laid thereon to receive the setts. Mr. Lawson mentioned the principle by which the cement was mixed with the bed of sand, and it was damped, and the setts were put down while the concrete was damp, the whole thing coming together as a compact mass. If there was any difficulty in the method mentioned by Mr. Lawson, it was that one might not get quite so regular a surface. He did not say it was so. He thought the system was well worth trying, and let people judge the result. No traffic should be allowed over the pavement for ten days. They tried as far as they could to keep it off twenty-one days, and if the traffic was allowed to go on sooner it was only under special circumstances, and a heavy coating of sand was put on. Pitch-grouting had certain advantages. Undoubtedly it did enable a road to be opened to traffic much more quickly than with concrete or sand, but he did not think it made so good a job. He did not agree with Mr. Lawson that mud was less likely to collect on a pitch-grouted road. If the setts were grouted in properly it made one mass with the stone. Mr. Lawson emphasised the necessity of having the stone and racking thoroughly dry before the pitch grout was poured in. That was absolutely necessary, otherwise the grouting did not adhere. Mr. Lawson mentioned a very interesting circumstance in which the grout split the setts when they were grouted up at a time when the setts were damp. Mr. Lawson also mentioned that in London specially dressed Grey Royal setts had been laid on steep gradients with much success. He observed that the depth of the setts was 1 in. less than the width. He thought as a general principle that the depth of a sett should not be less than its width, and if deeper the better. For that reason they preferred the 5-in. by 4-in. setts. Mr. Lawson had raised another very interesting point—viz., that of laying Jarrah or Karri wood with a close joint, and of bedding this class of paving on sand. He did not suppose they would ever quite agree on the best method of laying these hardwood blocks, for the simple reason that the blocks themselves were very treacherous. Some of the planks were properly seasoned and some were not, and when they were cut up into blocks one got unseasoned blocks among the others, and expansion and contraction took place, and one was often inclined to put the demerit of this to the method of laying. With reference to the grouting of the softwood blocks, Mr. Lawson mentioned that in some cases the joints were filled to the top with pitch and oil, and in others the final grouting was a mixture of 3 to 1 of sand and cement. This was another point which was always open to doubt. They found that their contractors with a maintenance contract for softwood paving preferred to use a cement and sand grout for the final grouting, and they certainly did not do that for any saving of the use of pitch, because they had to undertake twenty years' maintenance. They must know that their own pocket and the job did not suffer by reason of the use of cement and sand. The question

of weepholes drilled into both ends of the gully was a most important matter. He was bound to say that Mr. Lawson drew his attention to the advisability of doing this, and they had followed his advice in drilling holes in the sides of the cast-iron gullies where they had laid softwood paving. He had had a wide strip round the gullies cut off, and had discovered that the holes were having the desired effect. One did find that, however carefully laid, the water did get down, and unless it could escape there was bound to be an upheaval. Another useful thing was the emptying of the gullies by an exhauster. That was a great saving. Mr. Gettings had raised the question of laying tar-macadam. The road he had mentioned—the Hagley-road—had no foundation. He might say at once it was no use putting tar-macadam or anything else on that road until it had been reconstructed. It was an absolute waste of time. He had experience with the road running parallel to that. It was laid with tar-macadam some six years ago, and in a few months it was all cut to pieces. The tonnage was about the same on the road which failed as it was on the Hagley-road. He had a census taken, and it came out at 187 tons per yard width of carriageway per day of sixteen hours. He obtained the information for the Road Board, and that was the figure. In one instance where the Worcestershire County Council laid tar-macadam on the Bristol-road, now in the city, that was in very good condition until the motor buses began to use the road. Now it was pounded to pieces. It was laid in this way—the top surface was removed, but no foundation was put in. They had two other roads which carried heavy motor bus traffic, and the roads looked as good to-day as if no traffic had been over them. Those had been in six years. The tar-macadam was laid 4½ in. thick on a thoroughly good foundation.

Mr. A. S. PARSONS (Birmingham), speaking with reference to ruts forming in the macadam adjoining a tramway track, mentioned that in an instance with which he was connected they got over the difficulty by laying an 18-in. coat of tarred Clee Hill macadam, which stood for eighteen months. A water-bound macadam would not have stood for that time. With reference to the gross loads of motor vehicles, he had no doubt that the registered axle weight was frequently exceeded by overloading. He did not consider the exception in favour of rubber tyres was justified. The majority of the damage done to roads in Birmingham was caused by rubber-tyred vehicles. They had not many steel-tyred vehicles. It seemed to him the Heavy Motor Car Order required some amendment in order to deal with heavy loads on rubber-tyred vehicles. As to weighbridges, that was rather a difficulty, because under the Heavy Motor Order they could not compel a man to take his motor to be weighed if the weighbridge was more than half a mile away. They could understand a wily driver giving an inspector a long chase and keeping half a mile away from a weighbridge. He did not think Mr. Lawson had arrived at the right solution of the failure of the Grey Royal setts. He thought the fine dressing and the shape of the dressing had contributed to that fault.

Mr. H. RICHARDSON (Birmingham) remarked that there was a Scriptural reference to the person who touched pitch, and from the roadmaker's point of view they knew that the man who touched pitch, asphalt, bitumen, or any of these substances placed himself in great difficulties, because he was in the hands of the man who had to do the work. The solution of the dust problem on the country roads would be the use of pitch or tar in some form or another, but it must be thoroughly understood before they started making roads with these materials that they were entirely in the hands of the workmen. They must have the best labour that could be obtained, and have men who would do the work conscientiously and carefully. Then good results would be obtained.

Mr. W. B. CHANCELLOR (Lichfield) said they were rather interested in ascertaining what to do with the road which was not blest with a foundation. Were they intending to reconstruct those roads and put in proper foundations. With regard to tar, they were doing the work very cheaply. He presumed it was crude and not distilled tar. He would like to ask whether it was the practice to grit the road after tar-spraying. He believed a certain quantity of Rocmae was laid in Birmingham some time ago.

Could Mr. Lawson give them any information about that? Then with regard to the tar-macadam, he would like to know whether it was granite or limestone. He was rather surprised to hear Mr. Stilgoe say he had roads with a carriageway of 18 ft. He understood that it was merely intended to have that width of carriageway on side streets, but he did not know whether motor buses could pass down those streets to main thoroughfares. If so, they would have difficulty in passing. He had a road with a carriageway of 18 ft. 6 in., and it was not wide enough for two motor buses to pass, and they had an application to widen that road.

Mr. W. N. THOMAS (Birmingham) asked whether limestone or furnace slag had been used in any of the residential streets.

The CHAIRMAN (Mr. A. T. Davis) said they were all interested in the point raised by Mr. Pickering in reference to the reinstatement of roads. Now that roads were broken up by properly constituted authorities, the question troubled most of them. The point was arising constantly in Shropshire, where they tried to induce the contractor in restoring roads which were broken up for sewerage purposes to use tarred macadam for the surface coat. The contractor replied that the road which he had broken up was not a tar-macadam road, and his duty was only to restore the road in the same manner and material as he found it. The county authorities, in repairing roads which were broken up by their own workmen, and in repairing potholes, were in the habit of using tar-macadam. They did that because in these days of rubber-tyred wheels broken stone put down in a pothole was very destructive to the tyres. When a sewerage contractor opened the road for a space of 2 ft. or 3 ft. he filled it up with ordinary broken stones. That was a very unkind thing to do, because while the motorist could avoid these patches in the daytime, he could not see them at night. It was doubtful whether they had the power to compel them to put in tar-macadam unless it was a tar-macadam road. In the country he had found that tar-macadam was a great boon. Every day he was more inclined to bless it. They were able, by the use of tar-macadam, to keep their roads fairly smooth. Without tar-macadam it would be almost impossible to do that without a patching roller to go about the county and be used on every bit of material put down. Such was the effect of fast motor traffic that if they had a pothole in a water-bound macadam road, and they filled it up and rolled it, the place was soon broken up again. Nothing but tar-bound material was effective. With regard to tar-spraying, it occurred to him that the price given in the paper was very low. Mr. Stilgoe had explained that, but he would like to ask whether the price of less than ½d. per square yard included gritting. He had seen some prices given of tar-spraying at less than ½d. a yard, which were ridiculous. It was very misleading. If a man gave the cost of the actual spraying without the cost of brushing and gritting, which were so necessary, they were unable to make proper comparisons. When a price of ½d. per square yard was given, and they were paying perhaps three times as much, they felt they were not getting the best value for their money. He found great difficulty in getting the tar-painting done under 1½d. per yard. He hoped this year he might be able to reduce it. He had got a lower price for tar, and it might probably come out at 1¼d. per square yard. With reference to Mr. Chancellor's remarks, an 18-ft. road ought to be capable of taking three lines of traffic, and it should take two comfortably.

The vote of thanks was passed unanimously.

Mr. LAWSON, in reply, said, with reference to Mr. Pickering's remarks about a solid and well-drained foundation, they found in Birmingham, owing to the clay subsoil, that the only way in which they could get a properly drained foundation was by reconstruction with a porous pitching. The reason why they preferred broken stone was that in the district they had large gravel pits. In many cases the gravel was quite good, and the only thing they stipulated was that it should be broken. As to the even spreading of the stone with work done by contractors, these were really private street works. The only hold they had over the contractors was this—that if they did not make the road as they required, it had to be remade before the city took it over.

Mr. PICKERING: You put in a foundation if you do not find one there?

Mr. LAWSON: It goes back as before.

Mr. GREATorex: Surely you put the foundation in for your own benefit?

Mr. LAWSON: We do it in some cases, but we cannot charge that.

Mr. LAWSON, continuing, said he could not agree with Mr. Pickering as to Jarrah wood sectional blocks. He could understand these sectional blocks being put down where they had the concrete bed laid, but how could they justify the laying of 9 in. of concrete for these 3-in. blocks? He found the weepholes a god-send. With reference to tar-macadam, before coming to Birmingham he laid about $\frac{3}{4}$ mile of various grading—2½-in., 1½-in. and ¾-in. on the top—and for some unknown reason he understood it was in very bad condition. He came to the conclusion, perhaps hastily, that for heavy traffic it was not any good.

Mr. GREATORIX remarked that he could show him one or two good roads.

Mr. LAWSON explained that, with reference to the bonus for spreaders, if a man was spreading every day for a week he got 2s. extra, and if only for a day 1d. With reference to Mr. Gettings' remarks as to the cost of roads on which motor buses run, they had the cost got out for all their motor-bus roads in the city, and they found it exceedingly heavy. In the road he had taken in his paper the extra cost was the least of all. His chief reason for laying the setts on slightly damped cement and sand was that in London and other places where there was exceptionally heavy traffic setts had been known to be broken in half, and his method was intended to prevent that. The reason the sett was broken was that they got two hard substances together. In St. Pancras they had a number of setts broken, and he believed that if this system was adopted it would be saved. He was surprised that his chief said there was not more mud on a cement road than on a pitch-grouted road. He was glad to hear from Mr. Parsons about the paving by the side of the tramway track. He agreed with Mr. Parsons about the damage to the roads by rubber tyres. The proportion of rubber tyres to steel tyres was very great, and it was the rubber tyres which did the largest amount of damage. He was afraid he could not agree with him as to the cause of failure of the setts. It was big flakes or shales which came off these setts. He was convinced there was no other reason for it but that mentioned in his paper. He had that particular piece of paving inspected, and about 100 yds. grouted in with cement had not been touched, and there was no sign of any of the flags or corners going. He could understand where these setts were laid, they were, to all intents and purposes, laid to square joints, but, owing to the manner in which they were dressed, they could not get them square dressed throughout. It would pay engineers to specify that all setts were properly squared so that when laid they were touching both at bottom and top. He quite agreed with Mr. Richardson that the man at the pitch-boiler had great responsibility. They always paid the man who boiled the pitch 1½d. or 2d. per hour more than the other men. It was remarkable how an experienced man could tell by the feel of the pitch when it was ready for pouring. With reference to Mr. Chancellor's question as to whether motor buses could run on streets of 18 ft. 6 in., in Birmingham they would be able to stop motor buses running because the city was the licensing authority, and would not allow buses to run along a street of that width. As to tar-spraying, the tar was not crude nor was it refined, but he understood all the heavy oils and water were removed. They had exceptionally good tar all last year. The price varied, and it was up at times to about 55s. per ton. They had no tar-grouted roads, though he had laid a good bit of ordinary macadam and sprayed it with tar, and he must say it had gone together exceptionally well. The cost of tar-spraying included sweeping and grouting and tar, also the cost of the tractor for pulling the machine. The cost was actually 92d. per square yard. With their machine they could easily do 5,000 or 6,000 sq. yds. per hour, and they could regulate the spray from 18 in. to 7 ft. 6 in., and also regulate the spray.

It was stated that a district meeting would be held at Birmingham on Saturday, May 23rd, when Mr. A. S. Parsons will read a paper on bridge construction.

Oilcans.—Messrs. Joseph Kaye & Sons, Limited, Leeds, have just received further orders from the British Navy for 4,468 of their patent seamless serrated oilcans, fitted with the firm's patent seamless spouts, making a total of 60,048 of this particular pattern alone, to be distributed next month to the different dockyards.

WATER SUPPLY AND SEWERAGE IN JOHANNESBURG.

The various sources from which the water supply of Johannesburg is drawn are at present as follow:—

(1) About three-fifths of the daily supply is from deep wells in the dolomite at Zuurbekom, 15 miles west of Johannesburg. This water is of exceptional purity.

(2) About 250,000 gallons altogether is obtained from—(a) Two boreholes in the Lower Witwatersrand beds in Ellis Park; (b) Two boreholes in hard shale in Staib-street, Doornfontein; (c) Two wells sunk in weathered slates through a track of alluvium in Braamfontein, east of Auckland Park.

(3) The remainder is from Zwaartkopjes (Klip River Valley), from wells in dolomite, with some admixture of surface water. This water has for the past six years been treated with chlorinated lime, in the proportion of 13 lb. (with guaranteed minimum of 30 per cent available chlorine) to 1,000,000 gallons, or about 3.9 parts chlorine per 1,000,000. The result has been satisfactory, and no complaints have been received.

The length of mains within the municipal area is now 345.07 miles, no less than 7.59 miles having been added during 1912-13, while during the same period 856,101,400 gallons of water were supplied to consumers. These figures show an increase over any former year, remarks Dr. Charles Porter, the medical officer of health to the city, in his last issued report. The draw-off from the Yeoville service reservoir has been very varied, and at times, when only a few inches have been left, has caused considerable anxiety. The Water Board has recently somewhat augmented its local sources of supply, and an important scheme is now being promoted for pumping water from the Vaal, between Vereeniging and Parys.

SEWERAGE AND SEWAGE DISPOSAL.

The municipal area of Johannesburg has, roughly, the figure of a circle, whose diameter is 10 miles, and its physical features are such as nearly to divide it into four equal quadrants, making four main drainage systems of nearly 20 square miles each. The south-west quadrant is an important one, because it contains, in its upper reaches, the most densely populated areas of Johannesburg, consisting of a large section of the town proper and the townships of Braamfontein, Marshalls, Ferreira's, Fordsburg, Newtown, &c. These areas are completely reticulated with underground storm-water conduits.

Main drainage work was continued throughout the year covered by the last report of the town engineer, Mr. G. S. Burt Andrews, M.INST.C.E., M.I.MECH.E., the total area sewered and drained during that period being, approximately, 172 acres.

The length of sewers and storm-water drains in use at the end of the year under review was 80 miles and 48 miles respectively. Owing to the torrential seasonal rains the separate system has been adopted.

The sewage is now screened, treated in a detritus tank and in continuous sedimentation tanks, and subsequently irrigated upon land laid out in such a manner that a considerable interval of rest usually elapses between each period of irrigation of any one particular area. The length of carriers is now 34 miles, and the maximum irrigable area is 790 acres. The average daily flow of sewage was about 1,500,000 gallons. Sludge disposal is by burial in suitable trenches.

Royal Sanitary Institute.—The annual dinner of this body will be held on Wednesday, May 13th, at the Langham Hotel.

New Welsh Trunk Road.—Representatives of the Denbigh and Carnarvon County Councils, the Colwyn Bay and Llandudno Urban Councils, and the Conway Rural Council met last week to arrange for the construction of the new trunk road between Llandudno and Colwyn Bay, towards which the Road Board will contribute £6,000, and the several authorities the balance. The committee, which was constituted from the meeting, instructed Mr. William Jones, engineer to the Colwyn Bay Urban District Council, and Mr. W. T. Ward, deputy-engineer to the Llandudno Council, to prepare plans and specifications, which will be submitted to the next meeting of the committee with a view to tenders being advertised for as soon as possible.

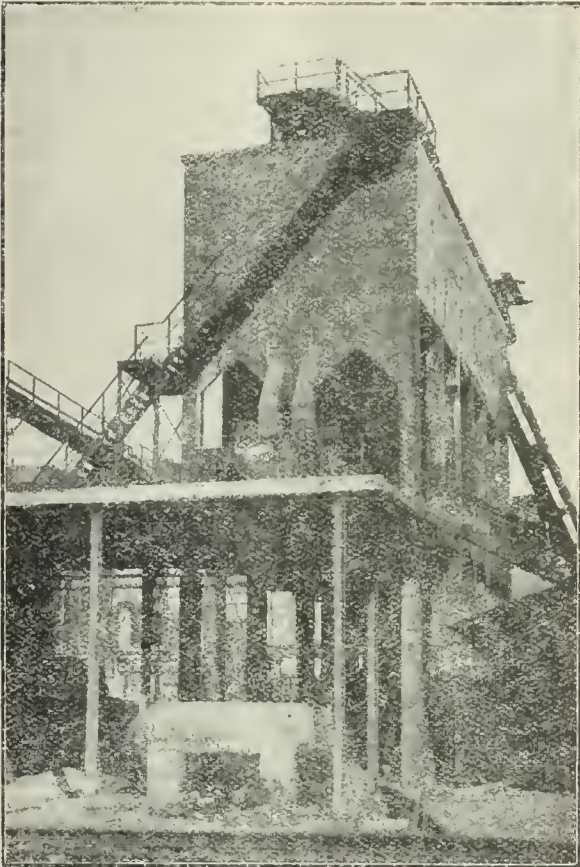
STORAGE OF COAL.

THE APPLICATION OF REINFORCED CONCRETE.

At a meeting of the Association of Engineers-in-Charge, held on Wednesday evening at the St. Bride's Institute, London, E.C., Mr. Henry Adams, M.A.S.T.C.E., vice-president of the Concrete Institute, read a paper dealing with some applications of reinforced concrete to structures intended for the storage of coal.

Coal storage, Mr. Adams observed, was chiefly required by the merchant who sold to the dealers and to private consumers, and by the large corporations for their own use in the production of light and power. The coal hoppers used by the merchants were built almost entirely of timber on a brick or iron column foundation, while those used by the corporations were mostly of brick.

There was always a risk of spontaneous combustion where a large quantity of coal was stored, but although the author had known of one or two cases, there was not much danger where it was kept under cover. In the various seaborne coal depots, there was always



REINFORCED-CONCRETE COAL BUNKERS AT HAMMERSMITH.

(Metropolitan Water Board.)

sufficient movement going on by coal going out and other coal coming in to minimise the risk. Spontaneous combustion of large collections of coal was more likely to happen when the cargo had been standing in trucks exposed for some time to rainfall, so that the coal was more or less damp throughout.

Proceeding to discuss the question of the weathering of coal, Mr. Adams said: "It has been established beyond doubt that coal exposed to the weather deteriorates, and loses some of its calorific value. The author has seen analyses which prove this, but cannot at the moment lay his hands upon them. The Admiralty made some experiments upon storing coal under water, and it was alleged at the time that it kept better than when exposed to the air; but possibly that result was desired rather than proved. It is often necessary to store coal for some considerable period in order to take advantage of cheap markets, and to avoid stoppages of work due to strikes in the coal trade. Under these circumstances stacking to a height of about 6 ft. upon the ground is usually resorted to, and it is likely that a cover of tarpaulins would be of advantage.

"The present century has, however, seen the intro-

duction of a new mode of building which is peculiarly suitable for the construction of coal stores—reference is made, of course, to reinforced concrete. In this material, composed as it is of steel rods embedded in concrete, there is the maximum of durability and the minimum cost of maintenance. Structures of creosoted timber may last for fifty years, with increasing expenditure for repairs after the first fifteen or twenty years; but in fifty years a reinforced-concrete structure will be in better condition than in the year it was built. It is probable that in the future this will be the only method of construction adopted for the purpose. It seems impossible to conceive of any better material: it has every advantage and no drawback.

"A somewhat fanciful objection to the use of reinforced concrete is being put forward by certain of the opponents to the employment of this material for structural purposes—namely, that, in consequence of its monolithic character and its extreme hardness, the work of demolition, where such is needed, entails excessive costs. In a recent instance in Germany, it is pointed out that some concrete vaults which had to be removed cost twice as much to destroy as they had cost to build, and that, in some cases, it has been found that only by recourse to blasting operations is it possible to break up the work in this material. There is no doubt that the strength and toughness of buildings in reinforced concrete increase with age, and that, in comparison with brick walling or even ashlar stonework, the expense of removal of the concrete is great; but the imperishable character of the structure and the small cost of upkeep are really great points in its favour. It is only in rare cases that new buildings have to be removed shortly after being built."

The paper was illustrated by a number of drawings and photographic views. One of the latter, which we reproduce herewith, shows a series of five coal bunkers constructed on the Hennebique system at Hammersmith for the Metropolitan Water Board by Messrs. L. G. Moucel & Partners, Limited, each bunker being 20 ft. square at the top and 21 ft. deep. The hopper bottoms are clearly shown in the photograph, as well as the slender reinforced-concrete columns supporting the entire range.

MONTREAL ROADS CONGRESS AND EXHIBITION.

The first Canadian and International Good Roads Congress will be held in Montreal from May 18th to 23rd. The congress will be held under the auspices of the Canadian Highway Association and Canadian Automobile Federation, with the co-operation of the American Highway Association. The principal object is to inaugurate a co-operative educational campaign which shall make for a uniform system of road building, proper methods, and economical management with a view to more practical work being accomplished.

Among the subjects proposed for discussion are matters relating to good roads legislation, the administration of public roads, the problems of construction and maintenance, the advancement of road building engineering in educational institutions, and other subjects of practical assistance to the good roads movement.

The various provincial governments have promised to send representatives, and invitations are also to be sent out to town engineers, county councils, boards of trade, engineering societies, and manufacturers' associations. A feature of the congress will be an exhibition of various appliances used in the construction and maintenance of roads.

The official opening of the King Edward Highway, 45 miles in length, and connecting Montreal with the New York State roads, will take place during the week of the congress.

Housing in Dublin.—On Monday, in the House of Commons, Sir Richard Cooper asked if the 20,108 families, stated in par. 8 on p. 3 of the recent report on housing in Dublin to be living in one-room tenements, were crowded into 4,577 one-room tenements, and, if not, how many one-room tenements the 20,108 families did occupy. Mr. Birrell said the 20,108 families referred to each had a one-room dwelling, and there were therefore 20,108 one-room dwellings, which, as he had already informed the hon. Member on the 3rd instant, were comprised in 4,577 tenement houses. Sir R. Cooper asked whether it was correct that, on an average, there were five living in single rooms in Dublin. Mr. Birrell said that was not so; it was sometimes four.

Modern Road Methods.*

By H. PERCY BOULNOIS, M.INST.C.E., Vice-Chairman of the Roads Improvement Association, and Member of the Engineering Advisory Committee of the Road Board.

The introduction of self-propelled traffic, the rapid motor car, the heavy commercial vehicle, and the ponderous motor bus have caused almost a revolution in our preconceived notions as to the construction and maintenance of our highways, and have raised considerable public and scientific interest in a question which has lain dormant and neglected for many years. The year 1908 brought with it the public outcry against the dust nuisance, and the excessive damage caused to the water-bound carriageways of this and other countries by the new description of traffic. Road makers became naturally much exercised in their minds at this outcry, and at once set to work to ascertain how this great change in the character of the traffic was to be met.

Three International Road Congresses have been held since then, the first at Paris, the second at Brussels, and the third in London. Extraordinary interest in the proceedings was shown at all these congresses, which were attended by delegates from all parts of the civilised world. Many interesting questions were discussed, but no very definite conclusions could be arrived at—beyond generalities—the fact being that there are so many conflicting and disturbing factors which enter into the question as to what should be the form of construction of the modern road surface.

The traffic on the road is the primary factor which governs the selection of the type of construction to be employed. The amount and description of this traffic varies in almost every locality, and the problem is further complicated because this traffic is in a state of transition. We have to deal with the self-propelled traffic of varying speeds and weights, but also with the horse-drawn traffic, and a surface that may be excellent for the one may not be the best for the other.

It has been stated, with some truth, that the bicycle requires a road as smooth as a billiard table, a traction engine, or heavy motor wagon, requires a solid stone causeway, a horse requires a soft and easy foothold, and that a rapid motor car requires a straight track all to itself. In addition to this, the pedestrian requires a footpath for safety, and there should be little or no dust, a requirement which is shared by the occupiers of adjoining premises; also there should be a minimum of noise. The ratepayer, who pays for the road, naturally requires that the construction and maintenance should cost as little as possible, while all the users of the road require that it shall be amply wide, so that there shall be plenty of unobstructed room for the traffic.

How are these problems to be solved is the question that exercises the minds of the modern road engineer.

EARLY ENDEAVOURS.

The earliest endeavours that were made to meet some of these difficulties consisted in tar-painting, or tar-spraying, the existing road surfaces, where the road was in good condition. The dust was no doubt greatly diminished, and the surface of the road was in great measure improved and preserved. Since then many hundreds of miles of road surfaces in this country have been thus treated, in most cases satisfactorily, and where there have been failures it has been due to want of proper precautions.

In this connection the Roads Improvement Association has issued a valuable little leaflet, entitled "Notes upon Tar Treatment of Road Surfaces,"† in which they point out the precautions that should be taken when dealing with the surface of roads in this manner. Shortly their recommendations are:—

(1) It is absolutely necessary that the crust and foundation of the road, taken together, should be sufficiently strong to carry the traffic.

(2) Before treatment the surface should be thoroughly cleansed from dust, caked mud and dung, in order that the tar may adhere properly, and that the surface of the road should be even and without depressions or potholes, &c., before the tar is applied.

(3) No tar should be applied unless the road is

thoroughly dug to at least $\frac{1}{4}$ in. below the surface, and they point out how impossible it is for tar to adhere to a wet, or even a damp, surface.

(4) Great care should be exercised in the selection of the tar; crude tar requires special care, as it may contain many detrimental compounds, and they give valuable hints as to the manner in which this may be avoided with reasonable care.

(5) The methods of tar-spraying by hand or machine are not discussed, but it is stated great care should be taken to apply only that quantity which the road will take, and at the same time amply cover the surface; from one-sixth to a quarter of a gallon of tar per square yard is suggested.

The leaflet contains many other valuable recommendations, and I advise all those who are engaged in this description of work to obtain a copy.

There can be no doubt that very excellent results have followed tar-spraying, and it has the advantage of being an exceedingly economical palliative, but it is only a palliative, and only solves the mere fringe of the problem of modern road methods. Something more is required in numberless cases where the traffic has abnormally increased, and a very large number of special methods of construction have been introduced during the last five or six years.

It would be impossible in a short paper to give a list of these various methods; suffice it to say that mainly all of them are on the lines of the introduction of a bituminous material to bind the stones together which form the road, instead of the now old-fashioned method of binding them with sand, dirt and water.

It has been found that the traffic not only wears the surface or crust of the road, but produces a movement among the stones themselves at some depth below the surface, causing a rocking action of the stones and producing an inter-attrition or rubbing which gradually wears off the angles of the stones until they are of a rounded shape and have no interlocking or power to resist movement among themselves. This is the main cause of the excessive mud on an ordinary water-bound road, and it is also the chief cause of the destruction of roads.

METHODS IN VOGUE.

It was to meet this interstitial wear, and to confine it, so far as possible, to the upper surface, that the bituminous-bound road has been introduced. The various methods that have been adopted may be divided into the following groups:—

The ordinary water-bound macadam road with surface tarring, or painting, already referred to, and the introduction of various patented preparations to take the place of ordinary tar for this purpose.

Tar-macadam, which consists of broken stones of various sizes, thoroughly dried, then coated with tar or other bituminous mixture (either by machinery or by hand), and then laid in the road and rolled into place.

Tar slag, where slag from blast furnaces is used instead of stone, the tar being applied when the slag is at great heat, thus ensuring penetration.

Tar grouting, where the tar or bituminous mixture is poured on to and into freshly laid dry macadam after it has been laid and rolled.

A modification of the above where special standardised pitch or bituminous mixture is used instead of tar.

A further modification of the above where a layer of very fine "tar concrete" is laid, and dry macadam is spread on the top and rolled into the tar concrete.

A still later development is that of the formation of a "carpet" or covering laid on a foundation or "strength crust" so that the surface or "wearing crust" somewhat resembles a compressed asphalt carriageway.

Each one of the above types of road construction has its merits and supporters: it is difficult, however, to say which of them, if any, will be the ideal road of the future. It is, of course, necessary to bear in mind that first cost of construction, and the life of the road, have an important bearing on the question of what type to adopt, and local considerations must in great measure decide; but so far as

* Paper read on Wednesday evening at a meeting of the Leicestershire and Rutland Branch of the Roads Improvement Association held at Leicester.

† Notes elsewhere in this issue.—Ed. THE SURVEYOR.

our present knowledge on the subject goes, it has become an established fact that the ordinary water-bound road is a thing of the past, and should only be employed where the traffic is light, both in the weights carried and in quantity, or where some special circumstances require that this method of construction should still be adopted. Otherwise modern road methods are undoubtedly in the direction of bituminous roads in some form or other.

THE POINTS TO BE AIMED AT

in modern road construction may be summarised as follows:—

(1) The carriageway should be built on a foundation or "strength crust" of sufficient strength to carry the weight of the traffic and to distribute the pressure of the wheels over the subsoil as to avoid any depressions or subsidences.

(2) Upon this "strength crust" there should be a wearing surface, or crust, so constructed as to minimise the abrasive action of the traffic, and also be quite impervious to water. It is universally agreed that water is even a greater enemy to a road than traffic.

(3) It has been discovered that the traffic not only wears the surface, or crust, of the road, but also produces a movement among the stones themselves at some depth below the surface, causing a rocking action of these stones, and producing what is known as inter-attrition or rubbing which gradually wears off the sharp angles of the stones until they are rounded in shape, and thus have no interlocking or power to resist movement among themselves. This is the chief cause of the excessive mud on an ordinary water-bound road, and is also responsible for the ultimate destruction of the road. It has been found that the bituminous mixtures now employed in all modern road making meet this difficulty, and tend to prevent this interstitial wear of the stones by interposing a resilient substance between the stones.

(4) In addition to this, the modern road, constructed with this bituminous binder, gives a slight elasticity or resilient action in the road, and this slight elasticity is very helpful to the present form of traffic. The elasticity of the modern wheel has played a very important part in helping forward the introduction and development of mechanical transport, and a similar elasticity in the surface of the road is equally necessary to preserve the road against the destructive forces of the traffic. It is also eminently desirable that the vehicle using the road should not be subjected to the violent reaction of an improperly constructed road surface. Such reactions must, of course, be detrimental both to the vehicle and to the road. The surface of the modern road should be smooth, and at the same time have a sufficient roughness or "grip" to prevent its being slippery. With care and a selection of the proper method any excessive slipperiness can be eliminated, though so long as horses still use the roads there may be some difficulty in altogether eliminating this objection.

(6) Under modern methods the excessive camber or crossfall of the surface of roads can be greatly reduced. Excessive camber is now altogether unnecessary, and should be avoided, as it tends always to divert the whole of the traffic on to the crown or centre of the road. The camber is only required to throw the water into the channels as speedily as possible, and the smoother the surface the less fall is required to effect this object.

MODERN REQUIREMENTS.

I think the requisites of a modern road may be summed up as follows:—

It should be sufficiently wide to meet the traffic requirements, but must not be extravagantly costly in its first construction.

The foundation must be sufficiently strong to bear the weight of the traffic, and the surface must be durable, and require the least possible amount of repairs at the least cost.

The road should be safe, firm, hard and at the same time resilient, with an even surface, and yet give sufficient foothold for horses.

It should be as noiseless as possible, and should be incapable of manufacturing any dust or mud. The surface should be so constructed that water cannot penetrate; that cleansing is reduced to a minimum; and that the camber or crossfall should be as flat as possible, compatible with the speedy draining off of the water falling on the surface. There should be no possibility of interstitial movement among the stones of which the road is constructed.

I have not dealt with the question of street paving but only with roads confined to a moderate traffic. When the traffic exceeds a certain limit it then becomes a question whether granite setts, natural rock asphalt, or wood should be employed.

The meeting of the Leicestershire and Rutland Branch of the Roads Improvement Association at which Mr. Boulnois' paper was read on Wednesday took place at the Grand Hotel, Leicester, and was presided over by the mayor (Councillor J. R. Frears), others present including Sir Samuel Faire, vice-president of the association, Messrs. Wallace E. Riche, general secretary, E. G. Mawbey, borough engineer of Leicester, H. G. Coales, engineer and surveyor to the Market Harborough Urban District Council, E. H. Crump, engineer and surveyor to the Hinckley Urban District Council, W. H. Blount, surveyor to the Market Harborough Rural District Council, J. W. Shaw (Leicestershire), H. Chapman, surveyor to the Blaby Rural District Council, J. Thorpe, surveyor to the Market Bosworth Rural District Council, and S. C. Winks, secretary to the Leicestershire and Rutland Branch of the Association.

Mr. E. G. MAWBEY, who opened the discussion on the paper, said he believed the county surveyors did their best to avoid loose stones. Their experience in Leicester was that whether they used best tar or pitch, or whether they used pitch and creosote oil, they found it was not strong enough for heavy traffic.

Mr. J. W. SHAW declared that he was "an out-and-out tar man." As to signs, he did not know of any better than those adopted in Leicester.

In replying to the discussion, Mr. BOULNOIS stated that he was entirely converted to tar slag. Incidentally, he expressed the opinion that tramways were condemned; the introduction of quick-running motor buses had practically put tramways in the shade.

A vote of thanks was passed to Mr. Boulnois for his paper on the motion of Sir Samuel Faire.

SEWAGE EFFLUENTS.

THE ROYAL COMMISSION'S FINAL REPORT.

In the House of Commons on Monday the President of the Local Government Board, asked when the proposed Bill for dealing with the question of sewage and trade effluents would be introduced, stated that in view of the expected issue of the final report of the Royal Commission on Sewage Disposal the question of introducing this measure was for the present postponed.

Local Authorities and Tarco.—Among the local authorities that have accepted the tenders of Messrs. R. S. Clare & Co., of Stanhope-street, Liverpool, for the supply of Tarco for the surface dressing of their roads are the Middlesex County Council, Staines Urban District Council, Altrincham Urban District Council, Bromsgrove Urban District Council, Wilmslow Urban District Council, Essex County Council, South Stoneham Rural District Council, and Huyton-with-Roby Urban District Council.

New Sewage Disposal Works for Yardley.—The Birmingham, Tame and Rea District Drainage Board at their meeting on Wednesday approved a scheme prepared by the engineer, Mr. John D. Watson, M.INST.C.E., to abandon Acock's Green Farm for the treatment of the Yardley district sewage, and convey sewage by gravitation to a site to be acquired in the parish of Sheldon, where a complete purification plant will be installed. The estimated cost of the scheme is £21,654.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times*.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

ROAD CRUSTS AND ROAD CARPETS.

[The following note, under the heading "Concrete in Highway Work," is a report of remarks made by Major W. W. Crosby at a Good Roads Congress held in Philadelphia last December. In a covering letter addressed to *The Surveyor*, Major Crosby writes:— "These remarks were made in discussion under the topic of 'Concrete Roads,' and while they may seem particularly applicable to roads built of concrete, I think the points made have a bearing on the work of surfacing macadam roads with a pitch (or bituminous) carpet, such as is now quite a common practice in Great Britain, especially where these macadam roads are composed of rather soft stone." Major Crosby's note is suggestive of the importance of distinguishing between (a) a carpet which is too tough to be crushed and may be placed on a very hard crust, such as a sheet asphalt carpet on a cement-concrete crust; (b) a carpet (also a carpet proper, but not necessarily so tough as (a) which rests upon a relatively soft crust, and, because it is less tough, depends for its resistance (to excessive rolling out) upon good adherence to the crust; and (c) an upper wearing crust of bituminous material, which must either have sufficient thickness to act as a layer of considerable strength, or must be well bonded into the lower course upon which it rests. Most of our work falls into the very last, and probably most promising, class; but in some cases an old crust is hardly touched before the carpet is laid, and the results may be inferior to those obtained with thinner layers firmly bonded into the strength crust, or, on the other hand, with tar or pitch macadam crusts proper, capable of spreading the loads. As strength crusts for road carpets, sandstone crusts have the important advantages (1) They can be made very smooth, so that the thickness of the carpet hardly varies at all; (2) they are usually cheap enough to be made very thick; (3) they take a bonding coat very well. Since, however, a water-bound sandstone crust becomes very friable when dry, it is, when capped with a waterproof carpet, likely to disintegrate, at any rate when the carpet is thin, as in the cases cited by Major Crosby. This difficulty occurs with other crusts under tar films, and is likely to occur even when the carpets or wearing crusts, above the water-bound crust, are of considerable thickness.]

MAJOR CROSBY'S NOTE.

While at present there seems to be sort of a stampede, ably assisted perhaps by certain interests, toward the use of concrete for roads and streets, the speaker wishes to utilise this opportunity to express the opinion that the selection of concrete for such work may well be considered as divided into two main questions of great importance for proper determination.

The first of these questions is that of a necessity for rich concrete, or even for a concrete base itself, for the pavement or wearing surface itself, a condition by no means always existing, or likely to exist, during the life of the wearing surface. Many mistakes, it seems to the speaker, have been, and are being, made by the use of any concrete base or foundation where equal satisfaction at least and great economy would have been had by its omission or the substitution of a cheaper, but, under the local conditions, an equally efficient foundation. It is to be understood here that the speaker believes that the use of concrete for the wearing surface itself, except in a few cases under peculiar conditions, is already proved impracticable, but for the sake of brevity the reasons for this conclusion will not be again expressed here.

The second of the questions referred to is made up of the old questions as to (a) the character of the wearing surface to be supplied on top of the concrete base or foundation, and (b) the thickness of such wearing surface.

As to (a) the character of the wearing surface to be built, little need be said at this moment for the purposes of the speaker.

The point which the speaker wishes to make at this time is under (b) the thickness of the wearing surface when the latter is bituminous in composition. Wearing surfaces composed of pitch compounds (bituminous materials, such as asphalts, tars, and oils), mixed either previously or in situ, with sand, gravel or stone chips, have almost invariably proved unsatisfactory as carpets on concrete unless the

carpets have been of more than a minimum thickness, dependent for expression in figures on local conditions, while those of sufficient thickness have proved satisfactory where their construction was proper under all the conditions.

The speaker thinks a reason for this difference in results between carpets identical except in thickness, and for the failure of many too thin carpets, comes from the fact that the thin carpets do not sufficiently absorb the shocks of traffic to prevent the disintegration, and pulverisation to a greater or less degree by such shocks, of the surface of the concrete to which the carpet is applied. Hence such carpets, lacking sufficient coherency in themselves and the preservation of a proper surface to which to maintain their adhesion, soon break up and disappear, first in spots and then altogether.

The surface of the concrete base naturally contains a great deal of mortar—an extremely friable substance, readily disintegrated under horses' feet and hard tyres. If the effect of these is permitted to pass through the carpet and to reach the mortar the latter soon becomes broken up and the adhesion of the carpet to a stable surface destroyed.

The same phenomena have been noticed by the speaker in the cases of macadam built of a soft, friable sandstone covered with a thin carpet, and their failure to occur has been equally noticeable where the thickness and character of the carpet has been sufficient to absorb the shocks referred to and to prevent disintegration of the friable materials underneath.

The speaker realises the difficulties of thick carpets, but he feels they can be solved by proper methods, such as have been used in the case of a familiar form of carpet for city streets—the sheet asphalt pavement. He believes that further solution of the problem of adapting this pavement to country roads—by the substitution of a "paint coat" for the "binder course," for instance—is in sight. But this too "is another story."

SPRING AND THE ROADS.

THE OBSERVANT MOTORIST.

Surveyors are looking to their roads, and throughout the country heaps of stone by the wayside, steam rollers and tar-boilers are met with, giving evidence (says a writer in the *Royal Automobile Club Journal*) of what is being done for the comfort of the road user.

During a recent run through a great part of the South of England it was noticed that in most cases where the highways were under repair a better material was being laid in place of that already on the surface. To quote an example: Many of the Hampshire roads between Winchester and Farnham are at present surfaced with flint—well-rolled, it is true, and very satisfactory in all except extremely dry weather—but the same roads, wherever repairs are necessary, are being relaid with granite. On the Wiltshire Downs the same thing was seen, and in other places tarmac is taking the place of water-bound macadam. The route taken included roads in Middlesex, South Buckinghamshire, Somersetshire, Wiltshire, Hampshire and Surrey, and it is proposed to note them in the order of the run.

Starting from London, the full extent of the Bath road was inspected. Until Hungerford is reached it is chiefly of tar-macadam, with many stretches of Tarmac—notably that at Maidenhead—and, with the exception of a rather potholed length near Slough (which, however, is at present under repair), is entitled to its claim of being the best road in England. After Hungerford the way becomes rougher, often being of a gritty flint. It is rather a pity that such a fine highway does not end as well as it begins.

From Bath to Salisbury the road winds considerably, and is chiefly of flint usually in good condition, though granite is gradually winning its way into use, particularly in the neighbourhood of Salisbury Plain. Turning south to the New Forest, one finds flint roads, which are generally built by having loads of gritty stone strewn across the way and left for passing traffic to work in. In wet weather they are fair, but in summer—! From Winchester to Farnham the state of repair has been mentioned, and along this part of the country there are many evidences of much work this spring. For the next month or so motorists should beware when driving this way. The Hog's Back is always an excellent stretch of road, and from Guildford to London the Portsmouth road can rank almost equal with the highway to Bath.

HOUSING INSPECTION.

LOCAL GOVERNMENT BOARD CIRCULAR.

The following circular was issued by the Local Government Board last week to town councils, councils of metropolitan boroughs, and district councils:—

Sir,—For many years the housing of the working classes has been a subject of constant public discussion. The measures which have been taken have effected much improvement, but there is an almost universal agreement that many evils still remain to be remedied. With a view to determining the precise methods by which Parliament and the administrative departments can best assist the local authorities in their efforts to cure these evils, His Majesty's Government are anxious to obtain fuller information than is now available as to the extent and distribution of the defects with respect to which ameliorative measures are needed.

As the council are aware, the provisions of sec. 17 of the Housing, Town Planning, &c., Act, 1909, impose upon every local authority within the meaning of Part II. of the Housing of the Working Classes Act, 1890, the duty of causing to be made inspection of their district, with a view to ascertain whether any dwelling-house therein is in a state so dangerous or injurious to health as to be unfit for human habitation, and the Order of the Local Government Board of September 2, 1910, prescribes the records to be kept of the inspection pursuant to the requirements of the section referred to.

The board direct me to enclose a form showing the results of this inspection and other particulars to be filled up by the local authority, and to state that it is very desirable that it should be returned to the board at the earliest practicable date.

I am, Sir, your obedient servant,
H. C. MONRO, Secretary.

[COPY OF FORM REFERRED TO.]

HOUSING OF THE WORKING CLASSES ACTS.

Particulars as to inspection of houses and housing conditions.

Name of Local Authority ... Town Council
Metropolitan Borough Council
Urban District Council
Rural District Council

Administrative County

1. The estimated number of dwelling-houses in the district of the local authority.

2. The estimated number of dwelling-houses within the limit of rent applicable to the district under sec. 14 of the Housing, Town Planning, &c., Act, 1909.

3. The number of dwelling-houses which have been inspected under and for the purposes of sec. 17 of that Act, and the particulars required by the Housing (Inspection of District) Regulations, 1910, duly recorded:—

- (a) Within the limit of rent applicable to the district under sec. 14.
- (b) Above that limit.

N.B.—If in any district special provisions are contained in local Acts of a similar character to those in sec. 17 under which the local authority carry out their work, instead of under that section, this should be indicated and similar particulars given, care being taken to avoid duplication of entries:—

- (a)
- (b)

4. By what date can the inspection of dwelling-houses within the limit of rent above referred to be completed and the necessary records made?

5. (1) How many of the dwelling-houses inspected were found to be in a state so dangerous or injurious to health as to be unfit for human habitation:—

- (a) Within the limit of rent above referred to?
- (b) Above that limit?

(2) And how many of those houses are still in that state:—

- (a) Within the limit of rent above referred to?
- (b) Above that limit?

A schedule identifying the several houses under 5 (2) (and, in a rural district, arranged under the names of parishes) should be annexed.

6. (1) How many of the dwelling-houses inspected, though not found to be in a state so dangerous or injurious to health as to be unfit for human habi-

tation, were seriously defective from the point of view of danger to health or structural faults:

- (a) Within the limit of rent above referred to?
- (b) Above that limit?

(2) And how many of those houses are still in such defective condition:—

- (a) Within the limit of rent above referred to?
- (b) Above that limit?

A schedule identifying the several houses under 6 (2) (and, in a rural district, arranged under the names of parishes) should be annexed and the nature of the main defects should be briefly indicated in each case.

7. The number of vacant houses suitable for persons of the working classes and in all respects reasonably fit for human habitation.

A schedule of these houses should be annexed giving the following particulars as to each house—viz., address (including, in a rural district, the name of the parish), character (e.g., tenement, flat, &c.), rent, accommodation.

8. The number of houses which are overcrowded on the basis adopted in the Census returns—viz., more than two persons to a room.

A schedule should be annexed in the case of a rural district giving separate information under this heading as regards each parish in the district.

9. Number of new houses, which, in the opinion of the local authority, is required to provide any necessary accommodation for persons of the working classes in the district and the nature and extent of such accommodation, e.g., separate houses, tenements, number of rooms.

A schedule should be annexed in the case of a rural district, giving separate information under this heading as regards each parish in the district, and also in the case of a borough or urban district of extensive area showing approximately the part of the borough or district where the accommodation is required.

..... Clerk to the Local Authority.
(Date) day of 1914.

REORGANISATION AT LEEDS.

SEQUEL TO MUNICIPAL EMPLOYEES' STRIKE.

The Special Committee appointed to deal with the strike of municipal employees at Leeds have prepared a report in which they recommend the re-organisation of several of the municipal departments. For all practical purposes the highways department is now closed down—the work to be done in future by private contractors—and the sanitary services are to be put on a different footing.

These changes have called forth the resignations of Mr. Thomas Alinson Prince, the head of the highways department, and Mr. John J. Mann, superintendent of the street cleansing department. At present Mr. Prince is in receipt of a salary of £400 a year and Mr. Mann one of £340. It is understood that the Special Committee's recommendations include proposals of substantial grants to these officials, who have been in the service of the corporation for many years, and whose ability is in no way questioned.

Honiton Town Planning Scheme.—The Local Government Board have intimated to the Honiton Rural District Council that they have decided to comply with the application for authority to prepare a town planning scheme in the parishes of Salcombe Regis and Sidbury.

City Tramway Lines Vetoed.—The Corporation of the City of London last week resolved not to consent to the proposals of the London County Council to extend existing tramways (1) from Whitechapel High-street to Aldgate Station; (2) from Whitechapel High-street along Mansell-street to Tower-hill and Trinity-square; and (3) from Charles-street along Farringdon-road and Farringdon-street to Ludgate-circus, so far as the lines were within the City.

The Colchester and Falmouth Vacancies.—The Corporation of Colchester are advertising for a borough engineer and surveyor, at a salary of £400, rising to £500, with a horse and trap or other suitable means of locomotion. Applications should be addressed to the town clerk, Mr. H. C. Wanklyn, not later than March 26th. The vacancy at Falmouth is that of borough surveyor, at a salary of from £150 to £200, and the last day for sending in applications is March 16th.

LONDON PAVEMENTS.

[Notes from the detailed returns accompanying the eleventh report of the Metropolitan Paving Committee.]

The returns sent in to the Metropolitan Paving Committee from the cities of London and Westminster, seven metropolitan boroughs, and the London County Council give the main particulars of the new pavings laid in the year 1912-1913, and, in some cases, the nature and life of the pavement previously laid and renewed, or replaced by another kind of paving, in that year. The chief facts as given in the report itself have already been published in *THE SURVEYOR*, and the following notes on particular points are supplementary to that information.

LIVES OF WOOD AND ASPHALT PAVINGS.

The following particulars will be more significant to those who are well acquainted with London than to surveyors who know only the main thoroughfares; but in some cases the expression "considerable" or "limited" will give some idea of the severity of the traffic.

Wood paving, the kind of wood not being specified, but most of it being (creosoted) softwood, had lasted in Kensington for periods of ten to eighteen years; in Richmond-road, Brompton, ten years; Kensington High-street and Kensington-road, eleven years; Ladbroke-grove, sixteen years; Munster-road and Lillie-road, Fulham, sixteen years; New King's-road and the middle strip of Wandsworth-road, nearly seventeen years; Manchester-square, seventeen years; Gloucester-road, eighteen years. In many residential streets in Marylebone wood paving had lasted from eleven to fifteen years, and in Marylebone-road, under "considerable" traffic, eleven years.

Creosoted deal lasted nine years in Hammersmith-road, and twelve years in Clapham Park-road.

Jarrah and creosoted beech lasted twenty-two years in Hammersmith-broadway.

Jarrah—in High-road, Kilburn, ten years; in Belize-road, Fitzjohn's-avenue and Heath-drive, all in Hampstead, twelve years; in Uxbridge-road, Hammersmith, seventeen years. Old jarrah blocks relaid in Norland-road, Hammersmith, eight years.

Karri had lasted fourteen years in Woburn-square, Holborn.

Asphalt (671 sq. yds.) had lasted eleven years in a part of Hart-street, Holborn, and in another part of Hart-street (1,147 sq. yds.) had lasted twenty-nine years, under "considerable" traffic. In Woburn-square, under "limited" traffic, fourteen years, in Woburn-place, under "considerable" traffic, sixteen years, this being an omnibus route. In the City of London asphalt lasted twenty-two years in Furnival-street under "limited" traffic, twenty-four years in Old Broad-street, twenty-six years in New Broad-street, and twenty-five years in Gracechurch-street, all with "considerable" traffic. In the last case the new paving was creosoted deal. There were credits of 6d., 9d. or 1s. per square yard for the value of the old asphalt in these streets, the credit being 1s. in the cases of the pavements which had lasted twenty-four and twenty-six years. In High Holborn the asphalt had lasted ten years, and in Southampton-row and Bloomsbury eleven years.

Asphalt blocks lasted eleven years in Waterloo-road, Hammersmith, and cork asphalt two years in Thurloep-place, Kensington.

THE NEW PAVEMENTS.

The general practice of recent years was followed in most of the cases of renewals of paving or substitution by a different kind of pavement. The methods of dealing with existing foundations varied with the circumstances, and the reports are probably not all comparable as regards the extent of the information in this respect.

Tar-macadam, in Marylebone and Hammersmith, was laid on old macadam crusts, and in Waterloo-road, Hammersmith, on old asphalt blocks. In Castle-street, Holborn, redressed granite setts were laid on a foundation of blue lias lime concrete 6 in. thick.

Concrete foundations ranged, by inches, from 6 in. to 12 in.—10 in. in Marylebone-road, 11 in. in Harwood-avenue, Marylebone, 12 in. in Hart-street and Bloomsbury-square, Holborn, in Southgate-street, Hackney, and Park-road, Marylebone, and 12 in. to 14½ in. in High Holborn.

The thickness of tar-macadam crusts was 3 in. and 4 in. in Hammersmith, and 4½ in. in Marylebone and Hampstead.

Of the woods used, creosoted pine was largely employed in Westminster, Archangel "thirds" in Wandsworth, yellow deal in Marylebone, deal in the City of London, Kensington, Hammersmith and Fulham. Sectional jarrah was put down in Hampstead and Holborn. The principal methods of making the joints of wood block paving were as follows: (1) Close-jointed, grouted in with pitch and cement (Fulham); (2) close-jointed, run in with a mixture of pitch and creosote oil, grouted with Portland cement or Portland cement and sand (Hammersmith, Marylebone, Westminster and Hampstead); (3) grouted with tar-pitch and cement (Kensington); (4) pitch, or pitch and cement grout (London County Council); (5) dipped in a mixture of tar and pitch, and grouted with Portland cement mortar (Wandsworth).

The asphalt paving was nearly all natural rock asphalt, compressed in situ, the use of heated pelons being mentioned in many cases. The thickness was 2 in., except in the City, where it was 2½ in.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MANSINGER: "The Fatal Dowry," Act. ii., 2.

WHY TAR-SLAG BINDS WELL.

To the Editor of *THE SURVEYOR*.

SIR,—Your correspondent "Cretaceous," in his letter published in your issue of March 6th, makes some interesting and useful observations. He endorses and emphasises my opinion that chemical action between the tar and the slag is one of the reasons for the good adhesion of tar to slag, compared with the adhesion to other road stones.

As regards the wearing qualities of slag, I do not think that we are in disagreement. I alluded to its superior wearing qualities compared with limestone and sandstone as a reason for the better results obtained with tarred material, and the relatively poor results with untarred slag, "especially on clayey and wet subsoils," are probably due to its inferior weathering qualities compared with those two materials. Prof. Fearnside's views on this point may be somewhat too strong, but they have a foundation in fact.

With respect to small-scale roughness, my argument hangs upon what are, to the naked eye, very small differences in the appearance of the different kinds of stone, but I think that the differences are real and important. Syenites and quartzites, even when their roughness is on a small scale, have not the minute pores or small crevices with unsealed inner ends, which are found in most specimens of compact limestone or true sandstone. In pointing out that when certain stones are examined after two or three years' wear, the tar will be found to have lost its life, but not in the case of tarred slag, "Cretaceous" refers to a point of much importance, but not, I think, one which affects the initial grip of the tar. This initial grip is, I consider, a leading factor, since, if the tar will grip well for a few months, or even weeks, the crust will settle down well. This, I believe, gives sandstone and limestone crusts an important advantage compared with crusts of tarred syenite or quartzite.

The greater or more rapid deterioration of the tar coating of sandstone and limestone road metal, as compared with that of slag, is a further consideration, and I frankly admit that the observations made by "Cretaceous" point to the existence of an additional factor in favour of slag besides its greater strength or wear-resistance. It may even be the dominant factor if it can be established as a fact in the experience of road surveyors. Can "Cretaceous" suggest a reason for it? Does the chemical action between the tar and the slag actually tend to preserve the life of the tar?

I am much interested to learn that "Cretaceous" has found no difference in the results obtained with slag laid hot and laid cold; but a slag crust grouted with tar, to which he especially refers, is under somewhat different conditions to those of a crust of tar-macadam proper. If my theory of the efficacy of atmospheric pressure is sound, it should apply, to some extent, to grouted crusts; but it would be difficult to test it by the results of experience with respect to these. As regards crusts made by the mixing or by the coating process, the usual practice is to heat the stone, and my contention is that in such cases the advantage is not wholly due to the driving off of moisture, but is partly due to the establishment of at any

rate a temporary pressure on the tar film. If dry but cold stone does give equally good results, I may still attribute some virtue to the cooling of the stone after its temperature has been raised by the application of hot tar. If, however, cold stone and cold tar are found, in the long run, to give results equal to the best, my theory will fall to the ground. The experiments cited by "Cretaceous" are interesting, and worth giving in greater detail. For instance, if, after tests No. 1 and No. 2, the conditions allowed of a true film being formed, and slices under the microscope showed no roofing of the tar film in test No. 2, these are against my theory, but not if a definite film was not formed. In (3) and (4) my theory is supported, since, if it was not atmospheric pressure which gave the penetration in (4) thrice as deep as in (3), what was it? The discoloration might not in itself affect the wearing properties of the slag, but it seems to point to the existence of a force which, if a true film were formed in time, would hold that film to the slag.

In conclusion, I should like to invite "Cretaceous" to give his opinion as regards the effect of clayey matter in adding to the advantages of materials which make good tar-bound crusts, compared with those which make inferior tar-bound crusts. His observations on practical points in road maintenance are so much to the point that your readers would, I am sure, be interested to know his views as regards the considerations set forth under the heading "the proportion of clay" in my article in your issue of February 27th.—Yours, &c.,

REGINALD RYVES.

March 7, 1914.

SEWAGE DISPOSAL BY DILUTION.*To the Editor of THE SURVEYOR.*

SIR.—Mr. Kershaw says that his object in answering my first letter was to draw attention to the fact that the commission expressly recommend dilution and not quality of river water as the chief factor. I hoped my second letter would have convinced Mr. Kershaw that his contention was wrong, but apparently it has not done so. I must therefore point out that Colonel T. W. Harding, a member of the Royal Commission, in a discussion on the eighth report at the Royal Sanitary Institute on February 11, 1913, evidently agrees with my view of the "relaxation" suggestions. He says, "The normal standard would be the only statutory standard. There would be no statutory right to relaxation because of dilution, but certain conditions of dilution would warrant a *prima facie* case for consideration by the Rivers Board or central authority, as, for example, if admixture did not bring the water to such a condition as to take up more than '4, and if the river were able to return to the normal '2 before the next pollution." (*Journal Royal Sanitary Institute*, vol. 34, p. 209.)

That others agree with my view is confirmed by the following quotation from Mr. Silcock's article on "Sewage Treatment" in "Kempe's Engineers' Year-book," 1914, p. 914. After stating the conclusions on standards and relaxation by dilution, he says: "These standards are not intended to apply to effluents discharged into streams which are used for drinking water, or to streams the water of which, at the point of discharge of the sewage effluent, normally takes up more than 2 parts per 100,000 of dissolved oxygen in five days at 60 deg. to 65 deg. Fahr."

Mr. Kershaw correctly says, "The commissioners' recommendations apply to the whole country," and they therefore apply to the rivers in the Mersey and Irwell watershed, as well as extremely large areas in other industrial watersheds.

I do not think it necessary to enter into a discussion of the hypothetical case mentioned by Mr. Kershaw.—Yours, &c.,

HUGH STOWELL, M.INST.C.E.,
Chief Inspector,
Mersey and Irwell Watershed.

44 Mosley-street,
Manchester.

March 6, 1914.

THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.*To the Editor of THE SURVEYOR.*

SIR.—I am always interested in the various letters which appear in your issues from such persons as "Road Surveyor."

I thoroughly appreciate and endorse his remarks, which are true in every respect. But there is one

very important matter which he has appeared to ignore, and that is that there are men (you will observe I do not call them professional men, but I doubt whether he can call it a profession or not) today holding very high positions who allow their office boys to be drafted into the drawing department at a salary, and afterwards considered one of the professional staff. Such a thing as this tends to cause friction, and, naturally, hits the pupils very hard. Under the circumstances one can account for the overcrowding in the business, and the small salary obtainable by fully qualified assistants.

I may say that I have been advised not to sit for any examinations, as the various institutions do not appear to be of any assistance. From what I have seen so far it is much better to have Mr. So and So behind one.

I would like to suggest that all institutions should make it a rule in their syllabus that all candidates should forward their original indentures when applying for permission to sit for an examination. If this were done it would lessen the tendency of the office boy to become a surveyor.

I should also like to see the various institutions amalgamating and forming one large representative and recognised body, and thus raising the standard of the profession. Why not have a charter?—Yours, &c.,

DISGUSTED.

March 7, 1914.

SLUDGE DISPOSAL.*To the Editor of THE SURVEYOR.*

SIR.—In your issue of March 6th you were good enough to comment on my paper on "Sludge Disposal." I notice that you question the general applicability of the process, and with this I agree, but not on the grounds you give. At Birmingham we have to deal with every class of sludge—from domestic to industrial. Some of our outlying districts are purely residential, and the sewages from these localities have to be treated separately. The principles established here, and enunciated in my paper, are general principles, and the sludge to which it would not be possible to apply them would indeed be refractory. The peculiar character of the Birmingham sewage ceases to operate when the sludge is isolated from the liquor. This is a cardinal feature of the whole process, and the only considerations which might be urged in a particular case against adopting this digestive process would be engineering or other practical ones which would be purely local.—Yours, &c.,

F. R. O'SHAUGHNESSY.

Denman Chambers,
42 Temple-street,
Birmingham.
March 10, 1914.

WARNINGS FOR DANGER POINTS ON ROADS.*To the Editor of THE SURVEYOR.*

SIR.—It was with interest that Mr. L. J. Rogers and myself read Mr. H. C. H. Shenton's letter on the above subject, more especially as we are at the present time experimenting with a similar idea.

We have observed the instances referred to, and agree with him that reflectors might be made to serve a very useful purpose where sharp turnings or other dangerous features present themselves on our highways; at the same time, we think that he is somewhat optimistic as to the brilliancy obtainable from these reflectors.

It is with the object of ascertaining the effectiveness of such reflectors that we are carrying out these initial experiments.

Should these experiments prove successful, we hope to place before the readers of your journal something definite.—Yours, &c.,

C. G. ATKINSON.

Council Offices,
Wellingborough.
March 10, 1914.

Rye Water Supply.—The Rye waterworks extension has been completed, and the undertaking is now capable of supplying 150,000 gallons in ten hours, and supplying a population of 6,000. The estimate of the cost of the works is £4,308, and application is to be made to the Local Government Board for a further loan of £400.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. M. INST. C. E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

381. Town Planning.—An area of 1,000 acres, chiefly undeveloped, in an urban district, is to be included in a town planning scheme. The approximate number of owners, occupiers and lessees is 250. Assuming that the referencing is to be done by the staff of the urban district council surveyor's office, state the information which should be sought, and the best method of ascertaining and recording it. Give an estimate of the cost of the work if done by professional referencers. Compare the advantages and disadvantages of the two methods, both in the above case and in the case of an area of 1,500 acres in the same district, which includes a considerable extent of partially developed building estates, and is to form the nucleus of a later scheme. (Togun.)

382. Fire Hydrants.—Fire hydrants, 2½ in. in diameter, are taken from a 4-in. and a 12-in. main. What will be the ratio of discharge in the two cases, assuming that the initial pressure is the same in each main? (X. X., *Hounslow*.)

384. Timber.—Sketch the cross-section of an oak tree and show the different nodes of conversion. How does oak compare with elm for use inside or outside a building?

385. Chimney Design.—Design a brick chimney shaft 130 ft. in height from ground level, the internal diameter at the base being 10 ft. (F. S., *Plumstead*.)

386. Storm Overflow Weir.—A 9-in. diameter stoneware pipe, laid on a gradient of 1 in 281, carries a mean dry-weather flow of 33,300 gallons per day. It is required to construct a storm overflow weir, in a manhole, to pass all above six times the dry-weather flow. At what height above the invert of the pipe should the lip of the weir be set? (H. V. O., *West Bromwich*.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

379. Testing Pipes.—What tests should stoneware pipes be subjected to before they are accepted for use? What defects are often thereby disclosed? (B. W., *Tadcaster*.)

The following are the most important tests which stoneware pipes should be able successfully to pass:

(1) The average thickness and weight of glazed stoneware pipes should be as follows:—

Length of pipe.	Diameter of pipe.	Length of socket.	Thickness of stoneware.	Average weight per 2 ft. length of pipe.
2 ft.	4 in.	1½ in.	½ in.	18 lb.
2 "	6 "	1¾ "	¾ "	32 "
2 "	9 "	2 "	1 "	58 "
2 "	12 "	2 "	1 ¼ "	90 "

(2) Tested pipes should bear the maker's name and the word "tested" stamped on the barrel. Such pipes should be capable of withstanding a pressure of 25-ft. head of water without showing signs of "sweating."

(3) The pipes should be salt-glazed inside and outside, and thoroughly vitrified. A minute inspection should be made to ascertain that the glaze is uniform, and that there are no air holes present.

(4) When struck with a hammer a pipe should give a good metallic ring. This is a most useful test, and should be carried out on every pipe.

(5) A section of the pipe, when broken, should show a dense and close grain with a somewhat metallic appearance.

(6) The pipes should be truly cylindrical in bore.

This can be tested by the use of inside and outside calipers.

(7) The pipes must be free from kiln cracks and other defects, and the pipes must be well burnt.

(8) The pipes should be tested as to the safe load they will carry by supporting a pipe at or near its ends and then building up a load gradually either by hanging weights on or by laying bricks on the top, course by course.

When these tests have been successfully passed through by the pipe, it may be assumed to be a good pipe. Some of the defects which may be disclosed (apart from those before mentioned) are that the pipe loses its truly circular section, it may lose its regularity in its length, it may prove to be too brittle, it may not be sufficiently dense, or it may not be strong enough in itself to resist a superincumbent pressure.

Any pipe that does not comply with all the above requirements, and which cannot undergo the above tests satisfactorily, should be rejected as being unfit. (T. W. P., *Bechill-on-Sea*.)

383. Grain Silo.—It is required to construct a grain silo, the bins of which are 64 ft. in height and 8 ft. square in cross-section. What lateral pressure at the base should be provided for? (X. X., *Hounslow*.)

The theoretical considerations affecting the lateral pressure in a grain silo are exactly similar to those which occur in determining earth pressures on vertical surfaces. As grain is of uniformly granular structure, it approaches more nearly than earth to the conditions which are assumed in constructing the formulae.

Rankine's formula—

$$p = w \cdot d \cdot \frac{1 - \sin \theta}{1 + \sin \theta}$$

will give the lateral pressure in a granular material at any depth provided the angle of repose and weight of the material be known.

The angle of repose of grain was not available in several tables consulted, but was found by taking several readings on piles of oats (not crushed). The heights of the piles and the horizontal distances to the feet of the slopes were measured. From these measurements the angles of the piles could be obtained from a table of tangents, and the mean of these was taken as the angle of repose of the grain.

Angle of repose of grain $\theta = 23^\circ$.

Wheat is probably the heaviest grain which will be stored.

Weight of 1 bushel of wheat = 60 lb.

$$\therefore \text{Weight of 1 cub. ft. of wheat} = 60 \times \frac{6 \cdot 23}{8} \text{ lb.} = 47 \text{ lb.}$$

In the formula, where

p = intensity of horizontal pressure,

w = weight of 1 cub. ft. of grain,

θ = angle of repose of grain,

d = depth.

$$\begin{aligned} p &= 47 \times 64 \times \frac{1 - \sin 23}{1 + \sin 23} \text{ lb. per sq. ft.} \\ &= 47 \times 64 \times \frac{.6093}{1.3807} \text{ " " " " } \\ &= 1,315 \text{ lb. per sq. ft.} \end{aligned}$$

The walls of the silo must be designed to resist a lateral pressure of 1,315 lb. per square foot at the bottom, but this pressure varies as the depth, and will be zero at the top. (H. V. O., *West Bromwich*.)

Bournemouth Road Improvement Scheme.—A Local Government Board inquiry was held at Bournemouth on Wednesday with regard to an application by the town council for compulsory powers to purchase property to carry out road improvements. Among other changes it is proposed to construct a direct road to the cliff from the centre of the town and a roadway between two parallel roads which, though within 100 yds. of one another, are without means of access for vehicles from one to the other for nearly a mile.

The Surveyor

And Municipal and County Engineer.

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LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

A meeting of the above-named association took place at the Town Hall, Twickenham, on Saturday last, when, notwithstanding the very inclement weather, there were a fair number of members present. A most valuable paper, entitled "A Comparison between the Use and Cost of Suction Gas and Oil Engines," was read by Mr. H. F. Coales, ASSOC. M. INST. C. E., engineer and surveyor to the Sunbury Urban District Council. Mr. Coales first gave a description of the suction gas plant installed by the Sunbury Urban District Council, for the purpose of providing power at the sewage disposal works, and furnished reasons as to why suction gas had been adopted as the motive power. Details of fuel consumption and maintenance charges, showing that suction gas is a much more economical form of power than oil, were given.

A most interesting discussion followed, and further figures were given by other members, fully bearing out the economical nature of suction gas as a motive power.

The question of fire plugs and hydrants, and the admission of waste from gasworks to sewers, were also discussed.

A very hearty vote of thanks to Mr. Coales for his paper was passed at the close of the meeting.

Harrow's New Council Offices.—The new municipal offices at Harrow, built at a cost of £6,000 from plans by Mr. H. Prince, have been formally opened.

Agent versus Owner.—A corporation official negotiating for the purchase of some land for the widening of a main road in the East-end of the city went (the *Liverpool Post* states) to the estate agent acting for the owner. No amount of expostulation would move the agent from the figure he named—15s. per square yard—and an angry parting was the only result of the interview. The official entered his motor-car and was driven to the house of the owner of the land, a public-spirited gentleman, with whom he had no difficulty in concluding a mutually satisfactory bargain at 4s. 6d. per square yard.

ARTERIAL ROADS FOR GREATER LONDON.

IMPORTANT CONFERENCE.

The first of the proposed six district conferences on the question of arterial roads for Greater London was held at the Local Government Board Offices on Monday last. Both Mr. Herbert Samuel, the President of the Local Government Board, and Mr. John Burns, the President of the Board of Trade, were present, and commenced the proceedings with short speeches.

Mr. Burns pointed out that the object of these district conferences was to "get a grip" of the local needs and details of the requirements of the district for further main or arterial roads, and then to report to a final conference which would be held when all the district conferences were ready with their reports. He considered that there was great need of further roads in the N.E. district (the district which the conference had been called to consider), owing to its ever-increasing population, its mighty docks, its important manufactures, and its railways which were not all that could be desired. He urged the necessity of introducing town planning schemes in order that land might be secured and held in readiness for schemes of new roads, observing that it was lack of foresight in this direction which had so hampered the London County Council in their important schemes. He asked the conference to endeavour to remedy this heritage of past neglect, and to enter into "healthy" give-and-take arrangements with the owners of land in the district.

Mr. Samuel, who followed, also drew attention to the national importance of the Town Planning Act, and said that for want of it our towns and cities were not worthy of the present century. He owned there were difficulties in carrying out the lines of proposed roads, as there were no fewer than 117 road authorities within the Metropolitan Police District. These difficulties, however, could be overcome by co-operation, and it was the object of these conferences to bring these various authorities into friendly touch with each other. He wished the conference to understand that the suggested lines of roads shown on the map prepared by the Traffic Branch of the Board of Trade were not to be considered as "hard-and-fast" lines, but were open to amendment or alteration by the conference, and that any decision arrived at would not commit any authority to the cost of carrying out the scheme, and he made the important statement that there would very shortly be introduced into Parliament legislation by which the expense of main roads would be provided out of the National Exchequer. He further said that he did not wish any conference to pledge itself as to the immediate necessity for any particular road, but that it should confine itself to dealing with the future rather than the present. Neither was it necessary to deal with street improvements, which was entirely a local question. He did not consider, either, that the conference need deal with any question of compensation to the owners of land, as he was of opinion that the argument was a fair one that the construction of a road in an estate was in the nature of a gift to the landowner for which he should be much obliged, and certainly should not demand any compensation for receiving this gift. He suggested that if the lines of main or arterial roads—of adequate width—could be thus arranged and pegged out, it would be sufficient, for the present, to metal the central portion and leave broad strips on each side until they were required for the complete scheme.

A New Town Hall.—Marylebone Borough Council at its meeting last week decided to borrow from the Huddersfield Corporation a sum of £60,000, at interest $3\frac{3}{4}$ per cent per annum, for the building of a new town hall on a site in Marylebone-road close to the Royal Academy of Music.

Institution of Civil Engineers.—On Tuesday evening next, at the Institution of Civil Engineers, the discussion on the papers, "Rail Steels for Electric Railways," by Mr. William Willox, M. INST. C. E., and "Rail Corrugation and its Causes," by Mr. Stephen Sellon, M. INST. C. E., will be concluded. The following papers will afterwards be read: "Some Recent Developments in Commercial Motor Vehicles," by Mr. Thomas Clarkson, M. INST. C. E., and "Comparative Economics of Tramways and Railless Electric Traction," by Mr. Theodore Gribble, M. INST. C. E.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

ANCIENT LIGHT. PARTIAL OBSTRUCTION BY CONSENT: ABANDONMENT. An interesting point as to the effect of the partial obstruction of an ancient light by consent was decided in *Bailey & Son, Limited v. Halborn & Prascuti, Limited* (Chancery Division, Mr. Justice Sargant, February 6th). The plaintiffs were the lessees of Nos. 38 and 40 Oxford-street, and for twenty years before the year 1911 they had enjoyed good and sufficient light to these premises. In that year the owners of certain adjoining property made various alterations in and additions to their buildings which had the effect of somewhat diminishing the light coming to the plaintiffs' houses. The plaintiffs, however, in consideration of a money payment by the owners of the altered buildings, consented to these alterations. In the following year the defendants, who were the owners of other adjoining property, made alterations in and additions to their premises, which further diminished the light coming to the plaintiffs' property. The plaintiffs thereupon brought this action, claiming a mandatory injunction and damages. The defence was that the diminution of the plaintiffs' light by the building operations of 1911, to which they had consented, had so altered the character of the easement that it must be treated as having been abandoned, these operations having, in fact, changed the plaintiffs' property from a well-lighted to a badly-lighted building. Mr. Justice Sargant held that the case was not one for a mandatory injunction, but that the defendants had caused an actionable nuisance to the plaintiffs, and he awarded them £150 damages. In the course of his judgment he said he accepted the proposition that until twenty years had elapsed from the date of the previous building operations the plaintiffs could claim no greater right over the defendants' land than they could have claimed previously to those alterations; but he saw no reason for saying that the plaintiffs had altogether lost their right, unless it had become impossible to decide what they would have been entitled to under the previous state of things.

EXTRAORDINARY TRAFFIC: RECOGNISED INDUSTRY.—Some interesting points in connection with the subject of extraordinary traffic were decided in *Llangollen Urban District Council v. Coward & Company* (Llangollen County Court, February 6th). The traffic consisted of the haulage of timber by three-horsed wagons weighing 30 cwt. to 35 cwt. each, with 4½-in. and 5-in. wheels, each carrying a load of from 3 to 4 tons. On an average two loads a day were carted (except in frosty weather), three roads being traversed, one of them having gradients varying from 1 in 11 to 1 in 4. On this road ruts 12 in. deep were cut, and on the others ruts 6 in. deep. Prior to this traffic the roads were fit and suitable for the ordinary traffic of the district, which was purely agricultural, except for a certain amount of tourist traffic during the summer. The council claimed £48 14s. 1d. As to part of the claim the defendants relied on sec. 12, subsec. (1) (b) of the Locomotives Act, 1898, as barring any damage done more than twelve months before the commencement of the proceedings. They also contested the entire claim on the alleged ground that timber growing was a recognised industry of the district. Other objections were that the roads with which these roads had been compared were not comparable roads, and that, as to one of the roads, the whole expenses claimed were for labour, the bulk of which (the scraping of mud and stones into the ruts) was useless. The point taken under the Locomotives Act, 1898, was allowed, and a further reduction was made in respect of part of the cost of the labour complained of. As to the main point—the question of a recognised industry—his Honour held that, although this contention was supported by the evidence, nevertheless the traffic was extraordinary by comparison with the timber haulage which had previously taken place on these roads during the existence of that same industry, and that the case was indistinguishable from *Gwionydd*

Rural District Council v. Green (72 J.P., 321). He gave judgment for the council for £33 11s. 9d. and costs.

QUERIES AND REPLIES.

In order to avoid confusion queries are requested to use distinctive words, as *noms de plume*. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

ALTERATION OF AREAS: COMPENSATION TO OFFICERS.

"Auld Lang Syne" writes: An application has been made to the county council by three urban district councils for the unification of their districts into one. The arrangement to do so is friendly, no opposition is expected, and the Order will no doubt be made. What I wish to ask is: (1) Have not the county council the same powers with reference to including a section in the Order relating to compensation to existing officers who may be displaced, as if the Order were made direct by the Local Government Board (I am aware that the latter have finally to approve the Order)? (2) If so, cannot an existing officer refuse to take office under the new authority, and still be entitled to compensation? (3) That being so, would not compensation for an officer having fifteen years' service (without added years) be assessed at 1/3ths of his salary, and emoluments for the five years preceding the Order? (4) Is a recent ruling of the Treasury to the effect that no years must be added, and do you know of any alteration in the law which alters the method of assessing compensation for completed years of service as set out in paragraph No. 3?

(1) Sec. 120 of the Local Government Act, 1888, provides for compensation to existing officers, and there is no need to make a special provision for this in the Order. (2) Yes; but in fixing his compensation regard will be had to any emoluments which he might have acquired if he had not refused to accept a new office. (3) The compensation would not exceed 15/60ths of the annual service, and emoluments plus 7/60ths additional for added years. It does not follow that it would amount to that. (4) Power was given to the Treasury to make an additional allowance for added years by a Treasury minute dated June 14, 1859. So far as I can ascertain, this minute has never been formally withdrawn. But it is permissive only, and it appears that of late years it has been the practice of the Treasury not to allow for "added years" except in what they consider to be "special cases."

BUILDING BY-LAWS: "HUMAN HABITATION."

"Alpha" writes: In the grounds of a private boarding school there has recently been erected a wooden building intended to be used as a gymnasium, and occasionally for private entertainments to be given by the pupils of the school, to which parents and friends of the pupils would probably be invited. The building, if "not constructed or adapted to be used either wholly or partly for human habitation," would, from its situation, be exempt from the operation of the building by-laws. Its legality, or otherwise, therefore hinges upon the interpretation of the words "human habitation." Will you kindly inform me whether, in your opinion, the use of a building for the purposes stated would render it a building used "wholly or partly for human habitation"?

There does not appear to be any authoritative definition or explanation of the expression "human habitation" as used in by-laws. On reading clauses (1) and (2) of No. 2 of the Model By-laws, in which the expression occurs, I am of opinion that "habitation" is there used in the sense of "residence." This view seems to be corroborated by the clause excluding from the exemption a building used as a place of habitual employment in a business, &c., which clause would be redundant on the assumption that "habitation" extended to any user short of actual residence. In my opinion, therefore, the use of a building as a gymnasium and for occasional private entertainments, is not a use "wholly or partly for human habitation." I think the phrase "wholly or partly" is used to cover the case of a building of which part only may be used as a residence.

HIGHWAY DIVERSION.—"O. P. H." writes: Plans were deposited by the lord of the manor showing a proposed diversion of an old parish highway and the laying out of a new road. These plans were duly approved by the council, and the diversion and a new road have been roughly formed and ballasted. Now the council consider that the lord of the manor should complete the diversion. He offered to com-

plete the surface of the roadway if the council laid the kerb, channel, lighted and completed the foot-paths. This the council refused to do. Now the lord of the manor says he has done all he intends to do, and that the council can proceed under the Private Street Works Act, 1892. Can such a diversion of an old parish highway be dealt with under the Act, or is the lord of the manor bound to complete the road? The diversion is much wider than the old highway, the old road being about 18 ft. wide, and the diversion 36 ft.

The only way in which the diversion can be legally carried out, and the old highway stopped up, is by obtaining a magistrate's certificate in the manner prescribed by secs. 84 and 85 of the Highway Act, 1835. The consent of the council (exercising the powers of the vestry) is necessary for this purpose. The council could refuse to consent unless and until the new road is properly made up.

COUNTY SURVEYOR: LIABILITY OF COUNTY COUNCIL.—"Backfire" writes: The main roads of a certain county are directly maintained by the county council, and the county divided into certain districts. The surveyor in charge of each district has to provide a motor cycle, and use it in the course of his duties, the remuneration being an annual allowance. The surveyor's salary is over £150 per annum, and under £200 per annum. The remuneration as regards the running of the motor cycle is distinct from that of salary. The questions arising are: (1) In the event of the surveyor, in the course of his duties, meeting with a motor-cycle accident, and become injured in any way himself, who is the responsible party? (2) If the surveyor, riding the motor cycle, meets with an accident or mishap, and does injury to other parties, is he, or are his employers, responsible?

(1) Unless the surveyor's total remuneration, including the allowance for the motor cycle, exceeds £250 a year, the council would be liable to pay compensation under the Workmen's Compensation Act, 1906, for his personal injury by accident arising out of and in the course of his employment. (2) If the injury was the result of the negligence of the surveyor in the course of his employment the council would be liable.

PRIVATE STREET WORKS: ADOPTION OF STREET.—"Alphon" writes: Some time ago my council served notices under the Public Health Act, 1875, for a certain street to be made up, the work being ultimately put out to contract and duly completed to my satisfaction. Afterwards apportionment notices were sent out and all payments made except in one case, where a part of the amount was paid, the arrangement being that the remainder should be met in four yearly instalments. Before the work had been finished three months, and any money on account of apportionment had been paid, I was instructed to tar-paint the surface of the road, and now one of the frontagers who has paid maintains we have, by executing the aforementioned tarring, taken over the road. Is this so, considering the cost was paid out of the rates, and not out of any monies due to the contractor on account of his contract, and we have not declared it a public highway repairable by the inhabitants at large?

No. The only way in which the street can become repairable by the inhabitants at large is by notice under sec. 152 of the Act.

BUILDING BY-LAWS.—"Discipulus" writes: (1) Has an urban district council the power to permit a breach of its building by-laws? (2) If it has no power to do so, and yet permits a breach, can a ratepayer obtain a mandamus to compel the council to enforce its own by-laws?

(1) Not unless the by-laws themselves give the authority a dispensing power or discretion. See *Yabbicom v. King* (1899, 1 Q.B., 444). (2) I cannot find any recorded instance of a mandamus having been granted to compel a local authority to enforce their own by-laws, and I think it is doubtful whether a mandamus would be granted at the instance of a ratepayer, at all events, unless the Attorney-General were a party to the proceedings.

BUILDING BY-LAWS: "HUMAN HABITATION."—"A. R. S." writes: A building 12 ft. by 10 ft., which is on wheels, and constructed of galvanised iron, and is used for a coal order office. Can this building be classed as being used for human habitation? Can a council compel its removal?

I do not think this would be held to be a building intended for human habitation within the meaning of the by-laws. It is a question whether it is a building at all. See *London County Council v. Pearce* (1892, 2 Q.B., 109); *Same v. Humphreys* (1894, 2 Q.B., 755). Unless it is a building the council cannot compel its removal.

ERRATUM.

At p. 349 *ante*, column 1, line 30, for "July" read "February."

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bradford T.C. (February 25th. Mr. F. H. Tulloch).—£6,705 for cottage baths at Greengates, Great Horton, Oswald-street, and Worthington-street; £800 for alterations and extensions at the Drummond-road baths; and £1,022 for the construction of bowling greens at Horton Park, Victoria Park, and Wyke Recreation Ground, and for transforming part of a tipping ground at St. Michael's-road into a recreation ground. The town clerk, Mr. F. Stevens, in explaining the grounds of the application, said that if there had been one thing more successful than another in the business of the corporation it had been the cottage baths. The baths were all erected in districts inhabited by the poorer classes of the population, and the convenience had been greatly appreciated. Evidence was also given with respect to the success of the existing bowlings.

Coalville U.D.C. (February 26th. Mr. F. H. Tulloch).—£216 for works of water supply.—The surveyor, Mr. L. L. Baldwin, stated that the work, which had been carried out, consisted of the laying of a 4-in. main to link up existing mains. A slight accident to a hydrant on the 12-in. supply main brought home to the council the risk of having the whole of the water supply to Coalville and Hugglescote cut off, and it was then decided to lay this connecting link. Owing to the tenders being excessive, the work was carried out by council labour. The inspector said if the tenders exceeded their estimate, it was wise for the council to carry out the work themselves.

East Stow R.D.C. (February 25th. Mr. W. O. E. Meade-King).—£1,147 for the purposes of water supply for Combs.—Mr. G. Midgley Taylor stated that the scheme would supply 250 people, and be a stand-pipe supply. A 6-in. diameter bore was contemplated, and the expected depth to the surface of the chalk was 90 ft. Each half of the proposed reservoir would contain three days' supply, that being 7,500 gallons.

Haslingden T.C. (February 25th. Mr. M. K. North).—£600 for the sewerage of Sunnybank, Helms-shore.—The borough surveyor, Mr. J. S. Green, said that the population which the sewer would serve was about ninety. There would be no separate surface water sewer, because the river ran parallel with the land, and the surface water could drain into that. They would use earthenware pipes except for 323 yds., where iron pipes would be used.

Hastings T.C. (March 11th. Mr. M. K. North).—£4,890 for the repaving of three streets.—In his evidence the borough surveyor, Mr. P. H. Palmer, stated that the experience of the council with regard to Jarrah blocks had been very good indeed.

Hove T.C. (March 5th. Mr. Edgar Dudley).—£10,000 for the widening and improvement of Hove-street.—The borough surveyor, Mr. H. H. Scott, stated that there was a considerable population in the north-western part of the borough, particularly in the summer-time, and this street formed part of the main artery to the sea front. The present street was only 30 ft. in width, and it was proposed to widen it to 60 ft. The widening had actually been commenced at each end.

Lowestoft T.C. (February 19th. Major J. Stewart).—£547 for alterations and extensions to the Royal Plain lavatory.—Evidence as to the proposed work was given by the borough surveyor, Mr. G. H. Hamby, it being stated that the lavatory, which was constructed some twenty years ago, was now inadequate.

Shepley U.D.C. (February 19th. Mr. Edgar Dudley).—£750 for the purchase of a recreation ground and bowling green.—The clerk, Mr. E. Emmott, stated that the area of the ground was 8 acres 730 sq. yds.

Stafford T.C. (March 10th. Mr. A. G. Drury).—£13,700 for gasworks' extension.—The gas engineer gave evidence as to the development of the undertaking, and said it was found necessary to increase the holder capacity by the addition of another gas-holder.

Tavistock U.D.C. (March 10th. Mr. W. O. E. Meade-King).—£750 for works of water supply.—The surveyor, Mr. F. Gamble, explained that it was pro-

posed to carry a main from the reservoir on Whitechurch Down to supply a number of houses on the Chollacott estate.

Wallasey T.C. (March 6th. Mr. T. Adams).—This was an inquiry into the application of the council for permission to prepare a town planning scheme for an area bounded on the north by Sandfield-road, on the east by Seabank-road, on the south by a line between the junction of Penkett-road and Stratheona-road and the junction of Elgin-drive and Seabank-road, and on the west by Penkett-road and Rake-lane. The total area is 1,423 acres, and practically all the land is potential building land, and extensive building operations it was stated might start at once.

Ware U.D.C. (February 25th. Mr. Edgar Dudley).—£1,000 for the widening and improvement of Star-street, and an application by the county council to borrow £1,500 as a contribution towards the improvement. The clerk to the urban council, Mr. G. H. Gisby, stated that the road was extremely narrow. There was a considerable amount of traffic over the road, which was a main road to the east side of the county. The junction of this street with the main street was particularly dangerous, and occasionally vehicles with wide angles had stuck in the narrow part of the street. The surveyor, Mr. H. Fox Hill gave figures and particulars regarding the materials of which the new street would be constructed.

West Hartlepool T.C. (March 6th. Mr. W. M. Cross).—£2,200 for the extension and rearrangement of the public library buildings. It was explained that it was proposed to adopt the open-access system in the lending department. The present news-room, which is to be converted into the lending department, will be enlarged to twice its size, and the present lending department will become the news-room.

Wilmslow U.D.C. (February 26th. Mr. P. M. Crosthwaite).—£1,100 for road improvements.—It was explained that it is proposed to widen Hawthorn-street, Macclesfield-road, Hough-road, and Mottram-road.

APPLICATIONS FOR LOANS.

- Bacup T.C.**—£1,000 for electric lighting extension.
Baldock U.D.C.—£420 for a water supply scheme, and £5,207 for a sewerage scheme.
Barnmouth U.D.C.—£2,300 for the provision of an open space.
Barrow-in-Furness T.C.—£8,000 for electricity mains, services, and other equipment.
Birkenhead T.C.—£1,350 for road improvement.
Bognor U.D.C.—£480 for the purchase of a steam roller with scarifier and water sprinkling attachment.
Christchurch T.C.—£3,850, supplementary loan for the sewerage scheme.
Croydon T.C.—£3,800 for the provision of a Game-well fire alarm.
East Cowes U.D.C.—£1,325 for pumps and a suction gas engine at the waterworks.
Epsom U.D.C.—£706 for water mains extension.
Hornsea U.D.C.—£1,500 for the erection of eight cottages.
Knaresborough U.D.C.—£3,180 for an electric lighting scheme.
Larne U.D.C.—£3,500 for road improvement.
Mansfield T.C.—£1,200 for road widening.
Rochdale T.C.—£17,000 for a tramway-car shed and machinery.
Swaffham U.D.C.—£1,110 for a new cemetery.
Torquay T.C.—£5,000 for the extension of electricity mains.
Ulverston U.D.C.—£5,612 for a sewerage scheme.
Workshop U.D.C.—£350 for a public convenience.

LOANS SANCTIONED.

- Beeston U.D.C.**—£28,770 for sewerage and sewage disposal works.
Chertsey R.D.C.—£1,520 for sewerage works.
Clevedon U.D.C.—£2,424 for drainage works.
Colne T.C.—£4,450 for the purchase of ground for a recreation ground.
Dartford U.D.C.—£1,835 for street works.
Glossop T.C.—£170 for road improvement.
Manchester T.C.—£10,000 for the purchase of Hulme Barracks site.

Nelson T.C.—£26,000 for vertical retorts and other equipment at the gasworks.

Potterspurty R.D.C.—£3,500 for works of water supply.

Ramsgate T.C.—£3,041 for tar-macadam paving, and £3,467 for wood paving.

Sandown U.D.C.—£490 for road improvement.

Scarborough T.C.—£3,412 for improvements in the South Cliff Gardens.

Twickenham U.D.C.—£5,300 for resurfacing Cross Deep and Waldegrave-road with asphalt macadam.

FORTHCOMING INQUIRIES.

	MARCH.	£
17.— Birkenhead. For street improvement (Mr. Edgar Dudley)		1,315
17.— Hereford. For the erection of workmen's dwellings (Mr. Edward Leonard)		11,752
17.— Leicester. For road widening and sewerage works (Mr. R. H. Bicknell)		1,381
17.— Manchester. For the purposes of water supply (Mr. W. M. Cross)		50,000
17.— Nelson. For the erection of slaughter-houses and street improvement (Major J. Stewart)		26,162
18.— Harrogate. For water supply and street improvement (Mr. R. G. Hetherington)		8,362
18.— Melton Mowbray. For cemetery extension (Mr. R. H. Bicknell)		700
18.— Preston. For works of sewage disposal (Mr. W. M. Cross)		12,075
19.— Bucklow. For works of sewerage (Mr. W. M. Cross)		1,624
19.— Crowle. For the provision of a refuse tip (Mr. Edgar Dudley)		150
19.— Keswick. For the erection of workmen's dwellings (Mr. C. H. Eyles)		600
19.— West Derby. For works of sewerage (Major J. Stewart)		2,200
19.— Willesden. For private street improvement (Mr. M. K. North)		3,755
20.— Chester-le-Street. For the erection of workmen's dwellings (Mr. C. H. Eyles)		50,600
20.— Congleton. For works of sewage disposal (Mr. W. M. Cross)		1,100

Scottish Road Works.—At the last meeting of Kilwinning Town Council the burgh surveyor reported that the cost of the proposed scheme to cause-way the main streets of the burgh would be £5,000. The council decided to communicate with the Road Board, pointing out their proposals for improving the roads within the burgh, asking what grant they were likely to offer in the event of the work being carried out, and the terms on which the board would grant a loan sufficient for the purpose, to be repaid in annual instalments spread over 30 years.—At the monthly meeting of Largs Town Council it was stated that, in reply to a request for a grant for the re-making of a portion of the trunk road through the burgh, the Road Board had intimated that they were not prepared to give any further grants to the burgh, but offering a loan of £600 without interest on the estimated expenditure of £900.

Refuse Disposal in Edinburgh.—In Mid-Lothian Justice of Peace Court on Tuesday a case was heard in which John Gibson, inspector of lighting and cleansing, in the employment of Edinburgh Corporation, was charged with depositing at Camps Quarries, Mid-Lothian, manure which contained waste paper, and failing to take means to prevent the paper being carried away by the wind. Evidence was given to show that the public road was covered for about 200 yds. with waste paper, and that it found its way into adjacent properties. Mr. Gibson, giving evidence, said that the disposal of city refuse was one of the most troublesome questions that corporations had to deal with. He mentioned the precautions taken to prevent paper flying about. Given certain weather conditions it was impossible to keep paper from flying about. Evidence was also given by Councillor Bruce Lindsay, convener of the Cleansing and Lighting Committee, who said that the spraying arrangements were the best that could be adopted. A penalty of £2 was imposed. Notice of appeal was given.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works, of which particulars appear below: Buildings—Forfarshire £20,000, Newport £15,000, Torquay £15,000; housing and town planning—Chester-le-Street; roads and materials—Lambeth £69,552; sewerage and sewage disposal—Dalkeith £8,000; water, gas and electricity—Birkenhead, Croydon £15,000, Torquay £50,000.—Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Dudley T.C.—The Higher Education Committee recommend the erection of a hostel for men in connection with the training college, towards which a contribution of 75 per cent of the cost would be obtained from the Board of Education.

Dumfries T.C.—It has been agreed, in conjunction with the burgh of Maxwelltown, to erect swimming baths at an estimated cost of £4,400.

Forfarshire C.C.—A scheme has been approved for the adaptation of Noranside House as a sanatorium, at an estimated cost of £20,000.

Hexham U.D.C.—It is proposed to build a shelter on Tyne Green, at an estimated cost of £350.

Newport (Mon.) T.C.—It was agreed at the Works and Parliamentary Committee meeting on Monday to carry out extensions of the town hall, at an estimated cost of £15,000.

Prescot U.D.C.—The Local Government Board have sanctioned a loan for the provision of a fire escape station.

Salford T.C.—It has been decided to purchase the premises and the site adjoining a church school for £5,490, for the purpose of a council school.

Selby R.D.C.—It has been agreed to contribute £2,500 towards the cost of the new bridge over the Aire at Carlton, provided the Goole Rural District Council contribute a similar amount. The estimated cost of the scheme is £16,000, and the balance of £11,000 will be met by the county council.

Swansea T.C.—Plans have been prepared for a new school for 1,200 scholars.

Tunbridge Wells T.C.—A tea kiosk is to be built in the St. John's Recreation ground, at a cost of £250.

Torquay T.C.—A report has been submitted stating that the Local Government Board had approved generally of the corporation's scheme for the provision of medical baths and swimming bath, at an estimated cost of £15,000.

HOUSING AND TOWN PLANNING.

Balbriggan U.D.C.—The council have determined upon a scheme for the better housing of the working classes of the town. The scheme proposes to provide thirty houses in the urban area, to be let at rents of 3s. to 4s. 6d. weekly, for which class of dwelling there is a large and urgent demand.

Buckingham T.C.—A committee has been appointed to prepare a scheme of workmen's dwellings.

Chester-le-Street U.D.C.—It has been decided to proceed with a scheme of municipal housing on model lines. An estate of 17 acres has been secured on the western side of the town, near the railway station, in a most healthy position, and on this it is proposed to build 198 houses at a cost of £50,609. There will be 116 houses with a kitchen, scullery and two bedrooms; 70 with kitchen, scullery and three bedrooms; and 12 with parlour, kitchen, scullery and three bedrooms. Each house will have a bath in addition. The rents will be 5s. 9d., 6s. 9d., and 7s. 9d. a week respectively. Each house will have a garden both at the back and front; there will be no back streets, but the front streets will be 40 ft. wide, with grass verges, trees, and good footpaths. The main approach will be 50 ft. wide. About 3 acres of the land is to be reserved for a children's recreation ground, and twenty-four sites abutting on the main road are to be sold to private individuals for the erection of a better-class house than any of those to be built by the council.

Irvine T.C.—It has been resolved to consider in committee the advisability of erecting houses suitable

for the working classes under the powers contained in the Housing of the Working Classes Acts, 1890 to 1909.

Kidsgrove U.D.C.—The surveyor, Mr. F. C. Crimes, has received instructions to report upon the provision of cottages at Hardingswood, on land belonging to the council.

Motherwell T.C.—A housing scheme has been adopted, the class of house to be erected to be, approximately, thirty one room and kitchen houses, with scullery and bath-room, ten two-room and kitchen houses, with scullery and bath-room, the remainder to consist of a larger class of house.

Naas U.D.C.—The council have accepted the tender of Mr. Denis Corcoran, Naas, at £1,599, for the erection of six artisans' dwellings near the railway station.

Newcastle-on-Tyne T.C.—The city surveyor, Mr. F. H. Holford, has received instructions to prepare plans for the erection of workmen's dwellings in City-road, and round South Byker playground, consisting of houses of two, three and four rooms.

Swansea T.C.—The Housing Committee recommend the corporation to appoint a new official, at a salary of £150 a year, whose duty it shall be to draw up specifications in reference to dilapidated properties. The medical officer of health and the borough architect, who have advised this course, reported that in Birmingham and Nottingham there is a special department for this purpose under the health authority.

Tenby T.C.—A scheme is under consideration for the provision of workmen's dwellings, at an estimated cost of £3,000.

Upholland U.D.C.—The council on Monday approved plans of eight houses to be erected under the Housing and Town Planning Act. Four of the cottages are not to cost more than £160 per house, and four not more than £175 per house. It was stated that for years there had been a serious shortage of workmen's dwellings in the district. The land had been offered at 1½d. per square yard. The Local Government Board is to be asked to sanction a loan.

REFUSE COLLECTION AND DISPOSAL.

Tiverton T.C.—A special committee has been appointed to consider the desirability of purchasing a steam tractor to remove the town refuse and do the borough haulage.

ROADS AND MATERIALS.

Barnoldswick U.D.C.—A scheme is under consideration for the construction of a road from Long Ing to Earby and Salterforth-road, at an estimated cost of £2,600.

Bicester U.D.C.—A proposal is being discussed for the improvement of Market-square and the provision of public conveniences, at an estimated cost of £631.

Bridgwater R.D.C.—The surveyor, Mr. W. A. Collins, has been instructed to prepare plans and estimates of alternative schemes for the road improvement at Wenubdon Hill.

Chelsea B.C.—The Road Board have sanctioned a grant of £1,000 towards the cost of paving work on the Embankment.

Colne T.C.—The council have approved a report by the borough surveyor, Mr. T. H. Hartley, and the town clerk, Mr. A. Varley, with plans and estimates, on the construction of a road from Byron-street to Keighley, and it has been decided that the thoroughfare shall be made 14 yds. wide. The estimated cost of the scheme is £9,100.

Lambeth B.C.—The Highways Committee have prepared a list of repairs and paving works to be done to various roads, amounting to £69,552.

Lewisham B.C.—It was recently reported to the council that the Improvements Committee of the London County Council were considering a suggestion of a new road of 70 ft. from Southend Village, in a south-easterly direction along the Ravensbourne Valley, to a point in Bromley, in line with Mason's-hill. The new road is proposed in preference to the suggestion to continue the widening of Bromley-road for the whole of its length to the Bromley boundary.

Northampton T.C.—The Highways Committee have adopted a scheme for the improvement of the Houghton-road, at an estimated cost of upwards of £7,400, towards which the Road Board had agreed to make a grant of £3,000. The Road Board have intimated that in addition they will lend the council a further sum of £3,000, free of interest, for a period of six years, the amount to be repaid by annual instalments of £500.

Oxford T.C.—It is proposed to reconstruct the foundations of the main streets, at an estimated cost of £1,000.

Torrington R.D.C.—In consequence of the increase in road work a road foreman is to be appointed to assist the surveyor, Mr. B. T. James.

SEWERAGE AND SEWAGE DISPOSAL.

Beverley R.D.C.—At the meeting of the council recently, a letter was read from the Local Government Board stating that they heard with regret the decision of the rural council not to proceed with the sewerage scheme for the contributory place of Elloughton-with-Brough, as required by the board's Order of December 19th last. The board further stated that unless they received within two months from the date of that letter a satisfactory assurance from the council that the works necessary for providing the contributory place with sufficient sewers would be commenced within the time limited by the Order of the board, they would, without addressing further communication to the council, place the matter in the hands of solicitors with instructions to apply to the High Court of Justice, immediately after June 10th next, for a writ of mandamus to enforce the Order. The council decided only to acknowledge the letter.

Burntisland T.C.—Improvements are to be carried out in the drainage, at an estimated cost of £668.

Dalkeith T.C.—A site has been obtained at Newmills for sewage disposal purposes, and the council have accepted an estimate, at about £8,000, for the necessary works.

Haywards Heath U.D.C.—The tender of Mr. H. White, at £178, has been accepted for sewer construction in Eastern-road.

Hetton U.D.C.—The surveyor, Mr. J. Harding, has prepared a scheme of sewerage extension, the cost of which he estimates at £954.

Wrexham R.D.C.—The first instalment of the Gwersyllt drainage scheme is to be carried out, at an estimated cost of £2,000.

WATER, GAS, AND ELECTRICITY.

Aberayron R.D.C.—The council are being pressed by the county council to provide an efficient water supply, and it has been decided to obtain the views of the parish councils on the subject.

Birkenhead T.C.—A special sub-committee of the Water Committee have recommended the acceptance of the tender of Messrs. T. Wardle & Sons, Bristol, for £140,325, for the construction of the Dee tunnel and pipe line between Connah's Quay (Flintshire) and Birkenhead, in connection with the Plwen water supply.

Bradford T.C.—The Gas Committee have approved a scheme for new carbonising plant.

Croydon T.C.—The chlorine process of water purification, capable of dealing with 4,000,000 gallons daily, is to be installed, at an estimated cost of £15,000.

Derby T.C.—It is proposed to provide additional electricity plant, at an estimated cost of £12,540.

Doncaster T.C.—Since the Leeds ratepayers rejected the clauses in the Leeds Corporation Bill empowering that authority to supply water to Doncaster, the Special Water Committee of the Doncaster Corporation have been forced to consider other sources of supply, and the matter is still engaging their attention. It is understood that a scheme has been brought before them for a supply from the red sandstone strata underlying the town and district.

Exeter T.C.—The Electricity Committee have decided to instal a 1,000-kilowatt high pressure steam turbo alternator of the impulse type at the electricity works to meet the increasing demand for current, and particularly in view of the additional framecars to be provided. The price of the new generator is £4,211, and the total cost is estimated by the electrical engineer at £6,200; but he considers that it will save a minimum of £440 per annum.

Gateshead T.C.—It was agreed last week to adopt the electrolytic system for purifying the water used in the Mulgrave-terrace swimming bath. The council further decided that the plant laid down should be of sufficient capacity to provide, in addition, fluid for the disinfecting of schools and for other public sanitary purposes. It was estimated that the cost of the plant would be £450.

Grantham T.C.—The council have accepted the tender of the Grantham Gas Company for street lighting for five years.

Hay (Brecknock) U.D.C.—The surveyor, Mr. A. E. Smith, has received instructions to prepare a scheme for a water supply from Dulais Brook.

Kidderminster R.D.C.—Plans have been passed for the enlargement of the Bewdley waterworks, including the area of the new borehole. The council have also signed the agreement with the Bewdley Corporation for the supply of water in bulk for the parish of Wribbenthal.

Kinghorn T.C.—The question of an improved water supply is under the consideration of the council.

Torquay T.C.—The Local Government Board have sanctioned a loan for the first part of the new water main which it is proposed to lay from the reservoirs on Dartmoor to the town in sections at a total estimated cost of about £50,000.

Whitchurch (Ross) R.D.C.—It has been agreed to forward the plans of the new water supply scheme to the Local Government Board for their approval.

PERSONAL.

Mr. W. J. B. Smale, surveyor to the North District of the Liskeard Rural District Council, has been voted an increased salary of £25 a year.

Mr. H. Hamer, deputy borough engineer of Acerington, has been appointed chief assistant to the borough surveyor of Stockport in succession to Mr. Ward.

Mr. C. Moulds, surveyor for the Louth district under the Horncastle Rural District Council, has resigned in order to take up a position in the South of England.

Mr. Robert Thomas has been appointed, at a salary of £80 a year, rising to £100, surveyor to the Valley (Anglesey) Rural District Council in succession to the late Mr. J. Hugh Evans.

Mr. Archibald Edwin Hewitt, of Hexthorpe, Doncaster, has been appointed sanitary surveyor and inspector of nuisances to the Blyth and Cuckney Rural District Council, at a salary of £130 per annum.

Mr. T. G. Crump and Mr. S. S. Orchard, surveyors to the Taunton Rural District Council, have each been voted increases of salary, from £230 to £250 in the case of the former, and £180 to £220 in the case of the latter.

Mr. David Ronald, burgh engineer of Falkirk since 1898, has been appointed to the engineering staff of the Local Government Board for Scotland. Mr. Ronald is hon. secretary to the Scottish District of the Institution of Municipal and County Engineers.

Mr. W. W. Newman, ASSOC. M. INST. C. E., deputy engineer, Mr. W. H. Duckworth, and Mr. W. J. Staddon, engineering assistants to the Watford Urban District Council, have been granted an increase in their salaries, and further annual increases to a maximum of £300, £160, and £110 per annum respectively.

Mr. Arthur H. Blanchard, M.A.M. SOC. C. E., Professor in Charge of the Graduate Course in Highway Engineering at Columbia University, on February 19th delivered illustrated lectures at the Ohio State University on the subjects: "Road Legislation, Present and Future," "Bituminous Surfaces and Bituminous Pavements," and "Foreign Highways."

Mr. William Gibson, who at present holds the position of assistant burgh engineer, was on Tuesday appointed burgh engineer of Falkirk in succession to Mr. David Ronald. Mr. Gibson is a native of Falkirk, where he served his articles in an architect's office. For some time before becoming assistant burgh engineer at Falkirk he occupied a similar post in Arbroath.

Messrs. J. D. K. Restler, waterworks engineer's office, Rickmansworth, and W. J. A. Watkins, engineer's department, London County Council, have been transferred from the class of associate-members to

that of members, and Mr. J. Mayho, borough engineer's department, Burnley, has been elected an associate-member, of the Institution of Civil Engineers.

Mr. J. R. Davidson, M.Sc., Assoc.M.Inst.C.E., at present principal assistant engineer for the Rivington and Vyrnwy works, who has been in the service since 1898, and whose present salary is £600 per annum, is recommended by the Water Committee as water engineer of Liverpool, at a salary of £800 per annum, in succession to Mr. Joseph Parry, who is to act in the capacity of consultant city water engineer.

Mr. O. Claude Robson, engineer to the Willesden Urban District Council, has had his salary increased by £200 a year, and the council have also decided to provide him with a motor car upon the understanding that one-third of the cost thereof and of the annual maintenance expenses shall be borne by Mr. Robson. The car will be available for his private use when not required on official business. Mr. Robson, it may be added, has been in the service of the council for thirty-nine years, and the council have placed on record their appreciation of his "faithful and zealous service" during that long period.

Mr. E. Campbell MacCormac, formerly chief assistant in the sewage department of Messrs. J. Stone & Co., Limited, engineers, Deptford, S.E., has been appointed chief of the sewage department of Messrs. Daniel Adamson & Co., engineers and boiler makers, Dukinfield and Westminster. This firm's patent sewage (pneumatic) ejectors, air compressors, sewage distributors, &c., are now in extensive operation both at home and abroad. For many years Mr. MacCormac has been in close touch with the scientific design and lay-out of sewerage, sewage lifting and sewage disposal appliances, and many of his specialities have been adopted by the British Admiralty, the Crown Agents for the Colonies, and by numerous consulting civil engineers and municipalities.

FOR OTHER ADVERTISEMENTS

See End of Paper.

WANTED, in Surveyor's Department of Urban District Council, 16 miles from London, South-West Suburb, a Junior Clerk; must be good shorthand typist, and have had previous experience in a Municipal Surveyor's Office. Salary £45 per annum, rising to £65 per annum.—Box 1,395, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,429)

DRAUGHTSMAN-SURVEYOR seeks position or Partnership with Surveyor. Building Construction; Surveying and Levelling; good Draughtsman; 16 years with Liverpool Corporation. Could invest £100.—Box 1,397, office of THE SURVEYOR, 21 Bride-lane, Fleet-street, E.C. (1,434)

SURVEYOR'S ASSISTANT (22) desires appointment. Three years articled to a County Surveyor. Experienced and efficient surveyor, accurate leveller, neat draughtsman, and good photographer. Excellent testimonials. Moderate salary. Free immediately.—Box 1,396, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,433)

EAST GRINSTEAD RURAL DISTRICT COUNCIL.

TENDER FOR THE SUPPLY OF TAR.

The above Council invite Tenders for the supply of about 10,000 gallons (more or less) of Tar, prepared in accordance with the Road Board's Specification for Tar No. 1, delivered, carriage paid, in Contractor's own barrels, to the following Stations on the L.B. & S.C.Rly.:—

Three Bridges, Rowfant, Grange-road, West Hoathly, East Grinstead, Forest Row, Hartfield, Withyham, Groombridge, Ashurst, Crowborough.

The Council will pay railway carriage on the empty barrels to be returned.

Delivery will be required in full truck loads within 7 days from receipt of order, the first of which will probably be dispatched during the second week of April, 1914.

Tenders, endorsed "Tender for Tar," must reach Mr. Francis S. White, Clerk to the Council, 6 High-street, East Grinstead, on or before Wednesday, April 1st, 1914.

The Council do not bind themselves to accept the

lowest or any Tender, and reserve to themselves the power to require delivery of a greater or less quantity than the approximate quantity (10,000 gallons) named above, at the same rate as the Contractor's accepted price.

(By order of the Council)

FRANCIS S. WHITE,

Clerk.

March 11, 1914.

(1,431)

COUNTIES OF BERKS AND SOUTHAMPTON.

CONSTRUCTION OF A BRICK AND CONCRETE BRIDGE AT NEWTOWN FORD, NEAR NEWBURY.

TO CONTRACTORS.

Persons desirous of Tendering for the Construction of a Brick and Concrete Three-arched Bridge at Newtown Ford, on the Winchester, Whitechurch and Newbury Main Road, may see Plan, Specification and General Conditions, and obtain a copy of the Bill of Quantities and all other necessary information, on application at the office of Mr. W. J. Taylor, County Surveyor, The Castle, Winchester, on and after Monday, the 9th day of March, 1914, between the hours of 9 a.m. and 4 p.m. (Saturdays, 9 a.m. and 12 noon).

A deposit of two guineas will be required for a copy of the Bill of Quantities, which will be refunded on receipt of a *bonâ-fidè* Tender.

Deposits must be made by cheque, payable to the "Hampshire County Council," and crossed "Capital and Counties Bank," or particulars will not be sent.

Tenders, on forms supplied by the County Surveyor, must be endorsed "Newtown Bridge," and be delivered to me on or before 10 a.m., Wednesday, the 25th March, 1914.

The County Council do not bind themselves to accept the lowest or any Tender.

H. BARBER,

Clerk of the Hampshire County Council.

The Castle, Winchester.

February 26, 1914.

(1,435)

TRING URBAN DISTRICT COUNCIL.

TENDERS FOR MATERIALS.

The Council invite Tenders for the Supply and Delivery of Kerb, Setts, Broken Granite, Flints, and Hoggin, as and when required for the year ending 31st March, 1915.

Full particulars and Forms of Tender may be obtained on application to the undersigned.

Sealed Tenders, endorsed "Tender for Materials," and accompanied by Samples, must be delivered to me not later than noon on Monday, the 23rd day of March, 1914.

The lowest or any Tender will not necessarily be accepted.

S. S. GETTINGS, Assoc.M.Inst.C.E.,

Surveyor.

Surveyor's Office,

Tring.

March 11, 1914.

(1,425)

THINGOE RURAL DISTRICT COUNCIL.

Tenders are invited for the supply of Granite during the year ending 31st March, 1915.

Particulars and Forms of Tender may be obtained on application to the undersigned.

A. R. CAMERON.

Board Room,

Mill-road,

Bury St. Edmunds.

March 11, 1914.

(1,430)

URBAN DISTRICT COUNCIL OF THAME.

TENDERS FOR GRANITE.

Tenders are invited for the supply of Granite during the year ending March 31st, 1915.

Forms of Tender and all particulars may be obtained on application to Mr. James T. Robinson, Surveyor to the Council, Town Hall, Thame, to whom Samples of the Materials tendered for must be delivered not later than Monday, March 23rd, 1914.

Endorsed Tenders must be sent to the undersigned not later than Monday, March 23rd, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

C. SIMMONS,

Clerk to the Council.

2 High-street,

Thame.

March 10, 1914.

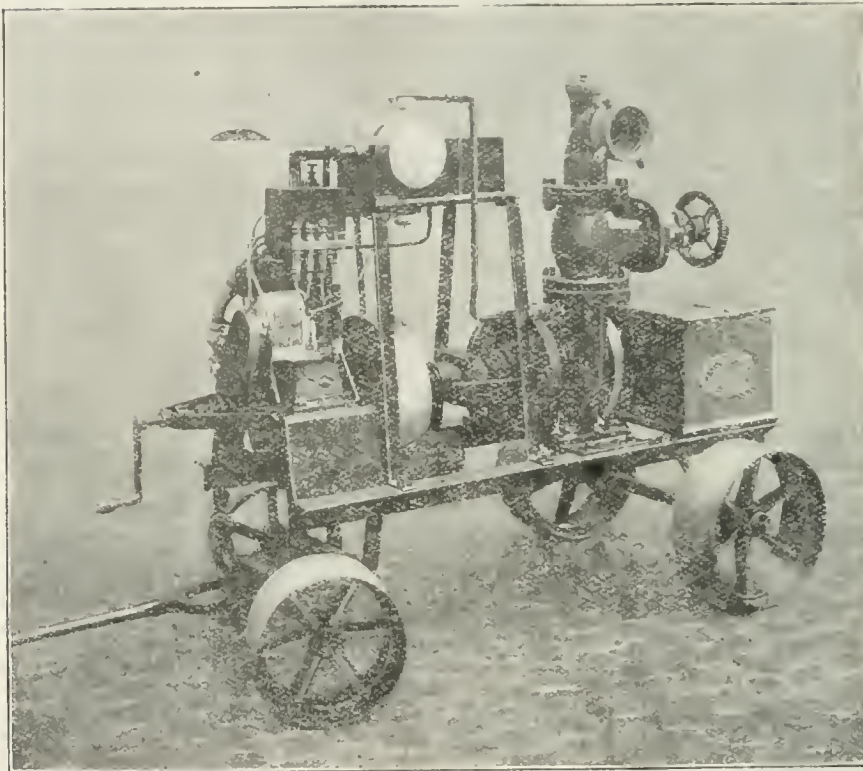
(1,432)

FIRE RESISTANCE OF REINFORCED-CONCRETE FLOORS.

At a time when the question of reinforced concrete is largely before the technical professions, and the question of regulating such structures is receiving the attention of the public authorities concerned, a report issued by the British Fire Prevention Committee (as Red Book No. 188), dealing with a fire test on a reinforced-concrete floor with triangular lattice reinforcement, may be deemed to be of special interest.

The prefatory note to the report indicates that, in comparison with other floor tests, the instructive feature of this investigation is that granite chippings do not appear so satisfactory from the fire point of view as some of the other materials that have been used in the committee's tests, and, further, that the question of protecting the soffit of the reinforced-concrete beams requires careful attention.

It speaks well for the system of construction and



MERRYWEATHER'S PORTABLE PETROL PUMPING SET.

the form of reinforcement used that, regardless of what appears to have been an unsatisfactory concrete aggregate, the floor stood up so well, and obtained the British Fire Prevention Committee's classification of "Full protection, Class B," which means a four-hour test with temperatures reaching 1,800 deg. Fahr., followed by the application of water from a steam fire engine, and it is obvious that if a better form of concrete had been used, and the question of protection had received more consideration, an even better result with less deflection must have been obtained—*i.e.*, a result that would have practically left the floor in such a condition that it need not be taken down for reinstatement after a severe fire.

The British Fire Prevention Committee is testing one to two large floors every year, and, apart from the non-proprietary systems of construction that they have tested, a number of patented systems have now obtained the highest classification, which gives them a special claim for employment by the public authorities and corporations with whom safety from fire is a matter of importance.

Some thirty floors have now been tested by the committee, of which about half were proprietary floors and half floors in common use.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

FLOODED TRENCHES.

A PETROL-DRIVEN PUMP.

We illustrate a light portable petrol pumping set which has recently been supplied to the Rickmansworth and Uxbridge Valley Water Company by Messrs. Merryweather & Sons, of Greenwich, to suit the special requirements of Mr. J. D. K. Restler, the company's engineer. It is employed for pumping out flooded trenches when repairs are being executed.

The pump, which is of the centrifugal type, is capable of dealing with from 200 to 250 gallons of water per minute, and of working on a suction lift of 15 ft., and delivering against a head of 6 ft. The pump casting is of iron, with steel spindle and gunmetal impeller, and has 4-in. pipe connections. The suction inlet is fitted with a gunmetal flange, having screwed connection for the attachment of flexible suction hose and foot valve. The outlet is fitted with a 4-in. gunmetal bend, with connection screwed for the attachment of flexible hose. It is also provided with a smaller screwed connection at the top for priming purposes by hose from the street main. The engine is direct coupled, has two cylinders, and develops 4 to 5 b.h.p. when running at about 1,000 revolutions per minute. It is fitted with magneto ignition, automatic lubrication, and is water cooled by a branch from the delivery.

The engine and pump are mounted on a strong four-wheeled carriage, with angle-steel side frames suitably braced and stayed, and provided with drag-handle. Wide tyred wheels are fitted for use over soft ground, and a small wooden box for tools is placed over the fore-carriage.

A portable petrol-driven trench pump has, undoubtedly, been a long-felt want, and one may prophesy the speedy adoption of such an extremely handy little appliance by waterworks engineers generally.

Association of Engineers-in-Charge.

The nineteenth annual dinner of this body will take place at the Holborn Restaurant on Saturday, March 21st, Dr. R. T. Glazebrook, the president, in the chair.

Inland Waterways.—The Prime Minister was asked in the House of Commons on Monday if, in view of the growing interest in the Midlands and South and West of England in the development of inland waterways of the country, he would state whether the Government proposed to appoint a Waterways Board, as recommended by the Royal Commission on Canals, or to carry out by legislation or otherwise any of the other recommendations of that commission. Mr. Asquith, in reply, said the Royal Commission recommended that the first step should be the appointment of a Central Waterways Board for Great Britain, and most of the other recommendations were dependent on that step being taken.

Concrete Pipes and Paving Blocks.—In Johannesburg the manufacture of concrete pipes for storm-water drainage, and paving blocks, is carried out departmentally by white labour. During the twelve months ended June last the number and sizes of pipes made were as follows: 825 12 in., 644 15 in., 549 18 in., 542 22½ in., 223 25 in. Total, 2,783 pipes, or 2,668 yds. when laid. A large number of concrete paving blocks for approaches to refuse destructors and intakes, and for tramway tracks, were made departmentally. These blocks are faced on the upper surface with granite spalls. They vary in size up to 26 in. by 20 in., and are 4 in. thick. The total area of blocks made during the year amounted to 3,450 sq. yds.

ORDERS FOR FOREIGN STEEL.

STELLORITE COMPANY'S CLAIM.

We are indebted to our contemporary the *Hythe Reporter* for the following report of a case which was recently heard at the Hythe County Court, in which the Stello-rite Company, Paris, sued the Hythe Gas Company. They claimed £29 12s., the price for the following steel sold and delivered: 1 cwt. 2 qrs. 1 bar, Stello-rite steel, 2½ in. square, for cold sets, at 1s. 4d., £12 1s.; 3 qrs. 26 lb., 1 bar, Stello-rite steel, 1¼ in. square, for smith use, £7 6s. 8d.; 1 cwt. 1 qr. 8 lb. ½ bar, Stello-rite steel, 2 in. square, £9 17s. 4d.

Mr. H. J. Wallington, instructed by Mr. W. H. Speed, appeared for the plaintiff, and Mr. Clements, instructed by Messrs. Atkinson & Stainer, appeared for the defendants.

After Mr. Wallington had briefly opened the case—

Mr. Tom Hayman went into the box, and said he was a partner in the plaintiff firm. On July 21st last year he called at the offices of the Hythe and Sandgate Gas Company. Mr. Tully, the manager, was away. He discussed with the son the question of him giving an order for some of the Stello-rite steel, and he (witness) described the qualities and its capabilities. He said to the son, "Your father being away you have no power," and he replied, "Oh, yes; I have full power." Eventually he gave him an order.

Cross-examined by Mr. Clements: The gentleman who signed the order said he was the manager's son. He (witness) had been a partner in the firm since July 24th last year. He was a traveller for the firm for six months before he became a partner. Their address was in Paris. At present they were getting someone to manufacture for them in Paris, according to their instructions. The son did not say his father was away, and that he had no authority to order any goods. He said he had full power when his father was away. He told Mr. Tully he would like him to try some of the steel, as there were others who had tried it. He did not say, "It is a pity your father isn't here." The son certainly did not write the order at his dictation. He saw what orders he (witness) had, and copied one. He told him that the approximate cost would be £34. When he told him it was about £13 per bar he said it was a lot of money, but he told the son he was only getting half a bar. He swore that when the young man signed the order he knew he was signing for £34 worth of goods. He did not know that the invoice was not sent until months after the goods were delivered.

In reply to further questions witness said that he explained what three metres meant.

Mr. Clements: I put it to you that you played a trick on this young man?

Mr. Hayman: I object to that remark.

Did you play a trick on him?—Certainly not.

Is it the first time in the course of your business experience your customers have made a mistake in regard to this measurement of the metre?—Out of hundreds and hundreds of orders.

Mr. Clements mentioned three other cases which had been taken by the Stello-rite firm at Market Harborough; but Mr. Hayman said he did not think the defence set up was that he had tricked the people into the orders, and that they did not understand the measurement of a metre.

Mr. Clements: Having that experience, why didn't you make it perfectly clear to this young man, so that this mistake was not made by him?

Mr. Hayman: I did.

You don't suggest it is as clear as the invoice attached to the summons?—No, not as clear.

Mr. Hayman was questioned as to whether he had done business with the Gosport Urban District Council, and he replied that he did not remember. He did not remember the name of Mr. Harvey, at Gosport.

In reply to a remark by Mr. Wallington, Mr. Clements said he could show Mr. Hayman had been following this system of fraud, and therefore would be likely to follow it to the end.

His Honour: What he said to this gentleman I cannot hear.

Mr. Clements: I say it is a trick played on Tully, and I am entitled to show he has played a similar trick as a system of business. I am entitled to give evidence to show the state of his mind when he

gave this order, if he induced him by fraud to give this order. Did you take an order from Mr. Harvey on behalf of the Gosport Gasworks?

Mr. Hayman: I don't remember.

Have you sent in an account to the Gosport Urban District Council?—They are owing us some money.

Do you know as a matter of fact you have issued a writ against them?—I don't know.

Do you know they have refused to pay on the ground of fraud?

Mr. Wallington: I object to this kind of cross-examination.

Mr. John Hayman was the next witness, and said he was a partner in the company. It was a French company. He had control of the correspondence department, the sending off of the goods, and the invoicing. The goods mentioned had been sent by him to the defendants.

Several letters were read, in which defendants said it was understood from the representative that they would only be short lengths, otherwise they would not have ordered it, as they had no authority to order large quantities. They asked where the goods could be despatched to. The firm replied that there could not have been any mistake on their part, and the length of the bars had been pointed out to the person who signed the order. In reply the firm got a letter on August 23rd, which Mr. Clements pointed out was not signed by Mr. Tully, but was initialed by "J. T." The letter stated that it was quite true the steel had been ordered by their firm, and agreeing to keep one length, but it was of no use to them as they were such large bars. Could they send it anywhere to execute one of the orders. The firm replied that they were unable to take the goods back, and offering 10 per cent discount on the amount.

Cross-examined by Mr. Clements: They had works in Paris. They did not employ many men now—about fifteen. They did not make the steel supplied to the gas company, but it had been made for them according to their own instructions. He supervised the making, and it was sent off by themselves. He could not tell them who made the goods for them. They had several manufacturers. He could not tell them who made these particular goods. The Stello-rite steel was their own speciality, which could only be made according to their formula. They owned the sole rights for the world.

Mr. Clements contended the claim could not possibly succeed. On the admission by the clients in the box, the order was given by an agent of an agent. It was signed, not on behalf of the gas company, but on behalf of the manager of the gas company. In any case, that was assuming there had been delegation of authority, and the agent, Mr. Tully, the manager, would have no right to delegate his authority to his son or anyone else, except under express orders from his principals. He asked His Honour to say the plaintiffs had not proved the agency.

Mr. Wallington having addressed the Court, His Honour said that his present opinion was that the plaintiffs had not proved that young Tully, by legal evidence, had the authority to give an order on behalf of the gas company, and for that reason only the action failed. From none of the facts of the case that day had he heard anything whatever, on the part of the plaintiffs, of what they might be ashamed. He could see no evidence of trick or attempting to deceive. He only went on the facts of this case, and he saw nothing whatever discreditable to them.

Mr. Clements offered to give evidence in the case, and called Mr. C. B. Tully, who said he was the manager of the Hythe and Sandgate Gas Company.

Cross-examined by Mr. Wallington: He was prepared to swear he was away on holiday at the time, but he could not give the dates. When he was away his son conducted the business of the company, and looked after the office. His authority for orders was limited to £5, and he would not give an order for more than that amount without the authority of the board. His son told him there had been a steel traveller sent by Mr. Jones, of Burslem, and he had given an order for a sample for testing. He took his word that it was a small sample. His son Thomas told him he thought the steel would be about 1 in. long, as it was marked on his rule. He showed him the rule, and his son had taken centimetres for metres. When his son told him he thought it was 1 in. he laughed at him. He laughed at him for being such a fool.

Mr. Wallington: When did you come to the con-

clusion that this gentleman in offering these goods had been guilty of a trick?

Witness: I have known of the game for years.

Mr. Wallington: Will you be surprised to hear that this company has only been in existence for one year?

Asked what he meant by tricked, Mr. Tully said it was talking ignorant men into buying things they did not want. It was a gift. (Laughter.)

His Honour said he was compelled to hold plaintiffs had not proved their case. He held the company were not legally responsible.

His Honour granted a stay of execution for fourteen days.

THE PHYSICAL PROPERTIES OF CLAY.

By ARTHUR E. BROWN, B.Sc.

[We make the following extracts from an interesting paper on "Bricks and Brickmaking," which Mr. Brown read last night at a meeting of the Society of Architects.]

Clay is unique, though to many it is only dirt, because it is the only substance found in nature possessing the property of plasticity. Plasticity may be described as the property by virtue of which clay may be changed in form without breaking up or destroying its continuity, or may be joined without the use of any cementing material. In nature, most clays are only in a semi-plastic state, and become quite plastic when water is added to them. The purer the clay the more plastic it is in the natural clay beds, provided the silicate of alumina is in a state of division sufficiently fine. It would seem that this important property is due to the fact that silicate of alumina can absorb water in a large volume, at the same time becoming gelatinous and swelling up. It is this property that makes clay impermeable to water.

From this explanation we can easily understand that when clay is dried and the gelatinous particles lose their water, they become less in volume and shrink. We all know that clay shrinks in drying because of the way clayey soil cracks in summer time. It is also pretty widely known that the more "sticky" the clay is the more it cracks when dried. This, it is apparent, is because it is purer, and contains more of the gelatinous silicate of alumina in a given volume than a sandier clay or loam which shrinks less in drying. It will be clear, then, that a sticky or strong pipe or tile clay shrinks more in percentage than a sandy clay; but there is more in the matter than this.

Given a sandy, less sticky or "milder" clay, like that of the Suffolk brickfields, the amount it shrinks in drying depends also on the shape and size of the sand particles. These are surrounded by the gelatinous material when wet, and at a certain stage in drying they come so close together in the mass as to touch each other. Now, if the sand grains are rough and angular, their further movement is arrested, whereas if fine and round they can slide on one another into still closer positions, and so shrinkage continues further.

When a clay with fine, round, sand grains dries, shrinkage goes on till arrested by the grains getting as close together as is possible; but still the gelatinous pure clay surrounding them goes on shrinking, with the result that spaces or pores begin to be formed in the mass, into which air enters. We thus arrive at another condition in which the pores formed in the clay gradually lose water throughout the whole mass. The size of these pores depending on the size and shape of the grains, we get two different states in different kinds of clay—the one is called porosity and the other permeability. They are only different degrees of the same thing, but they are interesting to the brickmaker because of the difference in quality of the brick produced and the different results obtained by different processes of manufacture.

All clays found in nature become porous when dried, but those with the larger angular grains are permeable even before drying. This peculiarity is of great importance in a building, for the striking reason that a permeable brick will better resist the weather and will also "breathe" or allow air to pass through the walls. This is easily understood, and is illustrated by a simple proposition. Take a glass tube with a bore of, say, $\frac{1}{8}$ in., or a straw, and one can easily blow through it. But take the broken stem of a thermometer which has a very fine bore, and it is not possible. The passage of water is of corresponding ease or difficulty.

Now I can quite well believe that my arguments may convince you that the permeable brick will let more air pass than the merely porous one, but you will say that the same applies to water. This is true, but two points even in this connection still indicate that the permeable brick is best for buildings. The first is that, provided the wall is not too exposed to constant driving rains, in which case it should be built hollow, the water dries out very rapidly when the rain stops. In our variable climate, the permeable brick will usually dry out completely between the rain periods and before any water has penetrated the wall, and will again let air through. The porous brick will not, because it takes proportionately longer to dry than it does to wet.

The second point is the effect of frost. It is well known that water expands just before freezing; that is why it cracks our water pipes. The same thing happens inside a brick; but when the water in a permeable brick freezes, the holes are large enough to let the ice squeeze out when formed, and no harm is done. In a porous brick that is, one with extremely fine pore—the ice cannot squeeze out for the same reason that you cannot blow through a minute tube, and so it bursts the face off the brick instead.

I must speak here, in passing, of two kinds of brick in which the properties of porosity and permeability are of quite a different nature. These are the bricks made by the semi-dry process of manufacture, of which more later. In one type, exemplified by the Ebbton brick, the shale is pressed into shape in a nearly dry state, and plasticity is not present at any stage of the process. When burned in the kilns no change of physical condition of the clay takes place. Shale is in the form of flakes, and the interior of the brick, therefore, is in an irregular condition with no direct uniform pores or tubes in it. Yet it contains a proportion of spaces with air in them. The outside surface is more compressed than the inside, and is smoothed or polished by the action of the steel moulds in which they are pressed. When, therefore, after a long exposure to wet, the interior becomes more or less soaked or sodden with water, frost will produce the same disastrous results as with the "porous" non-permeable brick, but in a still greater degree. And once the skin is broken, further disintegration is still more rapid.

The second type is exemplified by the Acerington red brick. This, too, is generally made by the semi-dry process, but on burning in the kiln the clay begins to melt, and becomes vitrified. It is then practically impervious to water, and suffers no harm in frosty weather. It is a good, sound brick, but it does not breathe at all, and therefore possesses only one of the two important virtues of the brick that is perfect from the hygienic point of view.

I must not forget to mention that the permeable brick has a further virtue as it does not conduct heat and cold as much as the hard, impermeable brick, and for all these reasons I venture to express the opinion that a sandy hand-made brick, besides being more artistic, is more lasting and more hygienic than any other type made.

Practical Hints on Road Tarring.—A second edition of the leaflet entitled "Notes upon Tar Treatment of Road Surfaces," giving the elementary principles in road tarring work, has been issued by the Roads Improvement Association. The leaflet was prepared for the information and guidance of men actually engaged in tarring work on the road who do not usually have access to the various comprehensive technical publications upon this subject. The unsatisfactory results from the tar treatment of roads often complained of by road users have been traced, in many cases, to the non-observance of the elementary principles in this work. The leaflet deals with (1) the suitability of a road for tar treatment, (2) the preparation of the surface, (3) the type of tar to be used, and (4) the application of tar to the road and its subsequent gritting. Notes upon the removal of tar splashes from clothing, paintwork, animals, &c., complete the leaflet. The leaflet will be found considerably interesting to laymen as well as to the men actually engaged in road tarring work, and the secretary to the Roads Improvement Association (Mr. Wallace E. Riche, 15 Dartmouth-street, Westminster, London, S.W.) will be glad to supply copies on request at 2d. each, post free. The association, it may be added, are prepared to supply quantities to surveyors for distribution to their men at a nominal charge of 3s. per fifty copies, post free.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.E.A.,
Borough Surveyor, Great Yarmouth.

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District will be held at Wakefield on Saturday, March 21st.

PROGRAMME.

2.30 p.m. Meet at the Town Hall, and proceed to Calder Vale to inspect the recently removed sewage disposal works.

4.30 p.m.—Return to the Town Hall, where tea will be provided by the kind invitation of his Worship the Mayor (Mr. J. W. Salville).

5.30 p.m. District business—

Correspondence.

To consider and arrange for the next whole membership meeting of the institution in the North-Eastern District.

To consider nominations for (a) two district representatives on the council, (b) district chairman, (c) hon. district secretary, for the year 1914-1915.

In accordance with notice given, Mr. A. Rothera (Liversedge) will move:—

“That the members of the North-Eastern District request the council to take a poll of members and associate-members as to whether they are in favour of the issue of the Journal of the institution in parts as at present, or the retention of the annual bound issue formerly existing, and that a copy of this resolution be sent to the secretary of the institution and the hon. secretary of each of the various districts, asking for their co-operation by supporting a formal resolution to this effect.”

J. P. WAKEFORD, M.I.C.E., F. MASSIE, M.I.C.E.,
Hon. District Secretary. *District Chairman.*
Wakefield. Wakefield.

SOUTH-WESTERN DISTRICT.

A meeting of the South-Western District of the institution will be held at Torquay on March 21st.

PROGRAMME.

12 noon.—Meet at the new Town Hall, Torquay.

Business: To confirm minutes of last meeting; to receive communications, if any; to decide as to nominations for district officers for the ensuing year.

1 p.m. Inspection of the recently completed pavilion described in Vol. 37 of the “Proceedings.”

1.30 p.m. Lunch (prepared by electricity) at the Pavilion café by the kind invitation of the Mayor and Corporation of Torquay.

2.45 p.m.—Proceed by tramcar for a visit of inspection of the recently completed town hall and municipal buildings.

3.30 p.m.—Description by Mr. H. A. Garrett, Assoc.M. INST.C.E., borough surveyor, of the Torquay Pavilion—public restaurant operated by electricity—with discussion.

4.30 p.m.—Tea at the Pavilion café.

D. EDWARDS, Assoc.M.INST.C.E.,
Hon. District Secretary.

Municipal Buildings,
Taunton.

EASTERN DISTRICT.

A meeting of the Eastern District is to be held at Chelmsford on April 18th.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on June 13th.

THE ANNUAL MEETING.

The date for the annual meeting of the Institution of Municipal and County Engineers at Cheltenham has been fixed definitely for June 24th, 25th, 26th and 27th next. It has been decided to make a special feature of town planning and of roads, and, if possible, to arrange for an exhibition of town plans.

THOMAS COLE,
Secretary.

92 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

FORTHCOMING MEETINGS.

Arrangements have been made for the following meetings: March 21st, Leeds; April, Birmingham; April 18, Hexham; May, Finedon and Wellingborough; May 16th, Hull; June 13th, Tisbury and Cumberland; July, Hunstanton; July 14th, Abwick; September 12th, Harrogate; October 10th, Sunderland; November 7th, Newcastle; December 12th, Newcastle.

Next Council Meeting.—The next meeting of the council will be held at Leeds on Saturday, March 21st.

B. WYAND,

39 Victoria-street, S.W.

Secretary.

Eye Water Supply. The Local Government Board in a letter write that their inspector, Dr. Seymour, considered the administration of the borough of Eye deficient in many respects. He indicated the principal matters requiring attention, including a public water supply to replace the numerous existing wells, which are liable to pollution. It would seem, the letter stated, that pure water could be obtained by deep borings to the chalk. The town council should obtain expert advice with a view to the formulation of a suitable scheme for supplying the borough.

Irish Labourers' Cottages. In the House of Commons on the 5th inst. the Chief Secretary was asked whether the Local Government Board had informed the Longford District Council that they would not advance any further portion of the loan necessary to pay for building labourers' cottages, under the 1908 scheme, because twenty-eight cottages had not yet been contracted for, whether he was aware that this was not the fault of the rural district council, but of the Local Government Board itself, which had refused to allow the limit of the cost of erection fixed ten years ago to be exceeded now, notwithstanding that materials and labour now cost more. Mr. Birrell said the loan sanctioned in this case amounted to £28,800, of which the council had already received £25,000. That was as much as they were entitled to having regard to the present position of the scheme—namely, 129 cottages completed, eight in course of construction, twenty-eight not yet contracted for, and one apparently abandoned. The Local Government Board had felt it necessary to fix a limit of £170 per cottage in regard to the issue of money out of the fund provided by Parliament for the purposes of the Labourers' Acts, but that does not preclude a council from borrowing in the open market any additional sum that might be required to complete their scheme, and the council had been so informed.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon ON WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1016) subject to later confirmation by letter.

CLERK OF WORKS.—March 14th.—Beckenham Urban District Council. £3 3s. per week.—Mr. F. Stevens, clerk.

ASSISTANT SANITARY INSPECTOR. — March 14th.—Corporation of Birmingham. 35s.—45s. per week.—Public Health Department, Congreve-street.

SURVEYOR AND INSPECTOR.—March 14th.—Corporation of Penryn. £70 per annum.—Mr. M. H. Truscott, town clerk.

LEADING FOREMAN.—March 16th.—Corporation of East Ham. £4 1s. per week.—Borough Engineer, Town Hall.

CLERK OF WORKS.—March 16th.—Tilbury Urban District Council. 45s. per week.—Mr. S. A. Hill-Willis, surveyor.

ASSISTANT.—March 16th.—Joint Committee for Llandudno-Colwyn Bay through road. £3 3s. per week.—Mr. W. T. Ward, deputy engineer, Town Hall, Llandudno.

MARKETS SUPERINTENDENT.—March 16th.—Chester City Council. £130—£150.—Town Clerk.

REFUSE DESTRUCTOR MANAGER.—March 17th.—Kensington Borough Council. £160 per annum, with house, coals and lighting.—Mr. W. Chambers Leete, town clerk.

SURVEYOR OF HIGHWAYS. March 17th.—Horncastle Rural District Council. £130 per annum.—Mr. J. E. Chatterton, clerk.

SURVEYOR AND INSPECTOR. March 18th.—Church Urban District Council. £110.—Mr. John R. Reddish, clerk.

INSPECTOR OF NUISANCES. March 19th.—Corporation of Wolverhampton. 35s. per week.—Manager, Team Department, Crown-street.

HOUSING AND TOWN PLANNING ASSISTANT. March 20th.—Corporation of Scarborough. £2 2s.—Mr. Henry W. Smith, borough engineer.

DISTRICT SURVEYOR.—March 20th.—London County Council.—Sir Laurence Gomme, clerk.

SURVEYOR AND INSPECTOR.—March 23rd.—Holywell Urban District Council. £105 per annum.—Mr. J. Kerfoot-Roberts, clerk.

BOROUGH SURVEYOR'S CHIEF ASSISTANT.—March 23rd.—Corporation of Shrewsbury. £140—£150.—Mr. A. W. Ward, borough surveyor.

CLERK OF WORKS.—March 23rd.—Pontypridd and Rhondda Joint Water Board. £3 10s. per week.—Mr. W. P. Nicholas, clerk, Gelliwasted-road, Pontypridd.

CHIEF ASSISTANT AND GENERAL ASSISTANT.—March 23rd.—Accrington Town Council. £150 and £104.—Mr. W. J. Newton, borough engineer and surveyor.

BOROUGH SURVEYOR'S ENGINEERING ASSISTANT.—March 23rd.—Corporation of Shrewsbury. £90—£120 per annum.—Mr. A. W. Ward, borough surveyor.

CLERK OF WORKS.—March 24th.—Littleborough Urban District Council.—Mr. G. H. Wild, clerk.

ROAD FOREMAN.—March 25th.—Wilts County Council. £2 10s. per week.—Mr. J. George Powell, county engineer and surveyor, Trowbridge.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

SURVEYING ASSISTANTS.—April 21st.—Shanghai Municipal Council. £385 per annum.—Messrs. John Pook & Co., agents for the Shanghai Municipal Council, 68 Fenchurch-street, London, E.C.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

MOLD.—Plans for a fire station and caretaker's house, for the urban district council.—Mr. D. Thomas, surveyor, Town Hall.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

SWANSEA.—March 14th.—For the erection of cemetery chapel, entrance lodge, and latrines, for the corporation.—Mr. E. E. Morgan, borough architect.

SMALLBURGH.—March 14th.—For the erection of six cottages, for the rural district council.—Mr. P. Davies, clerk, North Walsham.

ELY.—March 16th.—For the erection of a pair of cottages, and painting the county hall, for the county council.—County Surveyor, Ely.

CHELMSFORD.—March 16th.—For laying cast-iron water main, with valves and hydrants, for the rural district council.—Mr. James Dewhurst, engineer.

DORSET. March 16th.—For the erection of a balcony and verandah at hospital, for the county council.—Mr. F. T. Maltby, architect and surveyor, Dorchester.

COVENTRY. March 16th.—For the construction of shops and stores, for the corporation.—Mr. F. W. Stevenson, gas-works.

MONMOUTH.—March 17th.—For the erection of training centre, and extension of schools, for the Education Committee.—Mr. John Bain, County Council Offices, Newport.

ST. HELENS (Lanes). March 17th.—For the erection of a boathouse and landing stage, for the corporation.—Borough Engineer.

ABERDEEN. March 18th.—For additions to hospital buildings, for the county council.—Messrs. Jenkins & Marr, architects, 16 Bridge-street, Aberdeen.

WIGAN.—March 19th.—For the erection of an additional ward at sanatorium, for the corporation.—Mr. A. T. Gooseman, borough engineer.

HUDDERSFIELD.—March 20th.—For the erection of forty-nine working-class dwellings, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

WEST RIDING.—March 20th.—For the erection of a school centre (builder's and plumber's work), for the county council.—Education Architect, County Hall, Wakefield.

HULL.—March 21st.—For additions to the asylum, for the Committee of Visitors.—Mr. J. H. Hirst, city architect.

ASPATRIA.—March 21st.—For the erection of twenty workmen's dwellings, for the urban district council.—Mr. G. Armstrong, architect, 24 Bank-street, Carlisle.

CROYDON.—March 23rd.—For the erection of a gate-house, an electricity sub-station, and additions to existing station, for the corporation.—Mr. J. M. Newnham, town clerk.

GOVAN.—March 24th.—For the erection of a tramway depot, for the corporation.—Mr. J. Dalrymple, general manager of tramways, 46 Bath-street.

BRIDGWATER. March 24th.—For pulling down existing buildings, and erection of coach-house, lirage, slaughter-house, and offices, for the corporation.—Borough Surveyor.

HAMPSHIRE.—March 25th.—For the construction of a brick and concrete three-arched bridge, for the counties of Berks and Southampton.—Mr. H. Barber, clerk, Hampshire County Council, The Castle, Winchester.

CHESHAM. March 25th.—For the erection of twenty workmen's dwellings, for the urban district council.—Mr. Percy C. Dormer, engineer and surveyor.

SPALDING. March 27th.—For the erection of eighteen cottages, for the rural district council.—Messrs. Davis & Crowley, architects, 6 Double-street, Spalding.

SOUTHAMPTON.—March 28th.—For constructing concrete foundations, fencing and other works, for the county council.—Mr. A. L. Roberts, architect to the Education Committee, The Castle, Winchester.

SWANSEA.—March 31st.—For the construction of masonry and concrete approaches and piers, for a steel girder bridge of 111-ft. span, also for the supply of steelwork for the said bridge, for the corporation.—Mr. H. Howard Humphreys, 28 Victoria-street, Westminster.

BURNLEY.—April 4th.—For the completion of the construction of an impounding reservoir, with catchwaters, aqueducts, and meter-houses, for the corporation.—Messrs. James Diggle & Son, engineers, Hind Hide-street, Heywood, Lanes.

RUTLAND.—April 4th.—For the construction of a culvert over the brook at the foot of Wordley Hill, for the county council.—Mr. James Richardson, county surveyor, 13 Barn-hill, Stamford.

WITNEY.—April 6th.—For the construction of a concrete lining to a dug well 82 ft. deep, laying about 1,800 yds. of 3-in. service mains, with necessary fittings, and the supply and fixing of a vertical oil engine, three-throw pump, two air compressors, air-

lift plant, and necessary piping to connect existing main, for the rural district council.—Mr. H. Howard Humphreys, engineer, 28 Victoria-street, Westminster S.W.

MONAGHAN.—April 7th.—For the conversion of military barracks into eleven cottages, and the erection of sixteen new cottages, for the urban district council.—Mr. J. J. Inglis, 36 Dawson-street, Dublin.

KEIGHLEY.—April 11th.—For the construction of a storage reservoir, filter-beds, clear-water basin, and other appurtenances, for the corporation.—Mr. Ratcliffe Barnett, engineer.

WALLASEY.—April 21st.—For the erection of a town hall, for the corporation.—Messrs. Briggs, Wolstenholme & Thorneley, Royal Liver Buildings, Liverpool.

Iron and Steel.

COVENTRY.—March 16th.—For the supply of cast-iron pipes, lead pipes, solder, and hydrant and valve boxes, for the Waterworks and Fire Brigade Committee.—Mr. J. E. Swindlehurst, water engineer.

ROCHDALE.—March 18th.—For the supply of tubes, cast-iron main pipes, specials, oils, lime for purifying purposes, galvanised-iron buckets, charging shovels, and bar and sheet iron, for the Gas Committee.—Mr. T. Banbury Ball, manager, Danc-street.

TORQUAY.—March 19th.—For the supply of 500 tons of cast-iron pipes, for the corporation.—Mr. S. C. Chapman, water engineer.

COVENTRY.—March 23rd.—For the supply of cast-iron pipes, including bends, junction pipes, and sluice valves, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

MADRAS.—March 24th.—For the supply of 2,000 cast-iron manhole covers and frames, for the corporation.—Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster.

BEESTON.—March 28th.—For the supply of cast-iron pipes and special castings, for the urban district council.—Mr. W. H. Radford, engineer, Albion Chambers, Nottingham.

Roads.

DROXFORD.—March 16th.—For the supply of granite or hard stone, for the rural district council.—Mr. A. V. Carter, surveyor.

DARTFORD.—March 16th.—For the supply of road materials, for the rural district council.—Mr. J. Hookins, surveyor, Gartly, Dartford.

CHURCH.—March 16th.—For making up certain streets, laying granite macadam, rolling, and tar-spraying, for the urban district council.—Mr. W. E. Wood, surveyor.

WAKEFIELD.—March 16th.—For repaving work, for the corporation.—Mr. J. P. Wakeford, city surveyor.

BRIDGE.—March 16th.—For the supply of hard flints and gravel, and carting, for the rural district council.—Mr. S. Gladden, highways surveyor, Littlebourne, Canterbury.

SWANSEA.—March 16th.—For the widening and improvement of Dunvant-road, for the rural district council.—Mr. G. Powell Thomas, highway surveyor, Station-road, Fforestfach.

EASINGTON.—March 16th.—For the making up and paving of certain streets, for the rural district council.—Mr. Gilbert Waterhouse, surveyor.

WEYMOUTH.—March 16th.—For the repair of district roads, for the rural district council.—Mr. R. H. Luckham, surveyor.

POCKLINGTON.—March 16th.—For the supply of best blue stone and slag, for the rural district council.—Mr. T. Robson, clerk.

NELSON.—March 16th.—For the supply of granite macadam, limestone macadam, limestone paving chippings, pitch, creosote oil, flags, kerbs, grit setts, and cement, for the corporation.—Mr. W. Shackleton, borough engineer and surveyor.

CHORLEY.—March 16th.—For the supply of broken granite, limestone, slag, rubble, chippings, grit setts, flags and kerbs, for the rural district council.—Mr. P. Whalley, district surveyor.

LLANFRECHFA UPPER.—March 16th.—For road metalling and hauling, for the urban district council.—Mr. G. Jones, surveyor, Richmond-road, Pontnewydd.

ROCHFORD.—March 16th.—For making up a road, for the rural district council.—Mr. H. T. Sidwell, surveyor.

LANARK.—March 16th.—For granolithic paving, kerb and channel, and causeway crossings, for the District Committee of the Middle Ward.—Mr. R. Spittal, road surveyor, Hamilton.

MARKET BOSWORTH.—March 16th.—For the supply of broken granite, for the rural district council.—Mr. J. Thorpe, highway surveyor.

HEBDEN BRIDGE.—March 16th.—For tar-spraying, for the urban district council.—Mr. T. Waddington, surveyor.

CROFT.—March 16th.—For the supply of whinstone, ironworks slag, and annealed slag, for the rural district council.—Mr. J. Hodgson, surveyor.

EDMONTON.—March 16th.—For the supply of Norway granite kerb and Guernsey granite, for the urban district council.—Mr. C. Brown, engineer.

HUNTS.—March 16th.—For the supply of granite, slag, and tar-macadam, for the county council.—Mr. Henry Lecte, county surveyor, Market-place, Huntingdon.

BILLERICAY.—March 16th.—For the supply of granite, Kentish rag, flints and gravel, and steam rolling, for the rural district council.—Mr. F. E. Ennals, surveyor, Shelley-road, Hutton.

STOCKSBRIDGE.—March 16th.—For the supply of road material, for the urban district council.—Mr. C. Hodgkinson, clerk.

BLACKBURN.—March 16th.—For making up certain new streets, for the corporation.—Mr. W. Stubbs, borough engineer.

NEWARK.—March 16th.—For the supply of tar-macadam, granite and basalt, for the corporation.—Borough Surveyor.

BIRMINGHAM.—March 17th.—For road and sewerage works at Lordswood-road, and new road between Balden-road and Lordswood-road, Harborne, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

STROUD.—March 17th.—For the supply of granite, basalt, limestone and tarred macadam, for the urban district council.—Mr. E. N. Witchell, clerk.

ABERGAVENNY.—March 17th.—For the supply of broken and unbroken stone, quarry stone, and hauling, for the rural district council.—Mr. A. J. Willcox, surveyor.

GARFORTH.—March 17th.—For making up certain thoroughfares, for the urban district council.—Mr. W. G. Smithson, 2 Basinghall-square, Leeds.

ACTON.—March 17th.—For the supply of a tar-spraying machine, tar-spraying work, and coating certain roads with bitumen, for the urban district council.—The Surveyor.

THURNSCOE.—March 17th.—For the supply of broken granite, granite chippings, broken slag, slag screenings, flags, kerbs, channelling, and asphalt, for the urban district council.—Mr. T. Bull, surveyor.

WARE.—March 17th.—For the supply of broken blue Guernsey granite, for the urban district council.—Mr. G. H. Gisby, clerk.

MEXBOROUGH.—March 17th.—For the supply of channel setts, pitching setts, granite and whinstone macadam chippings, slag macadam, tar-macadam, patent paving and Trent sand, for the urban district council.—Mr. G. F. Carter, surveyor.

CAERLEON.—March 17th.—For making up a certain road, for the urban district council.—Mr. C. J. Fox, surveyor.

WEALDSTONE.—March 17th.—For the supply of well-matured slag, for the urban district council.—Mr. Herbert Walker, surveyor.

REIGATE.—March 18th.—For tar-washing about 170,000 yds. super. of roads, to include cleaning, tarring, and gritting the tar surface, for the corporation.—Mr. Alfred Smith, town clerk.

TUTBURY.—March 18th.—For the supply of broken granite and limestone, for the rural district council.—Mr. H. S. Tebbitt, surveyor, Tatenhill, Burton-on-Trent.

REIGATE.—March 18th.—For the supply of about 16,000 gallons of Tarvia in barrels, for the corporation.—Mr. Fred. T. Clayton, borough surveyor.

CHEADLE.—March 18th.—For the supply of granite and other tar-macadam, broken granite, artificial stone flags, setts, and flags, for the urban district council.—Mr. E. Sykes, surveyor.

ISLE OF WIGHT.—March 18th.—For the supply of about 10,000 tons of quartzites, basalts, syenites, or granites, for the rural district council.—Mr. H. Eldridge Stratton, clerk, 30 Pyle-street, Newport, I.W.

DURHAM.—March 18th.—For taking off a corner and remaking road, for the rural district council.—Mr. Geo. Gregson, surveyor.

CAMBS.—March 18th.—For the hire of steam rollers, for the county council.—Mr. J. E. Blackwall, county surveyor, Cambridge.

CAERPHILLY.—March 18th.—For the supply of limestone metalling, for the urban district council.—Mr. A. O. Harpur, surveyor.

ELY.—March 18th.—For the supply of 4,080 tons of granite and 1,110 tons of gravel, for the rural district council.—Mr. F. W. Pirby, district surveyor.

CARSHALTON.—March 18th.—For treating about 11,000 yds. super. of road with bituminous, dust-preventing material, for the urban district council.—Mr. C. P. Lovelock, clerk.

CHESTER-LE-STREET.—March 18th.—For the supply of whinstone, broken slag, tarred slag, broken limestone, brooms and shovels, for the urban district council.—Mr. F. J. Gray, clerk.

GUILDFORD.—March 19th.—For making up part of a certain road, for the corporation.—Mr. C. G. Mason, borough engineer and surveyor.

CHELMSFORD.—March 20th.—For labour, haulage, supply of broken granite, broken Kent flints, and hire of steam road rollers, for the rural district council.—Mr. F. E. H. Powell, surveyor.

NEWMARKET.—March 20th.—For tar-painting 125,000 super. yds. of roads, for the urban district council.—Mr. W. H. Eley, surveyor.

NORTHAMPTON.—March 20th.—For granolithic paving and fencing, for the corporation.—Mr. A. Fidler, borough engineer.

BISHOP'S STORTFORD.—March 20th.—For the supply of tar in accordance with the Road Board Specification for tar No. 1, for the urban district council.—The Surveyor.

PERTH.—March 21st.—For paving with whinstone setts, for the corporation.—Mr. R. McKillop, burgh surveyor.

NEWBURY.—March 21st.—For the supply and carting of road materials, for the rural district council.—Mr. O. Frewin, district surveyor.

GUISELEY.—March 21st.—For the supply of granite, limestone, whinstone, and tar-macadam, for the urban district council.—Mr. J. Battye, surveyor.

GATESHEAD.—March 21st.—For the supply of road materials, for the corporation.—Mr. N. P. Pattinson, borough engineer.

STEYNING WEST.—March 21st.—For the supply of broken granite, flints, chalk, and compo. sand, for the rural district council.—Mr. F. Slaughter, engineer and surveyor.

BILSTON.—March 23rd.—For the supply and delivery of broken stone, for the urban district council.—Mr. Vincent Turner, engineer and surveyor.

BRIGHTON.—March 23rd.—For the supply of 1,700 tons of broken granite, for the corporation.—Borough Surveyor.

SOUTHAMPTON.—March 23rd.—For laying asphalt paving in Upper Canal-walk, for the corporation.—Borough Engineer.

KING'S LYNN.—March 23rd.—For tar spraying roads, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

COVENTRY.—March 23rd.—For the supply of broken road stone, granite kerbs, granite setts, stone-ware pipes, castings, and workmen's tools, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

ALTRINCHAM.—March 23rd.—For the supply of granite macadam, Rochdale flags, kerbs, setts, and limestone chippings, for the urban district council.—Mr. H. E. Brown, surveyor.

TENTERDEN.—March 23rd.—For the supply of granite, Kentish ragstone, beach and haulage, for the rural district council.—Mr. W. L. C. Turner, district surveyor.

SOUTHAMPTON.—March 23rd.—For laying asphalt paving, for the corporation.—Borough Engineer.

EARSDON.—March 23rd.—For the supply of whinstone, whinstone kerb, and cartage, for the urban district council.—Mr. J. R. Macmillan, surveyor, Shiremoor, Northumberland.

NORMANTON.—March 23rd.—For the supply of stone and concrete flags, kerbs, channels, setts, granite, limestone, whinstone, limestone and granite chippings, and tar-macadam, for the urban district council.—Mr. J. W. Martin, clerk.

ORMSKIRK.—March 23rd.—For the supply of road materials, for the urban district council.—Mr. H. W. Chadwick, surveyor.

GATESHEAD.—March 24th.—For cement path work, for the corporation.—Mr. N. P. Pattinson, borough engineer.

CASTLEFORD.—March 24th.—For works of road improvement, for the urban district council.—Mr. W. Green, surveyor.

RUSHDEN.—March 24th.—For the supply of granite and slag, for the urban district council.—Mr. W. B. Madin, engineer and surveyor.

GOSFORTH.—March 24th.—For road construction works, for the urban district council.—Mr. G. Nelson, engineer and surveyor.

ORSETT.—March 24th.—For the supply of broken granite or basalt, chippings, and Kentish ragstone, for the rural district council.—Mr. F. T. Johnson, highway surveyor, 2 Orsett-road, Grays.

HAZEL GROVE.—March 24th.—For the supply of broken stone, setts, kerbs, and chippings, for the urban district council.—Mr. G. S. Doncaster, surveyor.

SUTTON BRIDGE.—March 24th.—For the supply of granite, slag, granite chippings and slag chippings, for the urban district council.—Mr. T. J. Whitehead, surveyor.

ISLINGTON.—March 24th.—For paving work with asphalt, wood blocks, and granite setts, for the borough council.—Mr. J. P. Barber, borough engineer.

NUNEATON.—March 24th.—For the supply of broken granite, for the rural district council.—Mr. C. Blakeway, clerk.

BARKING TOWN.—March 24th.—For private street works, for the urban district council.—Mr. C. F. Dawson, surveyor.

BAGSHOT.—March 25th.—For the supply of granite, chippings, flints, gravel, and carting, for the urban district council.—Mr. O. G. Stanley, surveyor.

CHELMSFORD.—March 25th.—For stone paving certain footpaths, for the corporation.—Borough Engineer.

CHATHAM.—March 26th.—For the supply of granite, chippings, flints, and Kentish ragstone, for the corporation.—Borough Surveyor.

WESTMINSTER.—March 26th.—For the execution of paving works, for the city council.—City Surveyor.

KING'S LYNN.—March 27th.—For the supply of road materials, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

HARROGATE.—March 27th.—For the supply of whinstone, limestone, kerbing, channelling, flagging, setts, shovels, picks, and concrete and artificial stone flagging, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

RICHMOND (Surrey).—March 27th.—For making up a certain road, for the corporation.—Mr. J. H. Brierley, borough surveyor.

CLUTTON.—March 27th.—For laying kerb and rebuilding culvert, for the rural district council.—Mr. T. Orchard, The Grange, Hallotrow.

BLEAN.—March 28th.—For the supply of gravel, flints, chalk flints, brick rubble, and cartage, for the rural district council.—Mr. F. A. Ward, surveyor, Eddington, near Herne Bay.

EAST GRINSTEAD.—March 28th.—For the supply of 12-in. Quenast granite, Quenast granite screenings, tarred macadam, hand-picked surface flints (broken), Kentish ragstone, and brick rubble, for the urban district council.—Mr. W. E. Woodlam, engineer and surveyor.

WORSLEY.—March 28th.—For the supply of macadam, tarred macadam, granite setts, grit setts, granite chippings, limestone chippings, grit kerbs and loukey kerbs, for the urban district council.—Mr. J. Howard, surveyor.

HORNSEA.—March 30th.—For making up certain roads, for the urban district council.—Mr. W. E. Warburton, surveyor.

KIRKBURTON.—March 31st.—For steam rolling and scarifying, for the urban district council.—Mr. G. W. Smith, clerk, 23 John William-street, Huddersfield.

LEWISHAM.—March 31st.—For laying wood paving in various streets, for the borough council.—Borough Surveyor.

MALDON.—March 31st.—For the supply of materials, and hire of steam roller, for the rural district council.—Mr. E. J. Ennals, surveyor.

MARTLEY.—March 31st.—For the supply of granite and slag, for the rural district council.—Mr. L. H. Richardson, surveyor.

HORSHAM.—April 1st.—For the supply of 4,750 cub. yds. of flints, 4,250 yds. of granite, and 1,000 yds. of gravel chippings, for the rural district council.—Mr. W. Dengate, surveyor.

BULKINGTON.—April 6th.—For the supply of stone, for the urban district council.—Mr. H. W. Wilson, surveyor.

INVERNESS.—April 11th.—For the upkeep of roads and bridges, for the Badenoch District Committee.—Mr. A. M. Grant, district road surveyor, County Buildings, Kingussie.

KIDDERMINSTER.—April 17th.—For the supply of broken granite, granite screenings, broken slag and slag screenings, for the rural district council.—Mr. G. J. Shepherd, surveyor.

Sanitary.

MERTHYR TYDFIL.—March 14th.—For providing, laying and jointing a 30-in. main sewer, comprising about $4\frac{1}{2}$ miles of concrete tubes and 173 yds. of 30-in. steel tubes, for the corporation.—Borough Engineer.

CHESHAM.—March 14th.—For the reconstruction with cast-iron pipes of about 712 lin. yds. of 12-in., 977 yds. of 9-in., and 935 yds. of 6-in. existing stone-ware pipe sewers and house connections with manholes and flushing chambers, for the urban district council.—Mr. Percy C. Dormer, engineer and surveyor.

BENFIELDSIDE.—March 14th.—For the removal of refuse, for the urban district council.—Mr. T. Knox, surveyor, Shotley Bridge.

KEIGHLEY.—March 16th.—For scavenging work, for the rural district council.—Mr. T. Burton, inspector.

READING.—March 16th.—For the construction of sewerage and manholes, for the corporation.—Mr. J. Bowen, borough engineer and surveyor.

DARTON.—March 16th.—For the construction of earthenware pipe sewer, surface-water sewer, manholes, and lampshafts, for the urban district council.—Mr. S. Wilkinson, surveyor.

ROCHFORD.—March 16th.—For the removal of house refuse and the supply of disinfectants, for the rural district council.—Mr. A. J. Dardis, surveyor.

LEIGH.—March 17th.—For the supply of disinfectants, for the corporation.—Mr. W. H. Cowburn, town clerk.

FRINTON.—March 17th.—For the construction of drains and filter-bed, for the urban district council.—The Surveyor.

MITCHAM.—March 17th.—For scavenging and street watering, for the rural district council.—Mr. E. J. Gowen, clerk, Croydon.

ST. COLUMB.—March 18th.—For laying a 6-in. sewer, for the rural district council.—Mr. B. C. Andrew, engineer, St. Austell.

MAIDSTONE.—March 18th.—For the construction of pipe sewer and manholes, for the rural district council.—Mr. T. A. Busbridge, surveyor.

HIGHER BEBINGTON.—March 18th.—For the removal of refuse, for the urban district council.—Mr. G. M. Lloyd, surveyor.

NUNEATON.—March 18th.—For laying earthenware pipes, storm sewers, and road work, for the corporation.—Mr. F. C. Cook, borough engineer.

YORK.—March 20th.—For the construction of earthenware pipe sewer, for the corporation.—Mr. F. W. Spurr, city engineer.

NORTHWICH.—March 23rd.—For the collection and disposal of house refuse, for the urban district council.—Mr. J. W. Cowley, clerk.

RUISLIP-NORTHWOOD.—March 23rd.—For the construction of roads, sewers, and subsoil drainage at cemetery, for the urban district council.—The Surveyor.

SEATON DELAVAL.—March 24th.—For the erection of thirty-three sanitary earth closets, for the urban district council.—Mr. A. Dorin, surveyor.

MOUNTAIN ASH.—March 24th.—For scavenging

and team work, for the urban district council.—Mr. W. G. Thomas, surveyor.

MADRAS.—March 24th.—For the supply and delivery of 2,000 cast-iron manhole covers and frames, for the corporation.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

BEESTON.—March 28th.—For the construction of culvert, iron and stoneware sewers, manholes, Dortmund tanks, bacterial filter beds, humus tanks, and other works, for the urban district council.

NANTWICH.—March 28th.—For the construction of sewage disposal works, including detritus, settling, storm-water, and stand-by tanks, laying stoneware pipe sewers, construction of 104 manholes, and other appurtenant works, for the rural district council.—Mr. Charles E. Davenport, engineer, 152 Hospital-street, Nantwich.

SWANSEA.—March 31st.—For the construction of about 2,350 yds. of roads, sewers, surface-water drains, manholes, inspection chambers, gullies, and other works, for the corporation.—Borough Surveyor, 13 Somerset-place.

CAMBORNE.—April 2nd.—For the provision of and laying about 11 miles of stoneware sewers, the construction of manholes and other works, the construction of about 1,000 yds. of tunnel, the provision and laying of a 24 in. by 16 in. egg-shaped sewer therein, and the provision and laying of about 175 yds. of 18-in. cast-iron outfall sewer, for the urban district council.—Mr. John Chadwick, engineer, Bletchley, Bucks.

NANTWICH.—April 11th.—For the construction of pipe sewers, for the urban district council.—Mr. W. F. Newey, surveyor.

DURHAM.—For constructing sewer, manholes, and lampshades, for the corporation.—Mr. J. T. Pegge, city surveyor.

Stores.

GREAT CROSBY.—March 16th.—For the supply of granite macadam and chippings, limestone chippings, tarred limestone macadam, Portland cement, stone-ware pipes, disinfectants, pitch and tar, incandescent mantles and chimneys, glass for street lamps, horse provender, granite setts, extra cart hire, and horsing fire brigade, for the urban district council.—Mr. Joseph A. Wright, surveyor.

SUTTON COLDFIELD.—March 16th.—For the supply of granite macadam, kerb, limestone macadam, setts, gravel, broken pebble stones, Yorkshire or Pennant kerb, Rowley setts, earthenware pipes, cement, lime, iron castings, iron, steel, timber, hardware, oils, paints, and bass brooms, for the corporation.—Mr. W. A. H. Clarry, borough engineer and surveyor.

BEDWELLY.—March 16th.—For the supply of stores and materials, for the urban district council.—Mr. Dan H. Price, surveyor, Aberbargoed.

GAINSBOROUGH.—March 18th.—For the supply of broken granite or whinstone granite or whinstone setts, broken and block slag, slag chippings and dust, York setts, kerbs, channels and flags, concrete flags, stoneware and earthenware pipes, gullies, cast-iron pipes, tar-macadam, pitch and creosote oil, Portland cement, and coal, for the urban district council.—Mr. Sam. W. Parker, engineer and surveyor.

HEYWOOD.—March 21st.—For the supply of setts, kerbs, flags, earthenware pipes, bends, junctions, taper pipes, traps, gullies, pitch, creosote oil, limestone chippings (white), hand-broken granite, granite chippings, and Portland cement (English), for the corporation.—Mr. J. B. Nuttall, borough surveyor.

LEEK.—March 23rd.—For the supply of flags, kerbs, channels and setts, macadam stone and chippings, limestone and tar slag macadam, Portland cement, sanitary pipes, pitch and oil, scavenger's bass brooms, cast-iron manhole and lampshades covers, galvanised malleable step irons, and cast-iron gullies and frames, for the urban district council.—Mr. W. E. Beacham, surveyor and water engineer.

LITTLEBOROUGH.—March 24th.—For the supply of setts, kerbs, flags, granite macadam, sanitary pipes, tools, and iron castings, for the urban district council.—Mr. George H. Wild, surveyor.

KENT.—March 28th.—For the supply of shovels, forks, scavenging brooms, scoops, scrapers, cart grease, tallow, oil, and general tools and materials, for the county council.—County Surveyor, St. Peter-street, Maidstone.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted † Recommended for acceptance.
‡ Provisionally accepted.

ALFRETON.—For the supply of a 10-ton steam road roller, fitted with scarifier, water spraying apparatus, and canopy, for the urban district council.—Mr. R. F. Ward, surveyor:—

Clayton & Shuttleworth, Limited, Lincoln	£530
Ruston, Procter & Co., Lincoln	527
Marshall, Sons & Co., Limited, Gainsborough	527
Aveling & Porter, Limited, Rochester	527
Robey & Co., Lincoln	525
J. Fowler & Co. (Leeds), Limited, Leeds	521
T. Green & Son, Limited, Leeds	518

BEDWELLTY.—For the erection of a public convenience, for the urban district council.—Mr. D. H. Price, surveyor:—

J. B. Packer, Hengoed	£85
T. Vadden, Bargoed*	83

BENFIELDSDALE.—For constructing main outfall sewer and sewage purification works, for the urban district council. Messrs. Taylor & Wallin, Newcastle-on-Tyne:—

H. Naylor & Son, Bradford	£8,741
G. E. Simpson, Newcastle-on-Tyne	7,799
W. Kennedy, Jarrow	7,618
W. Wilson & Co. (Newcastle), Limited, Ponteland	7,420
J. W. Henderson, Gosforth (Newcastle)	7,365
W. G. Armstrong, Blaydon	6,957

BENTLEY (Yorks). For the construction of a surface-water drain, for the urban district council.—Mr. R. G. Whitley, surveyor, Doncaster:—

H. Drake, Adwick-le-Street	£621
F. G. Stubbs, Bentley	405
H. C. Pullar & Co., Pickering	382
T. H. Wilburn, Doncaster	381
S. Porter, Doncaster*	365

BIRKENHEAD.—For the supply of granite, Rawtenstall kerbs and channels, Penmaenmawr breaking stone, natural flags, paving setts, and crosoted red deal paving blocks, &c., for the corporation.—Mr. C. Brownridge, borough engineer and surveyor:—

Granite Kerbs and Channels.—H. Campbell & Son, Newry.
Pwllheli Channels.—Pwllheli Granite Company, Limited, Runcorn.
Rawtenstall Kerbs.—I. Law, Rochdale; W. Lovick & Co., Stacksteads; Lord & Lord, Limited, Stacksteads.
Self-faced Flags.—J. Brooke & Sons, Halifax; A. H. Evans, Liverpool; J. Farrar & Sons, Limited, Halifax; A. Jagger, Halifax; J. Thompson & Sons, Halifax.
Breaking Stone, Macadam.—Penmaenmawr and Welsh Granite Company, Limited, Penmaenmawr; J. Ross & Co., Liverpool.
Pwllheli Macadam.—Pwllheli Granite Company, Runcorn.
Wood Paving Blocks.—Acme Flooring and Paving Company, Limited, London.
Portland Cement.—J. E. Beard & Co., Limited, Birkenhead; J. Crossfield & Sons, Limited, Warrington.
Coal.—Mersey Coal Company, Birkenhead.
Bricks.—Seacombe Pressed Brick and Tile Works, Limited, Seacombe, Cheshire.
Stoneware Pipes.—J. E. Beard & Co., Limited, Birkenhead; Doulton & Co., Limited, Liverpool.
Iron Castings.—Jenkins Brothers, Birkenhead.
W.I. Bars.—D. H. Collins & Sons, Birkenhead.

BOURNEMOUTH.—For the construction of surface-water drainage, for the corporation.—Mr. F. W. Lacey, borough engineer:—

Grounds & Newton, Bournemouth, £2,448.
J. Francis, Winton
Saunders & Co., Bournemouth.

BUSHEY.—For laying glazed stoneware pipe sewer, for the urban district council.—Mr. E. E. Ryder, surveyor:—

J. Williams & Sons, Manchester	£198
W. Wright, Chesham (Bucks)	197
Clark Brothers, Watford	167
F. P. Bliss, Bushey	147
W. Bailey & Sons, Bushey Heath	133

NORTHAMPTONSHIRE.—Accepted for the supply of broken granite, for the county council.—Mr. C. S. Morris, county surveyor, Northampton:—

BROKEN GRANITE.

B. J. Forder & Sons, Nuneaton	Tons.	9,960
Whitwick Granite Company, Leicester		8,855
Groby Granite Company, Leicester		3,115
Enderby and Stoney Stanton Granite Company, Leicester		2,665
Cliffe Hill Granite Company, Leicester		2,275
W. Griffiths & Co., Nuneaton		1,630
Charnwood Granite Company, Loughborough		1,340
W. L. Ireland, Atherstone		1,310
Forest Rock Granite Company, Leicester		900
Mountsorrel Granite Company, Loughborough		790
Clee Hill Granite Company, Ludlow, Salop		785
Ellis & Everard, Leicester		685
Rockside Stone Company, Stanton-under-Bardon, Leicestershire		660
Jess' Hartshill Granite Company, Atherstone		385
Abdon Clee Granite Company, Bridgnorth, Salop		335
Judkins, Limited, Nuneaton		310

BEST SLAG.

T. Butlin & Co., Wellingborough	500
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TAR-MACADAM.

W. Prestwich & Son, Kettering	3,264
Constable, Hart & Co., Wellingborough	2,498
J. Smart & Son, Walsall, Staffs	403

CHERTSEY.—For making up and draining certain roads, for the rural district council.—Mr. H. Beeny, surveyor, West Byfleet:—

T. Free & Son, Maidenhead	£1,910
S. Kavanagh & Co., Surbiton Hill	1,804
J. Mowlem & Co., Westminster	1,677
A. Hardy & Co., Woking	1,480
Surveyor's estimate,	£1,560.

FALMOUTH.—For additions to pavilion, for the corporation.—Mr. J. S. Walton, borough engineer and surveyor:—

E. H. Moss, Falmouth, £441

ROMFORD.—For the conversion of buildings into a fire station, for the urban district council.—Mr. H. T. Ridge, acting surveyor:—

J. Butterfield & Co., Romford	£182
E. W. Best, Romford	175
J. S. Hammond & Son, Romford	175
F. J. Cooke, Romford	170
G. J. Harvey, Romford*	165

TONBRIDGE.—For making up a street, for the rural district council.—Mr. F. Harris, engineer and surveyor, Tunbridge Wells:—

W. T. Burrows, Maidstone	£1,759
E. Free & Sons, Maidenhead	1,611
Road Maintenance and Stone Supply Company, Limited, London	1,596
W. H. Wheeler & Co., London	1,521
W. Arnold & Sons, Paddock Wood	1,474
A. Streeter & Co., Limited, Guildford	1,398
W. Pratt, Hildenborough	1,361

WARE.—For making up certain streets, for the urban district council.—Mr. H. F. Hill, surveyor:—

G. Crook, Ware	£336
N. Porter, Haekney, N.E.	326
Pilgrim & Son, Whetstone, N.	303
W. Jackson, Forest Gate, E.*	211
Surveyor's estimate,	£338.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MARCH.

- 13.—Town Planning Institute: Mr. Raymond Unwin on "The Town Planning Proposals of the Urban Land Report." 92 Victoria-street, S.W. 8.30 p.m.
- 16.—Junior Institution of Engineers: Mr. W. A. Tookey, M.I.MECH.E., on "The Running of Gas Engines and Gas Producers." Institution of Electrical Engineers, Victoria-embankment. 8 p.m.
- 17.—Illuminating Engineering Society: Mr. W. C. Clinton on "A Comparison between Illumination Estimates and Performance in Practice." Royal Society of Arts, 8 p.m.
- 21.—Association of Engineers-in-Charge: Annual Dinner.
- 21.—Institution of Municipal and County Engineers: North-Eastern District Meeting at Wakefield.
- 21.—Institution of Municipal and County Engineers: South-Western District Meeting at Torquay.

APRIL.

- 3.—Royal Sanitary Institute: Meeting at Southampton. Discussion on "The Housing, Town Planning, &c., Act, and its Application to the County Borough of Southampton." 7 p.m.
- 20.—Institute of Sanitary Engineers: Mr. E. A. Lees, A.I.N.S.T.C.E., on "The Birmingham Waterworks." Caxton Hall, Westminster. 8 p.m.

MAY.

- 13.—Royal Sanitary Institute: Annual Dinner, Langham Hotel.
- 23.—Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham; Mr. A. S. Parsons on "Bridge Construction."

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

BOROUGH OF SCARBOROUGH.

Wanted, an Assistant in connection with Housing and Town Planning; must be qualified Surveyor; one familiar with the Housing, Town Planning, &c., Acts preferred. Salary £2 2s.

Applications, accompanied with copies of three recent testimonials, to be sent to the undersigned not later than 12 noon on Friday, the 20th March, 1911.

HARRY W. SMITH ASSOC. M. INST. C. E.,
Borough Engineer.

Town Hall,
Scarborough. (1,417)

ENGINEER AND SURVEYOR to District Council has a vacancy for Articled Pupil. Water and Sewerage Works, and good general experience.—Box 1,386, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,370)

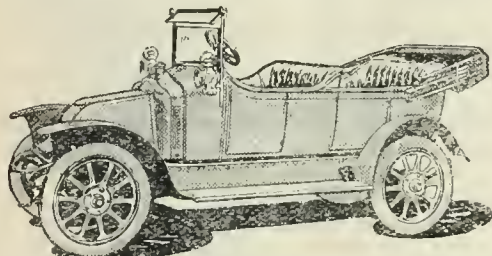
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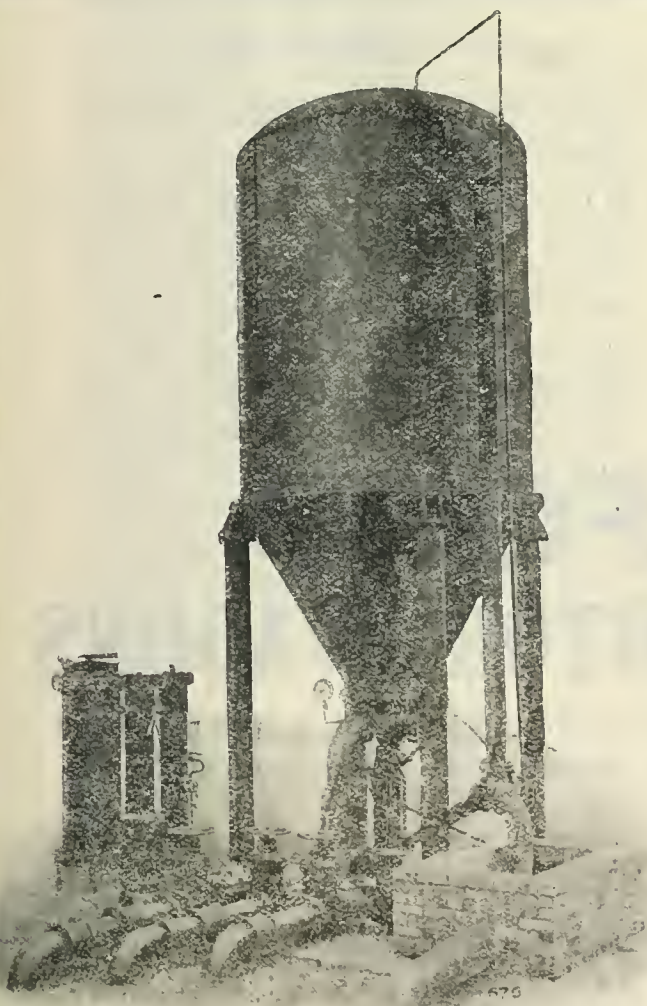
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BOROUGH OF SHREWSBURY BOROUGH SURVEYOR'S STAFF.

Applications are invited from persons qualified by training and experience in the office of a Borough Surveyor and Engineer for the following appointments—viz.:—

- (1) Chief Assistant, at a salary of £140, rising, on approved service, by annual increments of £10 to £180 per annum, and
- (2) Engineering Assistant, at a salary of £90, rising, as above, to £120 per annum.

Applications, endorsed "Chief Assistant" or "Engineering Assistant," as the case may be, setting out concisely the candidate's experience and attainments, also giving age (which should not exceed 30 years), and enclosing copies of two recent testimonials, together with the names of two professional referees, must reach the undersigned not later than first post on Monday, the 23rd instant.

A. W. WARD, ASSOC. M. INST. C. E.,
Borough Surveyor.

Shrewsbury.
March 10, 1914.

(1,427)

BOROUGH OF ACCRINGTON. CHIEF ASSISTANT AND GENERAL ASSISTANT, BOROUGH SURVEYOR'S OFFICE.

The General Works Committee of the Borough of Accrington invite applications from qualified persons from 25 to 35 years of age for the positions of Chief Assistant and General Assistant in the Borough Surveyor's Office. Salary £150 and £104 respectively.

It is essential that Candidates should be fully qualified, and have had the necessary education and Municipal training of a Borough Surveyor's Office, to fill the positions, including actual experience in the design and supervision of Tramways, Sewage Works, Private and Public Street Improvement Works, &c., and sufficient architectural knowledge for general engineering works.

Full particulars of the duties and conditions re-

lating to the appointment, together with Form of Application, can be obtained on applying to the undersigned.

Applications to be on the pre-scribed Form (no other will be considered), and addressed to me, endorsed "Chief Assistant" and "General Assistant," and delivered at my Office not later than the 23rd day of March next.

Canvassing will be a dis-qualification.

WM. J. NEWTON, ASSOC. M. INST. C. E., M. S. A.,
Borough Engineer and Surveyor.

Town Hall, Accrington.
March 6, 1914.

(1,393)

WILTS COUNTY COUNCIL. TRUNK MAIN ROAD RECONSTRUCTION.

ROAD FOREMEN WANTED.

The County Surveyor is desirous of engaging three or four Road Foremen for work to be carried out in the reconstruction of the London and Bath Trunk Road.

Applicants must have a full knowledge and experience of all matters appertaining to the making of Roads with bituminous or tarred material. Must be accustomed to the management of men, and able to keep accounts.

Preference will be given to applicants who are cyclists. Age between 30 and 50. Salary, £2 10s. per week.

The persons appointed will be expected to commence their duties on the 20th day of April next.

Applications to be on Forms obtained from the undersigned, and to be sent in on or before the 25th instant.

J. GEORGE POWELL,
County Engineer and Surveyor.

County Offices,
Trowbridge.
March 10, 1914.

(1,426)



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WORKS, KENT.

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

MARCH 20, 1914.

No. 1,157.

Minutes of Proceedings.

The Present Position of the Sewage Disposal Problem.

Any hope that may have existed with regard to the introduction during this Session of a Bill in Parliament dealing with this problem on the lines recommended by the Royal Commission on Sewage Disposal has been dispelled by the statement made in the House of Commons by the President of the Local Government Board, and reported in these pages last week. It is not known definitely, although it has been surmised, that a Bill has been drafted, and even if it has been prepared in rough outline it is not certain that the recommendations of the Royal Commission have been adopted. All we know is that the question of introducing this measure has been postponed for the present for the reason that the issue of the final report of the Royal Commission is expected shortly. On the face of it this would appear to be good grounds for delaying the introduction of fresh legislation on the subject, but it must be borne in mind that the Eighth Report, which included final conclusions on most of the main issues involved, was published in November, 1912, and the appendix to this report appeared last summer. Further, the final report referred to by the President of the Local Government Board will deal only with methods of disposal not involving water-carriage, and with standards in regard to trade effluents. In addition to all this, the prospects of a general election will very probably cause a further postponement of this question. It is thus evident that an important matter urgently needing fresh legislation will not be brought before Parliament until three or possibly four years after the Royal Commission appointed to deal with it has made definite recommendations as to what should be done. Meanwhile developments are taking place in several directions, and by the time the proposed Bill is introduced into Parliament improved and possibly entirely new methods of sewage disposal will probably have been discovered and be actually in use.

That this is not vain imagination is clear from the references we have made in these columns to new methods of sludge disposal, aeration as an aid in sewage purification, and similar matters. Further evidence appears in the extremely interesting paper read by Dr. Gilbert J. Fowler, F.I.C., before the Liverpool Engineering Society at the beginning of this month. From the extracts which we print on another page we gather that Dr. Fowler is supervising experiments in the aeration of sewage similar, in some respects, to those which have been carried out at the Lawrence Experiment Station of the Massachusetts State Board of Health, as described in these pages recently. He even goes so far as to say that he "looks for-

ward with confidence to the time when it will be possible completely to purify sewage in a tank with production, on the one hand, of inoffensive sludge, which can be readily handled and disposed of as manure, and, on the other, of a well-aerated effluent in which aquatic plants and fish will make final use of the nitrates and phosphates in solution." He also draws attention to various improvements in methods of sludge disposal, the great bugbear of sewage works managers at the present time, and suggests that in the future a sewage works will no longer be a source of nuisance and trouble either from decomposing offensive sludge or from flies and odours from percolating filters. It is, however, the concluding paragraphs of the paper which have the most direct bearing upon the delay in the introduction of fresh legislation upon the subject referred to above. Dr. Fowler emphasises the importance of realising that real advance in the art and practice of sewage disposal must come through the avenue of scientific research of the highest order, and that such research work necessitates well-equipped laboratories and large staffs of highly trained workers. He expresses the hope that "the present Royal Commission will not be concluded before its work has been put upon a permanent footing in the establishment of a national research department which could carry out work of a wider scope than is possible for any one local authority, and could correlate the work done by such authorities to the general benefit of all."

We have no desire to minimise in any way the importance and value of the investigations already carried out by the Royal Commission, but under its present constitution its scope is limited, and the continual delay in setting up the proposed central authority which would, we presume, be furnished with the means for carrying out the scientific research work mentioned by Dr. Fowler, postpones the time when full and prompt advantage may be taken of the various developments in methods of sewage disposal. The loss to the community caused by this delay is fourfold. In the first place, there is the loss due to the lack of the more efficient and more economical methods of treatment which would be available. Secondly, there is the waste of the large sums of money now being spent on works which may be rendered obsolete in a few years' time, and might have been avoided. Thirdly, there is the loss from the public health point of view by the delay in the thorough purification of our at present polluted streams and rivers, and last, but not least, there is the enormous loss due to the waste, under existing methods of disposal, of the valuable fertilising agents present in sewage. The opinion expressed by Dr. H. Maclean Wilson, and confirmed by Dr. Fowler, indicates that there

is an almost unlimited outlook for properly prepared sewage manure, either alone or as a basis for enrichment by artificial fertilisers, and the necessary investigations into the various developments in this direction described in the paper would alone be ample justification for the establishment of a national research department. It may be too late now to press for the introduction of the proposed Bill in the present Session, but it cannot be too strongly urged upon those in authority that the need for new legislation on the lines recommended by the Royal Commission is very great, and that the loss caused by the delay in dealing with the subject is much greater than is generally imagined.

**Is Cancer
a Water-borne
Disease?**

It has long been contended by several of the greatest authorities that the value of pure water is insufficiently recognised. Independent observers in America and in Europe discovered that a fall in the death and disease rates from causes other than typhoid fever followed the adoption of improved methods of purification. It was observed that, while with a purer supply there was a decrease in the general death-rate from causes other than typhoid, in cases where the supply to a town had remained unchanged no such decrease in the death-rate occurred during the same period. That this view is not generally accepted is evident. The very fact that the bacteriologist only acknowledges certain diseases as being water-borne seems to outweigh all other evidence, for "the mere fact," says Dr. Houston, "that there has occurred a decline in the incidence of tuberculosis, pneumonia and respiratory diseases generally—none of which can reasonably be regarded as at all likely to be water-borne—throws some doubt on the hypothesis that an improved water supply necessarily tends to produce any marked and continuously operating decrease of mortality for general and particular diseases." Cautious as this comment is, it seems to infer that certain diseases cannot be water-borne because they are not officially recognised as water-borne diseases. Dr. Houston's remark refers to a paper written by Prof. Sedgwick and Dr. J. Scott McNutt, already dealt with in these pages, and published by the Massachusetts Institute of Technology, which paper gave facts and figures relating to certain phenomena observed independently by Mr. H. F. Mills, of Lawrence, Massachusetts, and Dr. J. J. Reincke, of Hamburg.

We now have before us some very important investigations on cancer in trout carried out for the United States Bureau of Fisheries by Dr. H. R. Gaylord, director of the State Institute of Malignant Diseases at Buffalo. These are reported in the *Engineering Record* of New York, and they tend to show that cancer is a water-borne disease notwithstanding the established fact that cancer is of a non-contagious nature. It is reported that every one of nineteen trout hatcheries from Maine to Yakima, Washington, which were examined had cancer incidence, and the same thing is said to be true of trout hatcheries in all parts of the world. The important point is this, that "dogs drinking the water develop growths, and so do rats fed on the scrapings of the hatching troughs." It has been suggested that there may be "an intermediary host-bacteria which an infinitesimal cancer bacteria infects." Such a discovery would not be surprising to engineers, who have for some time been growing more and more sceptical as to the value of analysts' reports as compared with the results of practical experience and knowledge of conditions. Having first been under the impression that a chemist's analysis was final evidence of purity, the average layman was slow to appreciate the importance of bacterial examination, and now, having grasped the importance of the microbe, he is quite ready to learn that there are more things

in heaven and earth than are dreamt of in the scientist's philosophy, and that impure water or sewer gas may produce disease for reasons as yet unknown to the bacteriologist. It is to be hoped that the question raised in America will be carefully followed up by our own workers; also, we thoroughly agree with the *Engineering Record* that this water which appears to carry cancer should be filtered and sterilised or otherwise treated in order to find out whether it is possible to purify it. If it should thus be established that cancer is a water-borne disease, and that treatment will effectively remove the dangerous quality from the infected water, the fact will indeed be "of tremendous import to the waterworks field."

**"Constructive
Misfeasance."**

It is somewhat of an anomaly that, although it is the duty of a highway authority to keep their highways in a proper state of repair, they are not liable for accidents caused solely by mere omission to perform that duty. This doctrine of non-liability for nonfeasance—according to Mr. H. Hampton Copnall in his valuable work, "The Law Relating to Highways"—arose from the consideration that "if individuals who had suffered damage were allowed to sue the inhabitants at large it would lead to the multiplication of actions," which looks as if the originators of the doctrine did not expect very great things in the way of road repair from the powers that then were. But, however this may be, it would appear that the doctrine has of late years been somewhat modified in its application. The writer of a most interesting article on this subject, which appeared in the "Solicitor's Journal" for January 10th, after reviewing the nature and history of the doctrine, proceeds to discuss a few recent cases showing how greatly its operation has been limited by re-interpretation and restatement. He shows that the effect of this whittling-down process is to extend the term "misfeasance" so as to include some things which look like "nonfeasance," and to give rise to a novel doctrine of "constructive misfeasance." In other words, while in theory "nonfeasance" is still not actionable, certain defaults have been taken out of the category of "nonfeasance" and included in that of "misfeasance," so that while the area of the latter has extended, that of the former has correspondingly shrunk. The principle on which this new doctrine (or rather this new reading of the old doctrine) is founded is thus stated: "If a road authority has either in that capacity or in conjunction with some other public powers possessed by it, two duties connected together, and if it performs one of them, but leaves the other unperformed, then non-performance of that other duty which causes injury to any person ceases to be mere nonfeasance and becomes actionable misfeasance."

By way of illustration three cases are cited. The first was the case of a street in Manchester ending in an unfenced ravine, into which a motorist fell. Here the local authority had three separate duties—viz.: (1) To make up the road, (2) to light it, and (3) to fence the ravine. The performance of the first two of these duties turned the default in performing the third from "nonfeasance" which it would have been by itself—into "misfeasance," for which the authority were liable (*McClelland v. Manchester Corporation*, 1912, 1 K.B., 118). The next was an Irish case, in which the road authority repaired half of a road, leaving the other half unrepaired, but open to traffic. They were held liable for an accident due to the non-repair, the repair of the one half of the road being a partial and faulty performance of the duty to repair the whole (*Ryan v. Tipperary North Riding Council*, 1912, 2 I.R., 392). The third was the case of an accident to a cyclist caused by a defective sewer grating at Battersea. The dis-

trict council were both road authority and sewer authority, but they had made up the road without repairing the grating, and they were held liable (*Papworth v. Battersca District Council, Times, December 22, 1913*). It is true that, as the writer of the article referred to points out, the decision in this case was based chiefly on the view that non-feasance on the part of a sewer authority is in itself actionable. And there are reported cases which go to support that view. But as there appears to be some doubt upon this point, the case may for practical purposes be considered as an illustration of the principle in question.

* * *

The Amateur Surveyor Again. "At any time we are electing a surveyor, it would be very much better, I think, if we were to select a man from some trade—either a mason or a carpenter—who could get into contact with matters that were being done." These illuminating words were spoken by Councillor Bennett at a recent meeting of the South Molton Town Council. As an expert on road making Councillor Bennett stands very high in Councillor Bennett's opinion, and in moving for a return of the expenses of the council's steam roller during the past three months, and the number of yards of stone rolled in, he was consequently able to deliver a lecture on the subject for the benefit of the surveyor. At the conclusion of this discourse, Councillor Tucker observed: "Now we shall see who are the ratepayers' friends!" This worthy gentleman viewed the matter in its legal aspect, his speech containing the following gem: "I take in the Acts of Parliament every year, and look up the sections and subsections, and I tell you we are not compelled to roll in stones the same day. There's nothing in the Acts about it." Twelve members—friends of the ratepayers voted in favour of the return moved for, which was granted. Encouraged by his success, Mr. Bennett presently moved for another return as to the terms upon which a tar-sprayer had been tried, "the number of days it was in use, and the cost thereof." The last word of the motion suggests that the assistance of the legal expert was obtained in its drafting. This time, however, all did not go smoothly, for, when waxing eloquent as to the expenses which had been incurred, Councillor Bennett was reminded that he himself had signed the cheque! This caused a temporary hesitation, for it became necessary for the mayor to exhort the speaker to "go on," whereupon the discussion proceeded as follows:—

Mr. Bennett: I would go on, but they keep interrupting. (Loud laughter.) Then a bill was sent in by Fothergill's for the very handsome sum of £17—just for spraying a little bit of tar over our stairs—I mean our square. (Laughter.) It's a darn shame to the ratepayers. (Hear, hear.) It's ten pounds thrown away if it's ten pence; and I want to know how that £17 was made up.

Mr. Tucker: I second. Now we shall see who are the friends of the ratepayers.

The surveyor ultimately gave an explanation of the circumstances under which the hiring took place, and upon a vote being taken, fourteen members expressed themselves as being satisfied. Councillor Tucker may continue his efforts to discover who are the friends of the ratepayers, but we would observe that incidents of the kind referred to make it easy to find out those who are not.

* * *

Main Roads in Greater London. In our issue of November 11, 1913, there will be found a report of a conference of borough and urban authorities convened by the President of the Local Government Board for the purpose of discussing the subject of main routes in the London area. The sectional conferences held last week and this week carry matters a stage further, and the memoranda prepared by Mr. T. Adams and Colonel R. C. Hellard provide useful data, and suggest important considerations the recogni-

tion of which is essential to a wise solution of the problems which have to be faced. Mr. T. Adams, who is the town planning inspector to the Local Government Board, dealt first with matters pertaining to the subject generally, and then described the conditions in each of the separate areas in which authority for the preparation of schemes of town planning has been obtained. In the north-western district, it will be noticed, a draft scheme has already been prepared. Colonel Hellard, representing the London Traffic Branch of the Board of Trade, submitted a memorandum mainly relating to traffic statistics and to engineering features of the situation. These memoranda, which are reproduced in another part of this issue, should be carefully read by all who are interested in the planning of arterial roads in the London area, or in those general features of town planning schemes which are bound up with the subject of the alignment or improvement of main routes. We desire to endorse Mr. Adams' opinion, that those local authorities which have in view the preparation of town planning schemes should not defer obtaining the consent of the Local Government Board to the preparation of such schemes until the general conclusions of the sectional conferences have been reached. As Mr. Adams pointed out, a recently issued circular of the Local Government Board makes it clear that arrangements may be made for reserving the strips of land which are likely to be needed for new roads or widenings, and that new roads, when actually made, need not, in the first instance, be so made as to be sufficient for their ultimate purpose. It is unfortunate that the principle is not more generally recognised and more often acted upon in both urban and rural areas, and it may also be observed that many road problems would be much simplified if the authorities concerned would grasp another important fact—namely, that it is neither necessary nor desirable to look to the development of a road into a shopping street as a contingency that must always be provided for. If this fact could be recognised by the sectional conferences, their main problem would be much simplified.

* * *

Engineering and Finance. From the engineering point of view Mr. Adams' remarks as regards the topographical significance of the Lea Valley in the north-eastern section, and the need for cross communication in the northern section, are specially interesting. Colonel Hellard directed the attention of the conference to the engineering difficulties due to the numerous railways around the fringe of the most densely peopled area, these railways being the worst obstacles to a free choice of route. Highway engineers who frequently travel into and out of London will have observed that there are many places where an otherwise desirable route for a road is blocked by railways. A railway line is often, as Colonel Hellard pointed out, at such a level that it is not easy to carry a road either over it or under it, and places where many lines cross one another and join one another near the same spot are particularly troublesome in this respect owing to the considerable range of levels at which any intersecting line of route is obstructed. The advantages obtained fully justify the abandonment of considerable areas of valuable land to a few minor uses, and, this being so with respect to 44 per cent of the 2,000 million passengers carried by public services in the London area—the share of the railways—it is clear that a similar devotion of valuable areas is also worth while in the case of the 66 per cent carried by road. There are, it is true, some elements of the situation which tend to reduce the difficulties of main route problems; but since the actual numbers of passengers travelling by road is likely to increase considerably, it is not unreasonable to regard the expenditure of fairly large sums of money representing land values—as one of the elements of successful planning of main routes.

The Present Position of the Sewage Disposal Problem.*

By GILBERT J. FOWLER, D.S.C., F.I.C.

On May 7, 1898, a Royal Commission was appointed with wide terms of reference to inquire and report on the whole question of the treatment and disposal of sewage. The present Royal Commission submitted its first interim report in 1901, and its eighth report, embodying final conclusions on some of the main issues involved, was published in 1912.

ARTIFICIAL PROCESSES.

In the interim report of 1901 the commission state that it is in their opinion practicable to produce by artificial processes alone effluents which will not putrefy, and which might be discharged into a stream without fear of nuisance. These artificial processes are summarised in a list in the interim report.

STANDARDISATION OF METHODS.

A great part of the Royal Commission's work has consisted in the collection of evidence and the conduct of experiments, with the object of working out the conditions of efficiency of these various processes, and of standardising the methods employed as far as practicable, so that an authority may have a fair idea what sort of a result is likely to be obtained for a given expenditure.

FIFTH REPORT OF COMMISSION.

The Fifth Report of the Royal Commission and its Appendices are a mine of information in this respect, and the appointment of the commission would have been more than justified by this report alone, introducing as it does the idea of quantitative accuracy into the operations of sewage disposal.

There is no excuse now for authorities to launch out on expensive works without any preliminary study as to the character and amount of the sewage to be treated. The commission show clearly that the design and extent of the works must depend on the concentration or "strength" of the sewage. This is roughly proportionate to the water supply per head, and the amount of subsoil drainage finding its way into the sewage system. The composition of the sewage is also affected, *e.g.*, by the quantity and character of the trade effluents discharged into the sewers, and by the proportion of water-closets to pail-closets in the district sewered, and by other factors.

In the Fifth Report the commission indicate in general terms the kind of works necessary to obtain a satisfactory effluent from sewage of a given character.

NEED OF PRELIMINARY STUDY OF EACH PROBLEM.

This, of course, does not mean that in future all that a corporation or council has to do is to take a sample or two of the sewage, have it classified as "strong," "medium," or "weak," and order a sewage works accordingly.

The chemical and engineering conditions are in no two places alike, and in order to obtain the maximum efficiency and economy under any given set of conditions, careful thought and study on the part of the engineer and bio-chemist will always be necessary.

The author has, *e.g.*, on more than one occasion, recently found that the sewage to be dealt with in small installations in the country is rendered much more offensive and difficult to treat by the drainings from manure heaps which are allowed to enter the sewers. A creamery in a country district may also introduce unforeseen difficulties.

DEFINITION OF DRY-WEATHER FLOW.

The question of what really constitutes the dry-weather flow is one of great importance and some difficulty. The actual water consumption may vary from 100 to 150 gallons per head, as in New York, to, say, 10 gallons per head or less in a country town or village.

It does not quite dispose of the question to say that the strength varies in inverse proportion to volume, and therefore the provision of tanks and filters must be the same for all strengths, the rate of operation alone varying.

Obviously, as regards capacity of sewers the actual quantity to be dealt with must be considered, especially in reference to storm water. While it might be quite reasonable to construct sewers to take six

times, say 30 gallons per head, the problem becomes enormous if 100 gallons per head is to be taken as what may be called unit flow. On the other hand, if the dry-weather flow is, say, 10 gallons per head strength, storm overflows set at six times the dry-weather flow would discharge at only twice the dilution of ordinary 30 gallons sewage.

The question of actual quantity, apart from strength, also has to be considered in the design of disposal works. Tanks, channels and distributing mains, have all to be larger if six times an originally dilute sewage has to be dealt with, than if the original sewage is strong. There is also the physical limit of speed within which filters can be operated without water-logging. This question of what is to be taken as the dry-weather flow is, therefore of great importance in calculating the sizes and sort of works necessary to deal with a given sewage.

NEED OF STATISTICAL REPORTS.

It is because so few towns give returns of what has actually been thoroughly dealt with at their works as compared with the total quantity received, and the cost of such treatment, that it is so difficult to make just comparisons between one method of treatment and another, or one town and another. It is comparatively easy to get constantly good results when filters are carefully nursed, the test curves when they are called upon to take the day-to-day fluctuations year in, year out.

It is to be hoped that reports giving full data of costs in reference to flow and population will be more frequently published in future by municipal authorities than is now the case. Their value cannot be over estimated.

COST OF EFFECTIVE TREATMENT.

From such figures as are available, *e.g.*, from Leeds or Wolverhampton, Glasgow, and the Manchester statistics, it may be roughly assumed that the total revenue and capital cost for the production of a good effluent will amount to at least 2s. 6d. per head per annum. For small towns it may be more.

The term "satisfactory effluent" has been used in this paper so far without precise definition. This definition has been given by the Royal Commission in their eighth report as follows:—

"An effluent in order to comply with the general standard must not contain as discharged more than 3 parts per 100,000 of suspended matter, and with its suspended matters included must not take up at 65 deg. Fahr. (18.3 deg. Cent.) more than 2.0 parts per 100,000 of discharged oxygen in five days."

Under certain circumstances they indicate that an even more stringent standard may be called for. Few will deny that if every inland town produced an effluent of the character defined above year in, year out, the condition of rivers, especially in the North of England, would be very different. It can be done at a price, and is done, the author believes by certain towns in the potteries and in the Midlands. The more reason that full statistics should be published for the encouragement of others.

EFFECT OF DILUTION.

Where the effluent is considerably diluted by the body of water into which it flows, the commission conclude that the standard may, under proper supervision, be relaxed or suspended altogether.

It is, however, by no means easy accurately to judge of the effect of dilution. The problem is in the first place one of efficient mixing. Cases will readily be called to mind where sea-outfalls can become a source of serious nuisance if not carefully chosen. Bombay is an example where, owing to a clerical error, the tidal currents were wrongly marked on a map, the outfall site chosen in consequence has proved far from satisfactory, as the sewage lies in a still pool under Malabar Hill, one of the best residential quarters of Bombay.

Probably the most complete studies on the problem of disposal of sewage by dilution ever made have been carried out by the Metropolitan Sewerage Commission of New York.*

* Extracts from a paper read before the Liverpool Engineering Society on the 14th inst.

* Details of the results of the investigations of this commission and the recommendations which have been made have appeared from time to time in THE SURVEYOR.—EDITOR.

FURTHER PROBLEMS.

It has been shown that it is possible to dispose of sewage without causing offensive pollution in the body of water into which it is discharged. The outstanding problem remaining is the utilisation of the sewage. This has been the dream of the sewage enthusiast ever since modern ways of living forced most people away from the simplicities and economies of the Chinaman. The city of Shanghai makes a handsome profit from the sale of night soil, and the water carriage system is unlikely to be installed there, at any rate in the immediate future, if ever.

With its greater convenience and cleanliness the water carriage system entails constant wastage of valuable fertilising agents which should come back into the cycle of Nature. That they eventually do so to some extent as fish may be granted, but the world needs wheat, and the fact that the Manchester sewage works and others have been able to sell dried sewage manure at a profit in Canada, that Bradford has concluded a contract for its dried sludge with the intensive gardeners of Northern France, indicates that there is an almost unlimited outlook for properly prepared sewage manure, either alone or as a basis for enrichment by artificial fertilisers. This is the conclusion of Dr. H. Maclean Wilson in a recent report, and the author is quite in agreement with him.

In their conclusions as to the value of sewage sludge the Royal Commission do not appear very convincing. They seem to have insufficiently differentiated between sludges of different origin and composition, and it will be of interest to consider the possibilities of each of these in turn:—

Taking first sludge from sedimentation and chemical precipitation processes, which are very similar in character. The most successful utilisation of sludge is carried on at Bradford, Yorks, where the whole sewage, containing as it does, a high percentage of grease from wool-washing, is treated and "cracked" with sulphuric acid, the resulting sludge hot pressed, the grease thus recovered sold at a profit, and the residual cake sent away, as has been said, to France.

At Oldham, Dr. Grossmann finds a ready sale for the residue left after distilling away the grease from the sludge. It is largely the presence of soap and fat in sludge which precludes its use as manure, as if they are present it will not readily incorporate with the soil. Ordinary pressed sludge cake also contains seeds of weeds and undesirable plants. Thus, if the grease and these seeds are eliminated, a much more satisfactory product is obtained.

Other kinds of sludge than those referred to above are produced in modern sewage works either by anaërobic or aerobic processes.

The latest development of the anaërobic process is the Emscher tank, the first one of which in this country is now being erected at the Withington works of the Manchester Corporation. The Emscher tank consists of two parts, a settling chamber and a sludge digesting chamber. The sewage passes through the settling chamber, and the sedimentary matters (other than heavy grit, which must first be removed) fall through a slot in the sludge-digesting chamber, which is much larger than the settling chamber. Here the sludge remains and undergoes thorough fermentation, after which it can be run out, and, owing to the peculiar granular nature which it acquires by fermentation, can be readily dried in properly constructed draining beds. The residue thus obtained is quite inoffensive, and is useful itself as a light manure, and can easily be enriched.

In Dublin a process of fermentation of sludge by addition of yeast is in operation. A considerable separation of water occurs in the process, and the fermented and concentrated sludge is dried in an ingenious manner, and the resultant powder sold by itself for 50s. per ton and more, in proportion to added artificial fertilisers.

The mode of action of the yeast is not properly understood, but it has been suggested as the result of experiment that the yeast breaks down and the cellulose cuticle of the yeast ferments somewhat, yielding hydrogen and other gases which cause the solid matters to rise to the top of the fermentation tank, with separation of a considerable percentage of water.

Fermentation of sludge may also be aerobic, and this takes place in the Dibdin slate filter and the ordinary contact bed or percolating filter. The residuum in a Dibdin slate bed has to be washed out from time to time, the filtering medium in a contact

bed is taken out from time to time, and the humus from a percolating filter is generally caught in so-called humus tanks. These various products, though probably different in many ways, especially biologically, are at any rate generally free from grease, and are granular and inoffensive in character. They are therefore more readily dried than ordinary tank sludge, and in Manchester it is the "slurry," so called from the washing of the contact beds, which is being dried, powdered and sold at a price which covers cost.

It will be seen that the function of the filter-bed, whether slate bed, contact bed, or percolating filter, is largely the collection and granulation of the colloidal matters in the sewage or tank effluent.

In an address given in November, 1911, as chairman of the Manchester section of the Society of Chemical Industry, the author made the following among other concluding observations:—

"I cannot forbear to mention also a most illuminating suggestion made to me by Dr. Maclean Wilson, that it might be possible to discover some kind of clotting enzyme, which should do the work which now apparently takes place in the surfaces of the medium of the filter-bed. If this could be done, there is a possibility of enormous saving in costly works." While considering the problem of New York, this question was anew forced on the author's attention. The idea, as an alternative to the scheme of sea-disposal already mentioned, of treating some 1,000,000,000 gallons of sewage daily on percolating filters appeared altogether impracticable in view of the possible nuisance from flies and odours. Chemical treatment of such volumes had also its special difficulties.

But experiments on various systems of forced aëration, and collection of the oxidised solids on surfaces seemed to offer possibilities, according to the experiments of Major Black and Prof. Phelps. At the Lawrence Experimental Station the author saw sewage in a bottle which under certain conditions had been completely purified by nineteen hours' aëration. This work is referred to in the recent annual report of the Massachusetts Board of Health. But the element of surface and consequent cost remained.

Since then it has been possible in the author's laboratory at the Manchester University to go further. The author's assistant, Mr. E. M. Mumford, discovered a bacillus in the water of the old colliery workings at Worsley which has the property of precipitating iron from solution in presence of organic matter. It was then found, as already reported at the congress of the Royal Sanitary Institute at Exeter, that if this organism is added to sewage effluent, together with a little iron salt, and air is blown through, complete clarification results, and the resulting deposit has a very high nitrogen content. Since then the engineering developments of the process have been the chief concern, but it has been possible successfully to inoculate about 5,000 gallons of sewage with a pure culture of the organism, and a plant is now being experimented with capable of dealing with 10,000 gallons per day.

Laboratory experiments are in progress at Davyhulme which indicate even more far-reaching possibilities, and the author looks forward with confidence to the time when it will be possible completely to purify sewage in a tank with production on the one hand of inoffensive sludge, which can be readily handled and disposed of as manure, and of the other on a well aërated effluent, in which aquatic plants and fish will make final use of the nitrogen and phosphates in solution. The problem in its present stage is largely one of engineering, but granted the possibility of applying large quantities of air economically to sewage, the saving in space and capital cost may be very great.

It should be practicable even for seaport towns to purify their sewage without great difficulty before discharge, retaining the insoluble matters in an inoffensive form, easily disposed of as fertiliser. A sewage works will then no longer be a source of nuisance and trouble, either from decomposing offensive sludge, or from flies and odours from percolating filters.

NEED FOR RESEARCH.

In conclusion, it is necessary to emphasise again that real advance in the art and practice of sewage disposal must come through the avenue of scientific research of the highest order. It is well to remember that the modern developments are only the prac-

tical application of principles discovered long since by men like Pasteur, Warrington, Frankland, and many others, without whose work sewage disposal would be mere empiricism.

Such research work necessitates well-equipped laboratories and large staffs of highly trained workers. The author realises the responsibility in having at his disposal the resources of the Manchester University and the Manchester Corporation for this purpose, but the work is a national one, and it is to be hoped that the present Royal Commission will not be concluded before its work has been put on a permanent footing in the establishment of a national research department which could carry out work of a wider scope than is possible for any one local authority, and could correlate the work done by such authorities to the general benefit of all.

In what has been said the author is not for a moment forgetting that for the practical application of the discoveries of the bio-chemist the close co-operation of the engineer is necessary. It is through this harmonious working together of two great professions that advances may be looked for in the future adequate to the demands of complex modern life.

THE VALUE OF COST DATA IN HIGHWAY ENGINEERING.

By Major W. W. CROSBY,

Chief Engineer, Maryland Geological and Economic Survey.

The mention of cost in connection with any discussion of highway work seems almost inevitable, and its analysis or even its statement always arouses interest and, frequently, discussion. Cost is the ready yardstick of the world for measuring the worth of many things, including the results of road and street work. Often it is not the only one that can and should be used, but, generally speaking, it is the one most frequently applied. The importance of its standardisation may hence be readily inferred. In the engineering prescription toward a result, almost the first question after the possibilities of the solution of the problems have been indicated is, "What will it cost?" If variety in the solution is practicable, a comparison of the costs becomes necessary in order to assist if not to determine the wise choice. The recording and compilation of cost figures regarding work in progress is the most practical way, in these days of enormous operations, for testing the efficiency of the organisation and individuals employed thereon, and for enabling the proper management of the work. In small operations, where the details are not beyond the capacity of the individual in charge, personal knowledge and ability might be successfully depended upon to produce economical results and proper work; but as soon as the operation grows in size beyond the capacity of the individual in charge to control the details, inefficiency is bound to result unless proper records of cost are promptly presented.

The desiderata for cost data may be said to be comprehensiveness, clearness, conciseness, low expense of keeping, ease of keeping by unskilled employees, readiness of and clearness in compilations, regularity of compilation, and periodicity of publication.

Of course, if vouchers containing sufficient detail concerning each expenditure are preserved and filed, it may be said that cost data is being accumulated in a way, but few will pretend that such a course is sufficient. However, every record of expenditure should be so comprehensive on its face as fully to explain the payment made. Clearness should mean intelligibility without the aid of personal explanation from the responsible party in the case of a voucher, and, in the case of accounts, the reasons for segregation of different vouchers into one or more accounts should always be clearly logical or apparent from the established rules provided.

It may be said, without fear of contradiction, that the large majority of costs yet published, either of details of road work or of organisations for road work, are of no scientific value, nor are they of any appreciable value, except to members of the respective organisations themselves, and no fair comparisons between the work of different organisations, such as the various state highway departments, are possible in spite of the voluminous publications available.

The speaker has suggested before the advisability of better co-ordination in this matter of collecting and compiling costs. It was with a proper consideration of co-operation, as well as of local interests, that he devised the system adopted by the Maryland State Roads Commission.

It will be readily seen that if several states or organisations engaged in similar work kept and published their expenses along similar lines it would easily be possible to compare the relative efficiency of each, even though many local conditions were dissimilar, and allowance had to be made therefor. A type of organisation could thus be tested. Types of construction could be proved. Even corruption or inefficiency could be detected, and real defects of materials or methods could be observed. With all these advantages would also come that of presenting to the taxpayers, in understandable form, a concise report as to the expenditure from the public funds so that criticism could be made effective when good, and disarmed when merely captious, unreasonable, or malicious.

In establishing any system for recording and compiling cost data, while the outline may proceed from the top down, the actual work must be begun at the bottom and proceed upward. Hence consideration of the foundation in this matter, as in all highway work, is necessary. No system can be successful which relies on an impractical foundation—that is, the compilations and accounts must be settled with a clear view as to the possibility of obtaining the data on which they are to rest. For instance, unless expert timekeepers are to be employed regularly, it is useless to provide too much sub-division of accounts. In ordinary maintenance work by a patrol-man all that can be expected on this line from the patrol-men best fitted for the physical work is that they will be able to report separately the expense for earthwork culverts (including shoulders), bridges and drains and surfacing, with occasional special reports, from a special inspector perhaps, of such special work as the painting of the edges of the surfacing or the taking up and relaying of a pipe. It may even turn out to be impracticable for the maintenance work to be separated between two differently contracted-for sections of the same road.

Further, in proceeding upward from the collection of facts regarding costs toward the final compilation, the accounting and the intermediate compilations should be so arranged as to fit progressively into the final scheme without the necessity for retracing at any time the steps taken up to that point. This is an important feature, and one which seems to be too frequently ignored. If such progression is not carefully arranged, it will be found that the delay and work necessitated for a special or even routine report at an intermediate stage completely destroy the value of the system for many of the purposes for which it has been installed.

It is true, as first stated, that "cost" is not the only measure of value of work done, though it is a very common one. But other criteria should not be neglected or allowed to slip into "innocuous desuetude." Engineers have been criticised as lacking breadth, and as being too materialistic. It behoves us, therefore, to keep our eyes open to the criteria other than "first cost," or even "long-run cost," in passing judgment on work done, important as the cost factor may seem to be.

Preliminary Studies in Bridge Design.—This little book,* a reprint of articles which appeared in *THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER*, is intended as the first of a series of similar volumes which, taken together, will form a treatise on the design of ordinary highway bridges of moderate spans. This first volume goes further back in the evolution of the bridge than do most treatises, and considers the bridge in its essential elements, that is as the means of providing a crossing for man and beast across a watercourse. The bridge engineer is apt to forget this primary purpose and to consider his bridge merely as a framework or a carrier of stresses. Mr. Ryves, in a refreshingly original manner, has emphasised the necessity for studying natural and economic predispositions, one might say, of the bridge site, with a view toward producing, not the best type of bridge, but the best method of getting the river and the traffic across one another.

...—*Engineering News*, New York.

* Abstract of lecture delivered before the Graduate Students in Highway Engineering at Columbia University.

* By Reginald Ryves, ASSOC. M. INST. C.E. London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.

Forms for Concrete Work.

By ALLEN GRAHAM, A.R.I.B.A., M.C.I.

At a meeting of the Concrete Institute held on Thursday of last week, a paper on "Forms for Concrete Work" was read by Mr. Allan Graham, A.R.I.B.A., M.C.I.

"We do not often hear," said the author, "of failures occurring in reinforced concrete buildings after their completion, but generally during their erection, and although all failures cannot be attributed to defective forms, the forms are to blame in a sufficient number of cases as to render the forms for concrete work an important element in securing efficiency in construction, and not merely in the utilitarian aspect. Although it is not the practice, in England at any rate, for engineers to design their forms, that being generally left to the contractor, it is the author's belief that an engineer, for his own protection, should at least set out some typical portion of the forms for the contractor's guidance, thus doing all he can to circumvent failure in this direction at any rate. Of course, good forms alone will not ensure safety, and we have to use vigilance likewise in detecting bad work, bad design, and bad material.

"Formwork is a term embracing all kinds of moulds or centering set up to give shape to the concrete or similar plastic material. It is so employed in America. There is a consensus of opinion in favour of the definition 'formwork' as an inclusive term, owing to the real meaning of the term 'centering' having a more limited application than usually attributed to it. As the word 'form' is the same, and has the same meaning in French, German, Italian and Spanish, the author believes it will be agreed we are on safe ground if we accept it for our purpose. The term has great merit, being superior to such terms as falsework or shuttering.

"The contention that the engineer should prepare the design of formwork has much to recommend it. An engineer will generally have no hesitation in setting out the design of centering for a bridge or other equally important work, but for some reason or other the design of ordinary formwork which plays such an important part in the cost of reinforced concrete is never considered. There is no doubt that a thorough understanding of the principles underlying the everyday practice of concrete form design is one worthy of the best engineering talent. With this understood, the problem can be analysed, the requirements realised, and the design decided upon that will be the most economical and efficient, giving due consideration to the salvage of materials.

"It is not merely that a design is required for a specific case which will safely support a certain volume of concrete, it is rather the problem of designing a set of forms which can be erected, taken down, and many times re-used during the progress of work. The factors involved are many, such as the type of centering, the kind of timber, how much to centre at one time, and what clamps, bolts, nails, wire, or strap steel should be used. These things properly considered will repay the trouble taken, and result in better and more economical work.

"Various authorities place the cost of formwork at anything from 20 per cent to 60 per cent of the total cost. The possibility of reducing this hindrance to the more general use of concrete ought to be sufficient inducement for us to give the matter close consideration. The great American constructional firms have struck out in many directions to reduce this cost to a minimum, and to this end the forms in most instances are designed in the drawing office, and this we are told at a cost of 2 per cent, and a saving of 10 per cent."

The author dealt with the kinds of timber that are used for formwork, the desirability of giving a camber to the bottom of beam boxes, the desirability of carefully checking the measurements, to see that the concrete members are actually carried out as designed, the necessity of having joints close to prevent the mixture escaping, the remedying of cracks, the removal of forms, clamps and nails to hold the forms together, the repair and re-use of formwork, the number of sets required in order to get on fast enough with the work of building, the importance of carefully clearing forms of all sawdust, dirt and chips before filling with concrete, the wetting of timber to

prevent sticking, the use of sheet metal, the time for striking forms and methods of determining the strength.

TIMBER.

With regard to the question of timber, Mr. Graham said:—

"White pine, yellow pine and spruce are all excellent for the purpose, and should be free from knots, and must not be so dry that they will absorb the water from the concrete and so swell and bulge as to entirely distort the forms. On the other hand, if the timber be green it will shrink and cause the same trouble. Varieties with hard surfaces should be chosen in order that forms may be oftener used before dilapidation.

"The timber has to resist the weight or pressure when a considerable height of wet concrete is being poured, as in walls and columns. Many authorities calculate this pressure as a liquid of half its own weight—namely, 75 lb. per cubic foot. When the concrete is placed in layers no calculation is necessary, as it has been found in practice that for beams the bottom boards should be 2 in. to 2½ in. thick, with sides 1½ in. to 2 in. thick. Column sides should be 1½ in. to 2 in. thick. For walls 1½-in. boards are used. Of course, the thickness of boards can be varied just as we place the clamps or braces, but it must not be overdone, nor the material made too thin. A more solid board will ensure greater economy, from the fact that the form can be used over and over again. For slab panels 1-in. stuff is generally used, but 1-in. boarding requires staying every 2 ft., 1½-in. boarding requires staying every 3 ft., 2-in. boarding requires staying every 4 ft. to 5 ft. Studs should be of sufficient size and spaced so as to prevent the boards between them springing.

"They may be 2 in. by 4 in. to 2 in. by 6 in. if not used beyond 2 ft. to 3 ft. centres; 3 in. by 8 in. may be spaced about 4 ft. 6 in. centres; 4 in. by 10 in. at from 6 ft. to 8 ft. centres; 6 in. by 12 in. from 8 ft. to 10 ft. centres; but the spacing of the supports must be governed by the nature of the weight coming upon the boards."

CAMBER.

On this question the author remarked:—

"It is necessary to give to beams a camber of at least ¼ in. in 5 ft.—i.e., $\frac{1}{20}$ th of the span. This generally comes out during the ramming and tamping of the concrete and in the squeezing of the wedges. After the filling, the beams should be examined to see if the camber has come out during the process of tamping, so that it may again be secured by tightening up the wedges before the concrete has set.

"In cases where a great deflection was found in the beams, the failure of the supports to the studs has been the root cause, probably owing to soft ground. For that reason a little judgment should be used to see that the sole plates under the supports are sufficiently large to distribute the load safely over a sufficient area."

CALCULATIONS FOR STRENGTH.

All timber supporting floors, the author advised, should be calculated for deflection rather than strength.

Sanford E. Thompson, A.A.M.SOC.C.E., a recognised authority, calculates from the following data:—

(1) Weight of concrete with reinforcement 154 lb. per cubic foot.

(2) Live load—slabs, 75 lb. per square foot; beams, 50 lb. per square foot.

(3) In calculating planks, beams, and joists, he takes as the coefficient in the deflection formula a mean between the value for a beam fixed $\frac{5}{8}$ and a beam supported $\frac{1}{384}$. This average therefore amounts to $\frac{3}{384}$.

Then the deflection = $\frac{3}{384} \frac{Wl}{EI}$, where W = total weight or load (in lb.), l = length of span (in inches), E = elastic modulus = 1,300,000, I = moment of inertia.

The moment of inertia is, of course, $I = \frac{ba^3}{12}$ where d = depth and b = breadth (in inches).

He limits the deflection to $\frac{1}{8}$ in.

For struts the allowable compressive stress must be reduced in proportion to their slenderness. If we assume them to be in a condition intermediate between pin connected and fixed because of their flat ends, the values for spruce or fir may be taken as in the following table, wherein—

l = unsupported length of strut in inches,

g = gyration radius of strut in inches,

g being equal to $\frac{d}{\sqrt{12}}$ for square struts, and to $\frac{d}{4}$ for

round struts, where d is the diameter (in inches).

	Ratio of l/g						
	60	75	90	105	120	135	150
Value of allowable compressive stress	960	900	825	675	450	410	340

Mr. Graham afterwards dealt in detail with forms for various parts of construction, as, for example, floors, beams and pillars, culverts, conduits, tall chimneys, silos, tanks, gas-holder tanks, dams, domes and bridges.

The paper was illustrated by lantern slides and a considerable number of working drawings.

TAR AND TAR PRODUCTS.

CO-OPERATION BETWEEN SUPPLIERS AND USERS.

In his presidential address to the Southern District Association of Gas Managers at the annual meeting of that body, on Thursday of last week, in London, Mr. Thomas Glover, of Norwich, observed that the place that tar and bituminous binders would take in road surfacing and road crust construction was a subject worth closely following, and a sympathetic spirit of co-operation should exist between the producers of tar and tar products and the engineers who were responsible for the making and maintenance of our roads.

Commenting on the appointment of Mr. H. P. Maybury—at one time closely identified with their industry—as chief engineer to the Road Board, Mr. Glover said they might be quite sure that, in view of the splendid work done on Mr. Maybury's initiative with tar products in Kent, the use of the right quality of bituminous matter originating in gasworks would receive favourable consideration, and this would exercise a beneficial check on the exploitation, to an undue extent, of natural bitumen.

Mr. Glover proceeded: "While the surface treatment of water-bound roads for the prevention of dust, and the reduction of wear of road surfaces by attrition, is now out of the experimental stage, and the advantages of the process are well known and acknowledged, much remains to be done to ensure uniformly good results being obtained. Gas engineers, and particularly those who are also tar distillers, can be of much assistance to the road authorities in this matter, and while the final tribunal must be actual experience on the roads, the gas engineer and his staff are better equipped for the experimental work and standardising of the bituminous preparation than the road surveyor. The best results can only be obtained by the co-operation of those supplying with those using these materials.

"The specifications framed by the Road Board have been of some assistance.

GASWORKS TAR.

however, differs so much in its properties and characteristics with every variation in the class of coal carbonised, and particularly the method of carbonisation adopted, that it becomes necessary, in the interest of uniform results, that the tar from every works be separately studied. In the case of heavy-charge tar and vertical-retort tar, the material is usually readily rendered suitable for road surfacing by removing the lighter portions of the tar by distillation. Certain tar, however, as made at high temperatures from small, horizontal charge work, is of such a nature that the removal of its lighter constituents is not sufficient to bring it into conformity with the Road Board specification. This, it would appear, can only be done by synthetically blending the pitch from such

a tar with heavy oils (practically free from naphthalene) in the required proportions—a process usually too expensive to be admissible. Adherence to the Road Board specification would appear to mean the exclusion of many such tars, so reducing the source of supplies, with a consequent rise in prices—a feature undesirable in the interest of extension of the use of tar for such purposes. It has no doubt been observed that heavy viscous tar requires more and larger shingle or chippings, but a much more durable coating is obtained by its use. It has been estimated that the saving in tyres on a tar-surfaced main road from London is equal to £2,000 per mile per annum. The cost of tar surfacing such a road would be about £70 per mile.

"Viscosity and specific gravity are not qualities which follow on parallel lines, and of the two it is desirable to have a test for, and to adhere to, a standard of viscosity. The purer the tar the more difficult it is to get the specific gravity of the Road Board specification without getting a viscosity which the county engineer or his contractor finds inconvenient in application. The preparation of

AN IDEAL ROAD DRESSING

involves the exclusion of water-gas tar, the removal of water, naphthalene, and light oils. The naphthalene content should be as low as possible, and the free carbon should not exceed 16 per cent. The nearer the material approaches a mixture of pitch of low, free carbon content and anthracene oil the better the results are likely to be. Such a tar, when applied to the roads, is not readily soluble in water, and during wet weather it does not discolour drainage water, and will therefore not pollute streams. Properly prepared tar does not cause the death of fish. The surface treatment of existing macadam roads must continue for some years to come. At best, however, it is only a thin veneer, and there is little doubt that the substitution of bituminous-bound for water-bound roads will extend as existing roads are reconstructed, particularly in the towns and their environs.

"While the required properties for a bituminous binder for road construction are few, they are, nevertheless, exacting. The temperature of a road surface may vary between 26 deg. Fahr. in the winter and 120 deg. Fahr. in the summer, and the binder must stand this range of temperature without becoming brittle at the lower, or unduly softening at the higher, temperature. The problem appears to centre, for the most part, around the relative resistance of these bituminous binders to this range of temperature. The material must remain resilient at the lower temperature, and not soften too much under the summer sun, nor perish by the evaporation or oxidation of its constituent oils, after long wear and exposure.

"Natural bitumen has proved an almost ideal material for the purpose, but the limited supply and high price prevent its extensive use except for first-class roads. The provision of a substitute presents, therefore, an attractive market for the bituminous product of gasworks. Various pitch grouts, consisting of soft pitch loaded with sand and other materials, have been tried with varying degrees of success. Along with other workers in this line of investigation and experiment, I have been to some trouble to devise such an article as will answer the requirements, and am looking forward with reasonable expectation to disposing of the whole of the Norwich production of pitch in this way."

The Surveyors' Institution.—The next ordinary general meeting will be held in the lecture hall of the institution on Monday, March 30th, when a paper, entitled "London before the Fire: as Referred to in Sixteenth and Seventeenth Century Literature," will be read by Mr. W. W. Jenkinson (Fellow). The chair will be taken at eight o'clock.

The Proposed Visit to Hamburg.—It appears that up to the present very few acceptances have been received for the proposed visit of members of the Institution of Municipal and County Engineers to Hamburg. It should be noted that those who hope to attend must communicate with the secretary before the end of March. Through the mediation of His Majesty's Consul-General at Hamburg, the civic authorities are making such arrangements as should ensure the visit being most interesting, and it is hoped that members will respond to the invitation in good numbers in order that the institution may be well and worthily represented.

MUNICIPAL ENGINEERING IN INDIA.

CALCUTTA PROBLEMS.

As a rule (a writer in the *Englishman* observes), municipal engineering is of such a humdrum nature that the average man rarely finds anything in it to interest him. This much, however, cannot be said of Calcutta, which has undergone many and remarkably rapid changes within recent years. One of the most vital problems with which the municipal engineers have had to grapple within comparatively recent times was the efficient supply of filtered water—the ultimate solution of which was the erection of the Tallah overhead reservoir. The magnitude of this problem may be judged from the fact that the supply of filtered water has been increased during the past nine years from 20,500,000 gallons per day to over 36,000,000 gallons per day, and even this extraordinary increase does not meet with the demands of the public, and more especially the Indian inhabitants of the city.

Shortly after Mr. W. B. MacCabe came to Calcutta as the chief engineer of the Calcutta Corporation in 1903, he proposed and drew up a scheme for the supply of 50,000,000 gallons of filtered water per day, but the corporation called for an immediate supply of 32,000,000 gallons per day, gradually rising, as the population increased, to 40,000,000 gallons per day in the course of twenty-five years. The scheme hung fire till 1911, when it was brought into operation only to be found that 32,000,000 gallons per day was totally insufficient for a continuous supply at high pressure, and the amount had necessarily to be increased, with the result that it is now far ahead of what the corporation originally proposed, there being over 36,000,000 gallons coming into Calcutta daily at the present time. This increase is more especially interesting in view of the fact that as late as 1905 there was only 20,500,000 gallons of filtered water per day available in Calcutta.

It is thus self-evident that a daily supply of 40,000,000 gallons—the maximum for which the scheme was designed—requires to be delivered in Calcutta as soon as possible; in fact, it is probable that the amount will be delivered in the course of a year and a-half. Yet even when this figure has been reached it will be found insufficient to give a continuous *high pressure* supply. Emphasis is laid on the words *high pressure* because, although there has been a continuous supply of water in Calcutta since 1911, it is not given at high pressure throughout the twenty-four hours owing to the enormous draught which takes place in the northern half of the city. The supply must therefore be increased daily beyond the figure of 40,000,000 gallons adopted by the corporation, or somewhat drastic measures will have to be taken to control the excessive waste and misuse of water. This will not, however, entail any increase of size in the present elevated reservoir at Tallah, which is the main feature of the improved water supply scheme of Calcutta, and for the design and construction of which Mr. McCabe was responsible. This scheme, by the way, cost the corporation about 60 lakhs of rupees.

DRAINAGE OF THE FRINGE AREA.

Another great work now nearing completion is the drainage of the Fringe area, which has long been a slur upon the Calcutta drainage system, as it was little better than an area of swamps during the rains. It is confidently expected that the scheme will be in working order before next rains. The executive engineer of suburban drainage has undertaken the work, under the guiding spirit of the chief engineer. In carrying out this scheme some extremely difficult ground has been met with, and the worst portion is now that which has to be dealt with. In this length all sorts of expedients, such as interlocking steel piles, have had to be resorted to. There is no reason to anticipate any failure, although the short length referred to will be rather tedious to complete.

SILTING OF THE BIDYADHARI.

But perhaps the most important drainage problem with which the corporation has been confronted for many years past is the silting up of the Bidyadhari River, into which the whole sewage of Calcutta discharges. Although this problem is still in the melting-pot, careful observations are being kept of the behaviour of the Bidyadhari, and tentative estimates are being got out for various possible schemes, one

of which will ultimately have to be adopted. Two Government Committees, of which Mr. McCabe and Mr. Ball Hill are members, are dealing with the matter. One of these committees deals with the drainage and the engineering portion, and the other, which might be called the Chemical Committee, is seeking the best means of treating Calcutta sewage chemically or biologically should it be found necessary to adopt one of these expedients in order to get an inoffensive effluent. The alternative schemes are to treat the sewage chemically or biologically, and discharge the effluent into a canal or other water-course in the vicinity of Calcutta, the sludge being disposed of either out to sea or on the land, or to find an outfall where the untreated sewage can be discharged without undue cost of construction owing to difficulties and the distance to be traversed. An experimental works, for which the Government of Bengal has sanctioned Rs.50,000, is shortly to be erected.

SLIPPERINESS OF TAR-MACADAM ROADS.

At the present moment the public, and also the corporation, are greatly exercised about the slipperiness of the tar-macadam roads. This slipperiness has, of course, been cured by the employment of the same means as that adopted for the same trouble at home—namely, by painting the surface with the particular bituminous binder with which the road is constructed, and then blinding the surface with crushed stone or fine gravel. There the corporation have let the matter stand, principally owing to the expected rapid development of heavy motor traction. If this comes up to anticipation it will play havoc with all the Calcutta roads as they are now constructed, but the march of progress cannot be stopped until the problem of building roads strong enough to withstand the heaviest of traffic has been solved. It should, however, be borne in mind that the problem of road construction in Calcutta is an extremely difficult one, owing to the many adverse conditions which exist, chief among which are the exceptionally soft and wet subsoil on which the whole of Calcutta rests, the heavy cost of stone for making proper foundations, the high temperature in the sun during the hot weather, the long period of drought, and the phenomenal rains, and last the bullock-cart with badly mounted wheels and tyres which cut up the road surface. With the introduction of motor traction these will eventually be abolished, but even then a new destructive agency will merely be substituted for another and more ancient one.

The Civic Engineer's Who's Who, compiled by the editor of **THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER**, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

International Engineering Congress, 1915.—Rapid progress is being made in working out the final programme of papers for the International Engineering Congress to be held in San Francisco in 1915. The first volume of the publication of the congress will consist of a series of articles descriptive of the various technical features of the design and construction of the Panama Canal. This volume will constitute practically an official technical record of the gigantic engineering feat which is just nearing completion, and will be of interest, not only to engineers, but to laymen. The programme of papers for the various sections of the congress is practically completed, and notices of them will be published in the near future.

Back-to-Back Houses in Rochdale.—In the House of Commons last week the President of the Local Government Board was asked whether his attention had been called to the recent reports published by the medical officer of health of Rochdale, in which it was stated that here were 5,482 not-through houses in Rochdale, of which 3,470 were back-to-back; whether he was aware that Manchester had got rid of over 5,000 back-to-back houses in the last six years, and Salford had reduced the number of such houses from 2,525 to 73; if he could give any reason why similar action had not been taken at Rochdale; and if the Local Government Board proposed to take any steps in the matter. It was stated, in reply, that the President of the Board was aware of the facts stated in the question, and that he was in communication with the Rochdale Town Council on the subject.

Town Planning and Arterial Roads.

MEMORANDUM BY MR. THOMAS ADAMS.

[Mr. Adams is, as is well known, town planning inspector to the Local Government Board, and the subjoined memorandum has been prepared by him in connection with the sectional conferences on arterial roads in Greater London which commenced last week at Whitehall.]

The question of improving the road communication of Greater London has been fully dealt with in the reports of the Royal Commission on London Traffic, the Advisory Board of Engineers appointed by that commission, and the London Traffic Branch of the Board of Trade.

It is important that the evidence collected and the suggestions made by these bodies should receive the consideration of the sectional conferences, but it is equally important that the conferences should start their work without being committed in the slightest degree by any of the proposals put forward.

The constitution and representative character of the conferences will enable expert local knowledge to be brought to bear upon the details to be considered, which will be extremely valuable, and has not hitherto had such opportunity for concerted expression. This is one reason why members of the conferences should not be committed to any of the suggestions made in the past. Another reason is that the powers of local authorities to plan their areas and to co-operate with each other and with owners have been greatly extended under Part II. of the Housing, Town Planning, &c., Act, of 1909, and it is desirable that full regard should be given to these extended powers in dealing with the question of through roads.

The making of any new arterial road, any new connecting road of considerable length, or the widening of any existing arterial road in Greater London, cannot, as a rule, be carried out in its entirety within the area of one local authority, and it is therefore important that adjacent authorities should co-operate with each other in connection with such matters.

It seems probable that the best way to secure this co-operation will be by means of town planning schemes.

The improvement of the road communication of Greater London is only a part of the larger problem of the town planning of Greater London; but, whereas it is desirable for arterial and connecting roads to be considered over large sections of the Greater London area embracing the areas of many local authorities, it is only practicable to prepare town planning schemes for comparatively small portions of each section. These conferences would appear to have the opportunity of suggesting a skeleton plan for each section on which the separate town planning schemes could be based. But any local authorities which have in contemplation the preparation of town planning schemes should not defer the first stage—that is, the stage of obtaining the consent of the Local Government Board to the preparation of schemes—until the general conclusions of the sectional conferences have been reached. On the contrary, it will probably be found desirable to determine the areas which authorities may desire to include, and which the board may approve for inclusion, in town planning schemes in advance of the settlement of the lines of any arterial roads which may traverse these areas, and to proceed at an early date with any such proposal, so that the full advantage of the provisions which can be included in town planning schemes may be obtained by the various authorities in developing an improved system of road communication for each section.

When the conferences come to consider any question regarding the cost of making new and widening existing roads, it may be desirable to inquire into the advantages to be gained from town planning in regard to the development of intervening areas between the main lines of communication. If, by the preparation of town planning schemes, owners could be permitted to make purely residential roads not required for through traffic of lesser width than would be required in the absence of any properly considered schemes, it may be found that the land required for arterial roads will be provided by the owners free of cost to the authorities. An arrangement of this kind has been suggested in connection with schemes already submitted to the Local Government Board.

As pointed out in the circular of the Local Government Board issued on January 31st last, one of the chief advantages to be obtained from the preparation of town planning schemes is that arrangements may

be made for earmarking land which it may be decided is necessary for the construction of new roads or widenings of existing roads before it is necessary to proceed with construction, and new roads when actually constructed need not be "so made, in the first instance, as to be sufficient for their ultimate purpose."

The conferences are not limited in their consideration of arterial roads to such parts of the area of Greater London as are suitable for inclusion in the areas of town planning schemes—i.e., the parts which are in course of development, or which are likely to be used for building purposes—but it may be considered desirable to have regard, in the first instance, to the question of how far a system of roads can be planned in respect of these parts of the area, and then to consider how far the remaining parts may either be included or left for future inclusion in street improvement schemes.

In 1903—six years before the passing of the Housing, Town Planning, &c., Act—the Royal Commission on London Traffic suggested in their report the need for applying some method of the planning of such portions of the metropolitan area as were not developed, or only in process of being developed. They drew attention to the growing building operations round London, and urged that no time should be lost in arranging that all new streets should be laid out in accordance with a proper plan. Among other incidental matters referred to by the Royal Commission were the absence of sufficient power to define frontages on roads, and the need for preserving gardens and forecourts in existing streets, both of which matters can be dealt with more satisfactorily in town planning schemes than otherwise.

The relation between town planning and arterial roads is a very intimate one, and it is desirable to consider the two questions—if they can be described as two questions—together. The principal point to note at this juncture in connection with both matters is that the conferences should have full regard to their powers under the Act of 1909 in considering the questions that have been referred to them.

NORTH-EASTERN SECTION.

The Walthamstow Urban District Council have been authorised to prepare a town planning scheme in respect of the areas edged in green on the 6-in. ordnance map.* The undeveloped land in Walthamstow consists largely of a series of comparatively small units, separated by areas which are already built upon, and it will be observed that the proposal of the council is to prepare one scheme with reference to all these detached or partially detached areas. The combined areas coloured green comprise 1,530 acres. Part of the North Circular Road proposed by the London Traffic Branch of the Board of Trade goes through Walthamstow, and most of it is within the area of the scheme. The Walthamstow Council are now engaged in developing their proposals, and, among other matters, are considering the question of arterial roads. Walthamstow occupies an important position between the existing Norwich and Cambridge roads. Any scheme to connect these two radial roads by a new road across Walthamstow will not be easy to carry out. The engineering difficulties created by the levels and by the reservoirs, railways and other artificial formations which have to be encountered along the Lea Valley, whatever line of road is adopted, will make such a scheme a task of no small magnitude.

Tottenham Urban District Council will be most closely concerned with Walthamstow in connection with any scheme for bridging over the Lea Valley near the centre of the radial line formed by the Cambridge-road. The question of cross-communication by road over the whole of the Lea Valley requires careful consideration, and this conference, representative as it is of the two counties and the several boroughs and urban districts which lie on both sides of the River Lea, will provide a useful opportunity for the interchange of views on this im-

* The areas edged in green on the ordnance map are those in respect of which the board have given authority to prepare schemes.

portant local problem. It is desirable, however, in this as in other sections, that those councils who have the preparation of schemes in view should proceed simultaneously, so far as it is practicable to do so.

On the map circulated to the delegates the part of Enfield situate in this section, Woodford, Buckhurst Hill and Barking are hatched in blue to indicate that the councils of these districts have the question of preparing schemes under consideration, but since the map was prepared a further advance may have been made both in these four districts and in others which are uncoloured.

NORTHERN SECTION.

In the North Section, Finchley Urban District Council have been authorised to prepare a scheme in respect of an area comprising 1,044 acres. The council are proposing to make a further application in respect of the remainder of their district, which they regard as suitable for town planning. The board have received an application for authority from the Hendon Urban District Council in respect of an area comprising 5,195 acres, and consisting of the northern portion of their district. This council have also decided to make a further application for authority to town plan the remainder of their district.

Notices have been issued by the Wood Green and Barnet Urban District Councils. The Hendon Rural District Council have decided to prepare a scheme for the parish of Edgware in this section, and other councils have the matter under consideration.

It appears to be desirable that authorities in this section should give consideration to the improvement of cross-communications between the Edgware-road and Cambridge-road, as well as the provision of more adequate arterial road communication toward the eastern boundary of the section.

NORTH-WESTERN SECTION.

The Ruislip-Northwood area in this section is the only one in respect of which a draft scheme has been prepared.

The area consists of 5,906 acres, of which 5,843 acres are in the urban district and 63 acres are in the rural district of Watford. The scheme provides for several roads of from 50ft. to 60 ft. wide, intersecting the area from north to south and from east to west and linking up with main roads outside the district.

It will be observed that the line of the Great Western-avenue crosses part of the area on the extreme south, but the Ruislip-Northwood Council were unable to include this road in their scheme. It is hardly likely that separate authorities will be able to provide for the construction of short lengths of new arterial roads without some guarantee that the entire roads will be constructed, or at least a sufficient length to link up with a populous part of London.

Attention may be drawn to a few points in the proposed scheme regarding the method of meeting the cost of street construction, &c., but it should be noted that these proposals have not yet received the sanction of the Local Government Board.

The two principal streets intersecting the Ruislip area are proposed to be 60 ft. wide. In respect of these streets, and any other roads exceeding 40 ft. in width, no owner is to be required to bear any greater expense in the execution of the street works than he would have been required to bear had the new street been 40 ft. wide, with a carriageway of a width of 24 ft. Any greater expense is proposed to be borne and paid by the council.

If at any time the council desire to construct any of the new streets shown on the map, or part thereof, they are to be required to give six months' notice to the owners of their said desire. All costs and expenses incurred by the council are to be deemed to be expenses of private street works within the meaning of the Private Street Works Act, 1892.

An owner or owners of land over which a new street exceeding 40 ft. in width is shown on the map to be constructed, provided such street when constructed shall communicate at each end with a highway repairable by the inhabitants at large, are to give six months' notice requiring the council to construct the said new street. The costs and expenses incurred are to be met in the same way as in the case where the council themselves construct the street.

It is proposed to construct narrower streets of certain minimum lengths, varying from 20 ft. to 30 ft. in width, and to give special facilities for the construction of streets round quadrangles or open spaces. Provisions of that kind represent concessions to owners which have a bearing on the ques-

tion of land being secured free of cost to the local authority for constructing wide streets where required.

Twenty-two highways are proposed to be diverted or stopped up, and alternative routes are provided by the construction of new roads.

Under "Space about Buildings," provision is made for building lines to be shown on the map, varying from 15ft. to 35 ft. from the boundary of the roads, and, subject thereto, it is intended that no building can be erected nearer to the centre of any street than 30 ft., and nearer to the boundary of any street than 15 ft. Exceptions are made in respect of corner sites, shops, &c.

Probably the Ruislip-Northwood Council would have had extreme difficulty and been put to much heavier expense in securing their proposed new roads, and the widening of existing roads, if they had been unable to negotiate with the owners under the powers conferred by Part II. of the Act of 1909.

The Hanwell Urban District Council have also been authorised to prepare a scheme in respect of an area of 198 acres.

The Harrow-on-the-Hill Urban District Council have applied for authority to prepare a scheme for 1,720 acres.

Notices have been issued by the Acton and Willesden Urban District Councils.

Several other local authorities, whose combined areas represent the greater part of the section, have either decided to apply for authority, or have the matter under consideration.

SOUTH-WESTERN SECTION.

The Borough of Richmond and the Urban District Councils of Twickenham and Ham have been authorised to prepare schemes in this section. The respective areas are:—

Richmond	...	...	...	...	514 acres.
Twickenham	...	...	...	...	1,860 ..
Ham	...	...	...	...	976 ..

It will be noticed that Richmond and Twickenham are traversed by the proposed by-pass road to Chertsey. Notices have been issued by the Surbiton Urban District Council, and several other local authorities are likely to take action in the near future.

Cross-communication by road in this section is rendered very difficult owing to the fact that it is traversed by the river Thames and numerous railways.

SOUTHERN SECTION.

Carshalton Urban District Council have been authorised to prepare a scheme in this section in respect of an area of 2,320 acres.

The board have also decided to authorise the preparation of a scheme for a large area in Beckenham urban district.

Both the above districts are situate in important positions from the point of view of arterial and connecting roads, but it appears to be specially difficult to get any satisfactory treatment of connecting roads in this section without co-operation between the different authorities.

No action appears to have been taken in the South-Eastern section.

COLONEL HELLARD'S INVESTIGATIONS.

The proposals of the London Traffic Branch of the Board of Trade in regard to the subject of arterial roads are set out in another memorandum prepared by Colonel R. C. Hellard.

In 1909 the London Traffic Branch of the Board of Trade was directed to investigate the sufficiency or otherwise of the arterial roads leading into London, and to make suggestions for their improvement, and put forward proposals for new roads which might be found necessary to supplement them. The results of these investigations were published in the reports of this branch for 1910 and 1911.

In the first place the whole of the 6-in. maps of Greater London had to be brought up to date before much useful investigation could be made on the ground for any proposed new lines of road that might be considered necessary. Meanwhile, the existing arterial roads were examined, and their adequacy, or otherwise, for the population they serve and the traffic they carry was carefully considered, with a view to relieve the worst cases of congestion or to improve their direction.

TRAFFIC RECORDS.

The census figures and the estimates of the Registrar-General and of the medical officers of health afforded information as regards the distribution and

growth of population, but no systematic records of traffic existed, and it became necessary to ascertain at once the volume of traffic passing over each of the main roads leading out of London. A census of traffic was accordingly arranged for. The first was taken in January and February, 1910, and to compare winter with summer traffic a second was taken in June and July of the same year. It was found that in the central and eastern districts the difference is not great, but in the western districts and on the outskirts on all sides traffic is much greater in summer than in winter. The enumeration was made by the trained staff of the London County Council, and with their assistance a traffic census has now been taken each successive summer. They were thus gradually accumulating a mass of useful statistics that become more valuable each year in showing the nature, growth and conditions of traffic in and round London, and in indicating the measures necessary to relieve existing congestion, or to eliminate the possibility of such conditions arising in future.

In dealing with the arterial roads, it was found convenient to divide the area of London into six sections, each containing a group of main roads converging on the centre that could be considered in relation to the state of the traffic, population and development, in order to arrive at general conclusions as to their sufficiency or otherwise.

With the aid of the revised 6-in. maps, investigation was then commenced on the ground for the selection of those lines of road . . . which full consideration of all the circumstances in each case had shown to be necessary to supplement the existing roads. It was obviously necessary to follow lines of level that would ensure good grades for the roads, and at the same time avoid the closely built-up areas on the outskirts. The large number of railways round the fringe of the more densely populated portions of the metropolitan area, however, proved the worst obstacles to the free choice of route. On the lower levels most of the railways are on embankments, many of them too low to pass under, yet high enough to make it almost impossible to cross over, while level crossings on main roads round London must be considered impossible. On this account, and owing to the many junction lines and the wide areas devoted to railway sidings, the places where crossing is possible were comparatively few, and these constituted ruling points which governed and limited the selection of route. Again, in some cases the best line for a new road was already occupied by a railway, which it was obviously impossible to cross and recross, and yet to be restricted to one side or the other was distinctly prejudicial to the grade of the road. Many trial sections had to be made, and again and again a route which had promised well at its commencement had to be abandoned on account of some insurmountable obstacle encountered at some part of its course. A map gave no indication of the importance of buildings, and was therefore only a partial guide; all details had to be gone into on the ground itself, in order to find the line of least resistance, as a basis for discussion, prior to consultation with landowners and local authorities.

The 25-in. plans of the routes thus provisionally selected were next brought up to date, and plans of these roads, both on the 6-in. scale and on the 25-in. scale, are now available for those who might have to consider them further. As all these investigations were made on the ground either by him or his assistant, he could safely say that up to 1910 there were no serious engineering difficulties to be encountered on any of the routes selected. Development had, of course, proceeded since then, and buildings had been erected here and there which might add to the cost or even entail some deviation, but in most cases the lines were still open. In the course of these investigations, no systematic inquiries had been made as to ownership or cost of property, &c. So far as compatible with direction and levels, the cheapest route suited for the purpose was selected, although in many cases there are alternatives which it might be worth while to consider.

DEVELOPMENT OF ROAD TRAFFIC.

Although this question had been considered in the interest of traffic generally, it should not be overlooked that it was due to the introduction of the motor vehicle that the matter has now become so pressing. The convenience of the motor for passenger traffic rapidly asserted itself, and its development for commercial purposes was now making great progress, with the result that traffic of all sorts was being withdrawn from the railways to the roads.

The number of passengers carried by public services in 1912 within the metropolitan area reached the enormous total of well over 2,000 millions—the equivalent of 278 journeys per head of the population—and this figure was increasing far more rapidly than the population. Of these journeys, 66 per cent were made by road as against 34 per cent by rail, and while this of itself was sufficient to show the importance of the roads, there was the vast amount of commercial traffic to be considered of which they could make no satisfactory comparison as to the relative variation in the figures by road and by rail. They did, however, know that the delivery of goods by road had been largely extended within recent years, and that for commercial purposes the roads had now attained an importance that they never previously possessed. At the same time they were painfully aware that the present road system of London was practically identical with that of a hundred years ago.

As regarded relief, they must bear in mind that the possible sites for roads were limited, and that, once built over, enormous additional expense would be entailed in years to come to reopen the route. In most cases, it became a question of "now or never," particularly in view of the development in prospect under the Town Planning Act.

MUNICIPAL ENGINEERING IN NEW ZEALAND.

AUCKLAND'S ACTIVITIES.

With its rapid development into an important commercial centre—it is now easily the largest of New Zealand cities, its population, including suburbs, numbering 110,000—Auckland is at the present time a scene of municipal activity which is doubtless providing ample scope for the energies of the capable city engineer, Mr. Walter E. Bush, M.INST.C.E., who, it will be remembered, went out from England some years ago.

The city itself has recently extended its boundaries by close on 1,000 acres, having absorbed the suburban districts of Parnell and Arch Hill, and large areas of land reclaimed from the foreshore by the Auckland Harbour Board, a progressive body for whom Mr. W. H. Hamer is engineer.

The municipality are busy on an extensive scheme of street improvements, comprising, for the twelve months ended December last, over £60,000 worth of paving works, including compressed asphalt, Jarrah wood and New Zealand red brick (powellised) block-paving, and a short length of basalt stone setts and some £35,000 worth of macadam streets.

Mr. Bush has also in hand a sea swimming bath costing £2,500, new tepid salt-water baths, including men's swimming pool, 100 ft. by 50 ft., and women's swimming pool, 60 ft. by 30 ft., and slipper baths estimated to cost £10,000.

Mention may be made of the completion of large reinforced-concrete retaining walls at a cost of over £8,000, and a water service reservoir of the same material, and of a capacity of 1,500,000 gallons—the third of its kind Mr. Bush has constructed in Auckland, the other two, however, having each a capacity of 3,000,000 gallons.

Good progress has been made with the important scheme which the Auckland and Suburban Drainage Board—for whom Mr. Bush acts as engineer—are engaged upon. Work to the value of £350,000 has been completed, or nearly so, storage tanks and screening chambers—of 7,750,000 gallons capacity—and a sea outfall sewer alone accounting for an expenditure of no less than £50,000.

That there is a busy time ahead is evident when it is stated that, quite apart from ever-increasing demands in connection with maintenance, administration and general organisation, the projects for this year include additional street works, drainage, the provision of a new depot, new parks, and possibly another impounding reservoir to hold 100,000,000 or 200,000,000 gallons of water.

New Tracing Cloths. Attempts are frequently made to reduce drawing office expenses. One of the costliest articles, and that most frequently in use in large offices, is tracing cloth, the manufacture of which has been confined to a very few firms. For many years past prices have been maintained at a high figure, but Messrs. B. J. Hall & Co., Limited, of Chalfont House, Westminster, are now offering a series of excellent cloths of British manufacture which are stated by users to be equal in quality to the expensive cloths now in use.

LEEDS REORGANISATION PROPOSALS.

SPECIAL COMMITTEE'S DRASTIC RECOMMENDATIONS.

The *Yorkshire Post* on Saturday last devoted a special two-page supplement to the reproduction of the essential portions of the report which has been issued by the Special Committee appointed by the Leeds City Council to deal with the recent strike of corporation workmen. A thorough investigation into the working of the various corporation departments consequent upon their having to be administered for a considerable time with depleted staffs has indicated several directions in which effective reorganisation can be accomplished, and large sums of money saved for the ratepayers, and these matters are embodied in a series of important recommendations which the committee make to the council. The committee's report, inclusive of appendices, covers no fewer than 139 pages.

As a result of their review of the history of the trouble and of their experience during the strike the committee make the following recommendations to the city council:—

- (1) That a General Purposes Committee be formed, and that the committee consist of seven members.
- (2) That the council delegate to such committee full power to deal with all matters arising out of or in connection with—
 - (a) The appointment, control, and dismissal of all workmen.
 - (b) Wages, hours, and conditions of labour of all workmen.
 - (c) The distribution and supply of labour to the various departments.
 - (d) The reorganisation of the cleansing and highways departments.
- (3) That Mr. J. B. Hamilton be appointed executive officer of the General Purposes Committee at a salary of £500 per annum, to act under the instructions of the committee in the above duties and in such other duties as may from time to time be delegated to the committee.
- (4) That only applicants who are found suitable and are certified as fit after being medically examined shall be permanently engaged.
- (5) That no one in an official position shall be a member of a union existing among those over whom the official is placed.
- (6) That the city council meet once in each quarter, and that the necessary consequential alterations be made in the Standing Orders and delegations of duties to the committees.

LESSONS OF THE STRIKE.

In a section of the report explaining these recommendations, the committee say:—

"The strike has shown the necessity for improved methods of dealing with wages, conditions of work, hours of labour, &c., of municipal workmen. To enable such matters to be dealt with properly, the fullest information as to comparable work in other towns must be systematically obtained, as well as the conditions obtaining with private employers in the city, and also with trades unions, where standard rates have been established. The formation of a 'Commercial Department' for obtaining and collating such particulars is an absolute necessity. This would probably lead to a similar arrangement in other cities, and there would thus be a constant interchange of actual facts.

"We recommend that a General Purposes Committee be appointed as one of the Standing Committees of the council, with power to act in regard to all the foregoing matters. In our opinion such committee must be entrusted with the general arrangements as to labour in all departments of the corporation. To enable this to be carried into effect, it is necessary to appoint a commercial manager, to carry out the work above indicated. One important result of such appointment would be to eliminate casual employment, and to render permanent as far as possible the positions of men who are efficient under the corporation.

"The recommendations of the committee involve a complete change in the accepted form of council work. They are, however, the logical and inevitable result of the development within the last fifteen or twenty years of so many trading departments employing a large number of workmen, and the necessity of such a change is the distinct and unavoidable lesson of the strike.

"The corporation, as a large employer of labour, has made no advance during the last twenty years in its methods of considering demands for altered conditions, except by the formation of the Consultative Committee, whose decisions were not final. Such matters need to be dealt with uniformly and on business lines

"The powers and scope suggested for the proposed committee would bring the methods of considering all matters relating to their workmen in line with present-day requirements, and avoid the disabilities of the Consultative Committee."

A section of the committee's report shows how the work of the various departments was affected by the strike.

At the commencement of the strike the various waterworks, filter-beds, pumping stations, &c., were strongly picketed, but most of the men connected with the department who went on strike on December 11th offered to return to work almost immediately after the first announcement of the committee had appeared in the Press.

The electrical power station at Whitehall-road was maintained in a state of efficiency throughout the strike, and, as a matter of fact, 30 per cent more electricity was sold during the strike than under normal conditions.

The gas lamps of the city remained unlighted for some time, but the electric lighting of the streets was well maintained throughout the strike.

SUGGESTED ECONOMIES.

"It is clear," the committee state, "that a saving of £6,000 would be effected annually in connection with the lighting of the gas lamps of the city if an automatic system of turning the lamps on and off were generally adopted. The total cost of equipping the city with such a mechanical system would be approximately £19,000. With regard to the lighting of the electric arc lamps, these could be fitted with automatic controllers at an expenditure of £500, and this would bring about an annual saving of £500 on current used."

Little difficulty was experienced in maintaining the sewerage engineer's department in a state of comparative efficiency throughout the strike.

The committee are convinced that the various gasworks have been overmanned in the past, and that a system of "go-easy" has been in operation. They consider also that much of the plant is obsolete, and suggest that the whole should, by the adoption of the most efficient equipment, be thoroughly modernised.

As a result of their investigation of the cleansing department, the committee express the view that, with competent organisation, direction and supervision, this could be efficiently carried on with 300 fewer men than have hitherto been employed, and effect a saving of £21,000 a year.

In the highways department 248 men went on strike. The committee are convinced that a considerable saving can be effected if all possible work is put out to contract. They are of opinion that the road work of the highways and tramways departments touch at so many points, and overlap in so many ways, that uniformity of control as regards the maintenance of the roads and the paving of the permanent ways would result in considerable saving, and a great reduction in inconvenience to the citizens. It is therefore a matter for grave consideration whether the direction and control of the whole of the streets and highways of the city should not be combined in one department. Such combination would result in a considerable saving due to the avoidance of overlapping and waste consequent on two departments controlling the one road. Co-ordination would prevent the frequent opening of roads, and produce greater efficiency and a decrease in the expenditure.

The tramways department employs over 2,000 men. The general rule that has been in operation for many years is that no official in charge of other men shall be a member of any union. Consequently, when the strike was declared, everyone in an official position, including foremen, inspectors, timekeepers, gangers, and leading hands, remained at their posts, and the committee think it is not too much to say that the speedy termination of the strike in this department was due to the fact that so large a body of men remained loyal.

While the committee take up a neutral position as to whether the workmen should or should not be members of a union, they recognise that, in the case of those in official positions, the obligations of a

union prevent them from doing their duty properly towards their employers. It is for this reason that the committee recommend that in future it be a condition of appointment that no one in an official position shall be a member of a union existing among those over whom the official is placed.

A considerable portion of the work of the tramways department, particularly in the repair and renewal of the permanent way, is seasonal. At the present time many men who are employed in the tramways department through the summer go to the gasworks during the winter; but in the absence of a central organising office for the exchange of labour between the different departments, a very considerable amount of casual employment ensues. The committee hope that as a result of their inquiry and recommendations this will not obtain in the future.

As was stated in last week's SURVEYOR, Mr. Mann, the superintendent of the cleansing department, has placed his resignation in the hands of the committee, who have accepted it, and have granted him a retiring allowance of £250. The committee, having decided to recommend to the city council a complete re-organisation of the work of the highways department, had an interview with Mr. Prince, the highway surveyor. After friendly discussion Mr. Prince placed his resignation in the hands of the committee. On the understanding that Mr. Prince would place his special knowledge of the city and his services when required at the disposal of the council, the committee granted him a retiring allowance of £120 a year. An agreement has accordingly been entered into embodying the foregoing terms. The committee expressed to Mr. Prince their appreciation of the forty-eight years' faithful service that he had given to the city.

VIEWS ON THE COMMITTEE'S PROPOSALS.

The *Manchester Guardian* has gathered the opinions of representative men in other cities with respect to the Leeds proposals.

The Mayor of Manchester, Alderman McCabe, described the new departure as undemocratic. "Why," he asked, "should seven aldermen be appointed to deal with the arrangements and conditions of the workmen? Even if the system be adopted in Leeds, which is doubtful, I think it will not be adopted generally throughout the country; nor will it become permanent in Leeds. It seems to me to be subversive of all our ideas of government by the elected of the people. Of course, Leeds has recently been suffering some inconvenience caused by the recent strike, but this feeling of annoyance is probably only temporary in character, and would soon pass away."

The Mayor of Salford, Alderman Desquesnes, said he thought the proposal rather a good one, because there was a great deal of confusion and want of common action in almost every corporation when dealing with the labour side of its affairs. "In Salford, for instance," he said, "we have very awkward questions arising from time to time—questions of principle, really, in regulating the relations of the corporation to its workmen. What is being done by the Leeds Corporation seems—I speak generally—quite a rational thing. It does very often happen that you have in the employment of one committee more men than you can find employment for at the time, and it is always difficult to know what to do with them. A majority of members of the council will be against dismissing them, and you have no means of correlating what you want to do with what has been done by other committees."

The general view in Sheffield municipal quarters is that such a tight rein has been kept on the municipal departments in Sheffield that the necessity for drastic reforms such as those proposed in Leeds does not exist. It is considered, however, that the Leeds plan would be an excellent one for improving the type of corporation worker. "The growing practice of many councillors trying to find work for any voter who asks for a recommendation is threatening to weaken the municipal service," said one official, "and I think the Leeds plan will reduce the number of opportunities of this kind."

One of the civic chiefs of Newcastle-on-Tyne said his first impression was that the Leeds Corporation desired to find a scapegoat for use during the forthcoming clearing up of the strike trouble. He feared there would be many dismissals of employees for which the new manager might be made responsible. A prominent labour leader said the new scheme was, in his opinion, a further sample of the Americanisation of English concerns. It would be followed by a general speeding-up, and the dismissal of those who refused to be hustled.

AN ENGLISH ENGINEER IN PERU.

The life of an engineer in a South American State would seem, from a letter which we have received from Mr. Henry Criswell, ASSOC. M. INST. C. E., not to be altogether devoid of excitement. Writing from Lima, under date of February 10th, Mr. Criswell says:—

"There has been an attack on the Government Palace, the President has been imprisoned, and a council of six members appointed to take charge of affairs until the elections, when a new President will be elected. . . . As I was in the palace at the time of the assault, I am able to give you a few particulars if they will be of any interest to you, as it does not fall to the lot of every engineer to pass through such an interesting experience in the execution of his duties.

"By the courtesy of the ex-President I had been given quarters in the Palace of Government, so that in the usual way I went to bed about 10 o'clock on Tuesday evening last. At 4 o'clock next morning I was awakened by the marching of troops in the courtyard outside my rooms. As, however, I knew trouble was expected, I concluded that the authorities were simply marshalling the troops against a possible attack. So I looked out, but not seeing anything very unusual I went back to bed till 5 o'clock, when I was roused again by volleys of musketry. I knew then that the blow had fallen and a revolution was in progress. Owing to my bedroom adjoining the magazine there was considerable danger, but as the firing was directly outside my door—fortunately parallel to it—I did the only thing left for me to do, which was to dress as quickly as I could and sit in the safest place I could find. At six o'clock the 'Cease fire' was sounded, and I knew the place had been taken by the troops outside. I must say that perfect order was maintained throughout. There was no shouting, but the noise of the firing was terrific, as there were either Maxims or Gatling guns at work.

"I took this opportunity of getting through the main gate, which was simply riddled with bullets. Strange to say, no one challenged me, though the entrance was packed with troops. As soon as I got to the Plaza de Armas I made the quickest time I have ever done across this Plaza, because there were a lot of stray bullets flying about for several hours after this in the squares and streets. The rest of the day I spent with some brother Englishmen at Miraflores, and they kindly put me up for the night.

"It speaks very highly for the authorities of Peru that business was perfectly normal next day, confidence was restored, the banks were opened as usual, and but for bloodstains on the streets there was no sign of there having been any disturbance. I was filled with admiration at the moderation of the troops and their superiors, and I do not think Peru will suffer by the loss of credit in any way.

"It seems to me that the ex-President allowed his enthusiasm perhaps in some small way to overrun his good judgment, for I have the greatest respect for his integrity, his desire for the public good, and his honesty of purpose. I can speak with a certain amount of confidence, as it has been my privilege to have had a number of interviews with him with reference to the works proposed for me to carry out.

"A son of Mr. Lloyd George is in Lima at the present time representing the Pearsons, and after the assault I showed him the results of the firing at the Palacio."

Royal Institute of British Architects.—The annual dinner of this body will take place at the Hotel Cecil on June 17th.

Housing in Rural Districts.—In the House of Commons on Monday the President of the Local Government Board was asked how many cottages built under the Housing Acts by the rural district councils were now in existence, and how many were under consideration. Mr. Herbert Samuel said he could not state how many of the cottages referred to were now in existence, but he might say that the Local Government Board had sanctioned loans to rural district councils under Part III. of the Housing of the Working Classes Act, 1890, for the erection of 1,570 houses, and that applications for sanction to borrow for the erection of 363 more were now before him.

LIGHTNING CONDUCTORS.*

By FREDERIC H. TAYLOR, A.M.I.E.E., A.M.I.M.E.

The subject of lightning conductors is one which is, or certainly should be, of great interest to everyone, and particularly, I think, to engineers and architects. The latter are justly expected to provide means of protection to the buildings they erect, and the former to see that these are properly erected and duly tested, &c. The engineer also requires to provide protection to sundry structures which are more peculiarly within his own province, such as power stations, waterworks, oil tanks, overhead wires, &c.

PRESENT-DAY NEGLECT.

It is frequently supposed by several classes of people who might well be expected to take a more considered view that protection from lightning is of but little consequence in this country. I agree that this country is let off very kindly in the matter if you are going to compare it, say, with South Africa; but, nevertheless, the damage done and the risk incurred through want of adequate protection is considerable, and very largely, if not quite, preventable.

The Lightning Research Committee during the three years 1901-1904 were advised of over 500 cases of buildings in Great Britain damaged by lightning, or an average of 166 per annum. If you omit the first two and the last two months of the year as being those in which storms are least likely to occur, this leaves your average of 166 spread over eight months—that is, approximately, twenty cases of damage per month. I hardly feel such figures are not worthy of our serious consideration.

It is sometimes urged that buildings provided with lightning conductor systems are occasionally struck. This may be so, but what was the condition of the lightning conductor system at the time; and even if in order so far as it went, was it adequate? The answer which appears to be justified by modern knowledge is that either the system was in bad condition or inadequate.

In a report to the Metropolitan Asylum Board in 1912, the engineer-in-chief, Mr. W. T. Hatch, mentions 400 buildings as being damaged by lightning each year in England. Of these only 2 per cent have been fitted with conductors, the remaining 98 per cent not having been so provided. Where damage has occurred to what were facetiously called protected buildings, "it has generally been found to be due to an insufficient number of conductors, or to the latter having been applied incorrectly, or, after being fixed, no subsequent attention having been given to see that their earth connections remained in order."

Some persons are inclined to suppose that if a lightning conductor is struck and partly fused or destroyed, it proves uselessness. It proves the very opposite.

FALLACIES REGARDING LIGHTNING CONDUCTORS.

I would like to mention two which one often hears. One is that the conductors attract the lightning. This is nice of the conductors, and probably therefore the gutters attract the rain. The other fallacy I would mention is that of supposing that only very tall buildings need protection. Other circumstances than height above ground must be considered if reasonable protection is to be obtained. A building may have two chimney stacks—a tall one and a shorter one. Where the former has been fitted with a conductor, the latter has been known to be struck, and the reason has been definitely ascertained.

It might be urged that it is cheaper to repair buildings damaged by lightning, or even in some cases to rebuild them, than to provide complete systems of conductors and to have them tested by an expert periodically. This may be so, particularly as fire insurance policies commonly cover damage due to lightning. But there still remains the risk of human life—in these days the dearest risk of all.

LIGHTNING DISCHARGES.

I do not propose to deal, except very scantily indeed, with the purely scientific aspect of a lightning discharge. The engineer's lot is more often that of dealing with facts than of finding scientific theories for their occurrence. The generally accepted opinion, however, is that lightning discharges are of two distinct kinds, named by Sir Oliver Lodge

the "A" flash and the "B" flash respectively. The "A" flash is simple in character, and consists of a discharge between an electrically charged cloud which is approaching the surface of the earth without any intermediate cloud intervening. The path of the "A" flash is more or less prepared by the electrostatic conditions of the case, and it is said to strike pointed conductors in preference to others.

The "B" flash is a disruptive discharge of great suddenness, and arises where another cloud intervenes between the cloud carrying the primary charge and earth, the two clouds acting like a condenser. The Lightning Research Committee of 1905 reported that "when a discharge from the upper cloud takes place into the lower cloud the free charge on the earth side of the lower cloud is suddenly relieved, and that the disruptive discharge from this to the earth takes such an erratic course that no series of lightning conductors of the then hitherto recognised type suffice to protect the building."

THE PROTECTION OF BUILDINGS FROM LIGHTNING

Protection against the "A" type of flash is fairly easy, and it is considered that the ordinary system of conductors, when properly constructed and maintained is reasonably safe. Discharges of the "B" type involve more complex treatment, and, in the words of the Lightning Research Committee, 1901-1905, "absolute protection can only be assured by a complete wirework enclosure, in fact, of the nature of a bird cage." In any case, the extent to which a building shall be protected, and the cost of such protection, usually have to bear a certain relation to the importance and the first cost of the building itself. Unfortunately, the lightning conductor work of most buildings is treated with an indifference as dangerous as it is unjustifiable.

PARTS AND DESIGN OF LIGHTNING CONDUCTOR SYSTEMS.

Briefly put, any lightning conductor system comprises—(1) The air terminal, consisting of what is called the "elevation rod," the top of which is provided with one, three, four, or even five points; (2) the conductor from the elevation rod to the ground, with branch conductors from other parts of the building, or from the metal work of the structure, such as gutters, stack pipes, metal roofing, &c.; and (3) the earth connection.

The metal most commonly, in fact, almost universally used is copper, in the form of copper tape from 1½ in. by ¼ in., down to ½ in. by ¼ in. Iron is electrically efficient, but is more subject to corrosion, and not so easily fitted into position. As to the design of the conductor system, this can only be settled when the design of the building, including its chimneys, turrets, gables, ridges, &c., roofing material, &c., are known, and some consideration must also be had for its general situation. For rough guidance, however, a few general first principles may here be given:—

(1) Conductors should run in as direct a line to earth as possible. Some persons prefer to keep them a certain distance from the wall. This has the advantages of avoiding an accumulation of dirt, and also avoiding sharp bends when crossing over cornices, &c.

(2) Vertical rods should preferably be connected by horizontal conductors fixed to ridges or other suitable parts.

(3) Roof metal work, &c., should be connected to the system.

(4) Chimneys should be protected as being specially liable to be struck, due, of course, to the column of hot gases which are good conductors, the carbon lining to the chimney in the form of soot and the mass of metal work at the base, in the form of a stove.

(5) Any joints in conductors should be both soldered and screwed together.

(6) Conductors should be kept as much away from interior gas pipes or electric pipes, &c., as possible.

(7) Similar metals should be used throughout—i.e., the holdfasts should be of gunmetal, and screws or rivets, &c., of copper.

(8) Long runs along ridges, &c., should preferably have more than one elevation rod, say at least one at each end, several short points along a ridge being better than a few tall ones.

EARTH CONNECTIONS.

The earth connection of any lightning conductor system, however simple that system may be, is of the very utmost importance. It is the connection

* Extracts from a paper read at a meeting of the Junior Institution of Engineers on Friday last.

to earth, and if this be inefficient the whole system may be regarded more as a danger than as a protection. The mere fact of taking the conductor into moist earth, or even into water, does not necessarily form a good earth unless there is a considerable area of contact. The usual method of forming an earth connection is by means of a copper plate. The thickness is not important, provided it is sufficient to withstand oxidation. A plate measuring 30 in. by 30 in. by $\frac{1}{2}$ in. would be more efficacious than one 12 in. by 12 in. by $\frac{1}{2}$ in., although the latter gives 72 cub. in. of copper as against 56 cub. in. of the former. The copper tape conductor should be well connected to the plate, preferably riveted as well as soldered, and the soldered joint painted over to retard electrolytic action. Many people bury the plate horizontally; personally, I always make the interment vertically. The earth connection should always be kept well away from the building, and also well away from gas mains.

It is usual to bury a quantity of broken coke or cinders with the plate, with a view to retaining the moisture. If either material be used it must be thoroughly washed so as to get rid of any sulphur present, which would destroy the copper.

It not infrequently happens that the earth plate originally installed on a job has failed, and that for various reasons one cannot sink another. In this case a live water main makes an excellent and a lasting earth contact, care being taken, of course, that the connection between the tape and the pipe is properly made. Such connection will, of course, be external to the building.

TOWN PLANNING CONFERENCES.

PAYMENT OF DELEGATES' EXPENSES.

Mr. Thomas Cole, the secretary of the Institution of Municipal and County Engineers, has received from the Local Government Board a letter on the subject of a communication from the institution with reference to the Town Planning and Road Conference which has been arranged in connection with the forthcoming annual meeting at Cheltenham.

The letter states that the board are not prepared to sanction expenditure in connection with the representation of a local authority at more than one conference on the subject of town planning in the present year. They understand that several such conferences at different centres are being convened, and, generally speaking, they think that any local authority desiring to send representatives to any of these conferences should select the centre most conveniently reached from their district. The board also think that, usually, the local authority should be represented by their surveyor, or other officer concerned in the working of the Housing, Town Planning, &c., Act, 1909.

Subject to the conditions above indicated, the board will be prepared to consider applications from local authorities under that Act whose accounts are subject to audit by district auditors for sanction to the payment of the reasonable expense of not more than two delegates to the proposed conference.

It is added that, in cases where the surveyor or other officer of the council concerned in the working of the Act referred to is a member of the institution, the board do not consider that they could properly sanction the payment of his expenses in connection with the annual meeting of the institution other than those of attending at the conference.

IRISH COUNTY SURVEYORS.

THE QUESTION OF EMOLUMENTS.

At a meeting of the Institution of Civil Engineers (Ireland) recently a resolution previously passed by the council was adopted stating that attention has been drawn to recent cases in which county councils have proposed terms of remuneration for county surveyors which appear quite inadequate, having regard to the great responsibility and arduous duty connected with such a position. The council are of opinion that in no cases should the initial salary for the office be less than £400 a year, with provisions for reasonable increments dependent on satisfactory services, and that such salary should be independent of allowances for offices, travelling and other necessary expenses.

ORDERS FOR FOREIGN STEEL.

ACTION AGAINST ISLE OF WIGHT COUNCIL.

Judge Pery Gye concluded on Friday last, in the Isle of Wight County Court, the two days' hearing of an action of the Stellorite Company, of Paris, against the Mayor and Corporation of Newport and their surveyor, Mr. F. W. B. Waterworth, for £16 18s. 8d. for 4 metres of Stellorite steel. The surveyor rejected the goods on the ground that more than eight times the quantity he understood he had ordered was sent.

Mr. Tom Heyman, a partner in plaintiffs' firm, who was acting as their traveller in the Isle of Wight in August last, said that Mr. Waterworth gave him the order, which he (Mr. Waterworth) wrote out himself, for 4 metres of Stellorite, and in cross-examination he ridiculed the contention of defendants that the surveyor could have been misled by the use of the term "metres," as a knowledge of the metric system was the necessary qualification of a surveyor.

Mr. Waterworth gave evidence to the effect that Heyman recommended the Stellorite for laying pick-axes and cold sets, and he (witness) told him he would have a small experimental piece, valued at not more than £2. He wrote out the order at the dictation of Heyman, and just as he was about to write "feet," in describing the quantity required, Heyman said: "Put it in French lengths; our people over there won't understand English terms of measurement." He then said: "What shall I put?" and Heyman said: "Four metres."

In cross-examination, witness said he was not conversant with the metric system, which was not taught when he went to school, and he had never before had any transactions dealing with French metres during the thirty years or more he had been borough surveyor of Newport. He thought a large percentage of surveyors would fall into the same trap. He trusted to Heyman to tell him the French equivalent of the quantity he had told him he required. Mr. Heyman denied that the conversation as alleged took place, or that he dictated the wording of the order.

Mr. Cababe, counsel for the mayor and corporation, said he had three surveyors of other public authorities—Mr. Oakes, of Ventnor, Mr. Dashper, of Sandown, and Mr. Harvey, of Gosport—as well as several tradesmen, who had given orders to Heyman under similar circumstances, and were now disputing the plaintiffs' account.

Mr. Heyman warmly declared that those people were simply conspiring to repudiate the orders because they unjustly said they had been misled by the use of the term "metres."

The Judge held that there was no concluded contract, but only a verbal agreement on the part of the surveyor to take a small trial quantity of the steel. The surveyor did not appreciate the difference between "metres" and "feet," though he (the judge) could not understand how a man with the experience of a borough surveyor had not come across the terms of the French metric system before; but Mr. Waterworth gave his evidence with such obvious truth and veracity that he was bound to believe him. He therefore gave judgment for the corporation and their surveyor, with costs on scale C, and refused leave to appeal.

Tarco and Bi-Tarco.—Tenders for the supply of Tarco and Bi-Tarco for the surface dressing of roads and the construction of improved tar-macadam have been accepted by the Sale Urban District Council, the Cheshire County Council, Leyland Urban District Council, Urnston Urban District Council, Malling Rural District Council, Breconshire County Council, and the Corporation of Ossett.

Tunbridge Wells Meeting.—We received yesterday the official programme of a South-Eastern District meeting of the Institution of Municipal and County Engineers which is to be held at Tunbridge Wells on Saturday, the 28th inst. Members will assemble at the town hall at 11.30 a.m., and be received by the mayor (Councillor C. W. Emson, J.P.), and after the transaction of district business a luncheon will take place at the Royal Mount Ephraim Hotel. The members will later proceed in motor conveyances to Mount Ephraim, Major Yorke's-road to Forest-road, along Forest-road, and thence to Pembury to inspect the corporation waterworks. A visit will subsequently be paid to the corporation electricity works. Tea will be provided by the mayor.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. M. INST. C. E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21, Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

Mr. H. V. OVERFIELD has selected the following books in respect of the premium for February which was awarded to him:—

- "Mechanism," by S. H. Dunkerley (Longmans).
- "Elements of Machine Design, Part II.," by Unwin & Mellanby (Longmans).
- "Building Construction," by Prof. Henry Adams (Cassell).

These have been duly forwarded to him.

QUESTIONS.

This week answers are invited to the following questions:—

381. Town Planning.—An area of 1,000 acres, chiefly undeveloped, in an urban district, is to be included in a town planning scheme. The approximate number of owners, occupiers and lessees is 250. Assuming that the referencing is to be done by the staff of the urban district council surveyor's office, state the information which should be sought, and the best method of ascertaining and recording it. Give an estimate of the cost of the work if done by professional referencers. Compare the advantages and disadvantages of the two methods, both in the above case and in the case of an area of 1,500 acres in the same district, which includes a considerable extent of partially developed building estates, and is to form the nucleus of a later scheme. (Togun.)

382. Fire Hydrants.—Fire hydrants, 2½ in. in diameter, are taken from a 4-in. and a 12-in. main. What will be the ratio of discharge in the two cases, assuming that the initial pressure is the same in each main? (X. X., *Hounslow*.)

385. Chimney Design.—Design a brick chimney shaft 130 ft. in height from ground level, the internal diameter at the base being 10 ft. (F. S., *Plumstead*.)

386. Storm Overflow Weir.—A 9-in. diameter stone-ware pipe, laid on a gradient of 1 in 281, carries a mean dry-weather flow of 33,300 gallons per day. It is required to construct a storm overflow weir, in a manhole, to pass all above six times the dry-weather flow. At what height above the invert of the pipe should the lip of the weir be set? (H. V. O., *West Bromwich*.)

387. Boring.—Describe, with sketches, the appliances necessary in carrying out borings to a depth of 100 ft. for the purpose of ascertaining the character of the soil. (W. N. B., *Cambridge, N.Z.*)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

384. Timber.—Sketch the cross-section of an oak tree and show the different modes of conversion. How does oak compare with elm for use inside or outside a building?

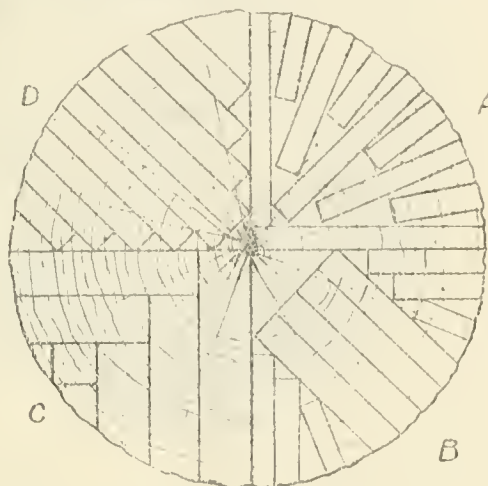
Good oak is a light-brown colour when new, but turns to a brownish yellow on seasoning with a hard, firm, glossy appearance; a cross-section shows that the annual rings are very distinct, but small and regular, with strong radial lines from the centre known as the "medullary rays." When these are cut obliquely across they show beautiful marks known as the "silver grain." This property makes the wood valuable to cabinet makers for high-class joinery. The smaller and more indistinct the medullary rays, the stronger is the wood.

The timber is very strong, hard, tough, and used

for all purposes where strength and durability are required. As compared with elm for building purposes, oak is far superior for outside work—such as window and door sills, treads of steps, gates and other positions alternately dry and wet—as elm decays quickly in such a state; but if the latter wood is kept perfectly dry or wet, it is quite as durable as oak. Both timbers are strong, tough and durable, and for inside work, where large scantling, to take heavy compressional forces, is required, they are equally good; but for inside high-class joinery and small work elm is inferior, not having so good an appearance as oak, and being much harder to work.

There are several methods of conversion, the following four being among the best:—

The log is first cut into four quarters; each quarter may then be converted by any of the following methods:—



SECTION OF OAK.

The best method is shown at A, in which there is no waste, as the triangular portions form feather-edged laths for tilting and other purposes. This method also cuts very obliquely across the medullary rays, and thus exhibits well the "silver grain" of the wood.

Of the other three methods B is the best, and D the least good. The method shown at C is useful for cutting up thick stuff. (H. B., *Falmouth*.)

NOTES.

J. K. P. points out a slight mistake which occurs in the reply to question No. 380, *re* belt gearing, which appeared in our issue of March 6th. In the reply it

states the law for belts is $\text{Log} \frac{T}{t} = e^{\mu \theta}$

The correct formula is $\frac{T}{t} = e^{\mu \theta}$

and the reply proceeded as if the formula had been so stated.

In regard to question 383, a reply to which appeared in our issue last week, we are indebted to Mr. Hugh Stowell, M. INST. C. E., for the following references in the "Proceedings" of the Institution of Civil Engineers:—

Pressure of Grain in Silos H. A. Sanseen, Vol. cxxiv., p. 553.

Measurement of Pressure of Grain—Prante, Vol. cxxix., p. 481.

Paper on "Pressure of Grain"—Wilfrid Airly, Vol. cxxxi., p. 347.

"Notes on Pressure of Grain"—Wilfrid Airly, Vol. cxxvi., p. 336.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2.

THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

To the Editor of THE SURVEYOR.

SIR,—By the amount of correspondence relating to the above subject which has been published in your journal it appears that the younger members are taking a keen interest in the affairs and management of the institution. If the correspondence had contained less grumbling, and a few more practical suggestions as to what it is that requires to be remedied and how this might be accomplished, I think we should have made more advancement.

One has only to attend a few of the meetings to be aware that many of the younger members are dissatisfied with the institution as it is to-day, the chief causes of complaint being:

(1) That a preliminary examination has to be passed before a candidate is eligible to sit for the institution's examination. The institution not holding a preliminary examination of their own, but recognising that of the Surveyors' Institution or the Institution of Civil Engineers, thus forcing men to abandon all idea of taking the proper qualifying examination, or to join other associations as a student, many then preferring to go on and obtain the A.M.I.C.E. or F.S.I. qualification, rather than that of their own professional institution.

(2) That many associates and members have been elected during the past two years without examination qualification whatever (see the "Journal" for 1912-13), thus causing it in some cases to be more difficult to obtain permission to sit for the examination than to obtain election as associate or member of the Institution. Also it puts the worker who has spent time and money in order to become properly qualified on the same footing as the man who has no knowledge except that which he may (?) have picked up during the few years of his experience. (The institution has held examinations annually since 1886, and there can now be no reason or excuse for electing to membership men who do not hold the diploma of the institution.)

(3) That the junior members of the institution do not receive the consideration to which they are, if only by reason of their numbers, entitled.

As a junior member, I take the liberty of making the following suggestions:—

(a) Any person having served articles of pupillage with a municipal engineer or surveyor shall be eligible to sit for the institution's examination.

(b) No person shall be elected to membership or associate membership unless he holds the testimony of the institution.

(c) Junior members should be well represented on the council by deputy or assistant engineers or surveyors.—Yours, &c.,

LEONARD J. SMALL.

Council Offices,
Woodford Green, E.
March 18, 1914.

WHY TAR-SLAG BINDS WELL.

To the Editor of THE SURVEYOR.

SIR, Mr. Ryves, in your issue of the 13th inst., asks if I can suggest a reason for the more rapid deterioration of the tar-coating of limestones and sandstones as compared with that of slag. It can be deduced from my letter appearing in THE SURVEYOR of the 6th inst. that I attribute the better wearing qualities of tarred slag, as compared with other materials, as being due to the fact that the valuable properties of tar as a binding agent are retained practically to the end of the life of the slag, and the only conclusion I can possibly come to is that there must be some chemical action between the slag and tar whereby the life of the latter is preserved.

Your correspondent considers that my experiments are worthy of being recorded in more detail. He will, I feel sure, be interested to hear that four separate batches were weighed before and after the mixing with tar. Each batch registered exactly the same weight, but as I did not consider my weighing apparatus sufficiently accurate for a test of this description, I withheld the figures until I could repeat the tests under more scientific conditions.

Mr. Ryves invites me to express an opinion upon

his views given under the heading "The Proportion of Clay." To be candid, I do not quite follow him, especially in the paragraph—"that the absence of any considerable proportion of clayey matter in the detritus is a factor partly accounting for the successful use of these three materials in tar-bound crusts." Wouldn't this apply to granites, &c., of which it is said that in combustion, silica, alumina, alkalines, earthy bases, &c., have in cooling separated into quartz, mica and feldspar?

I have no experience of roadstones containing a fair proportion of clayey matter, and cannot conceive that such stones would make a first-class tarred material.

Clay as a binder is still used, and it is claimed that a granite surface so bound and afterwards tar-painted gives better results under motor traffic than a surface bound with hoggin or chipping and painted. Personally, I disagree with these views.

When laying tar-macadam I pay particular attention to the proper scavenging of the crust so as to prevent clayey matter, manure, &c., being ground into the interstices of the material. When ordinary heavy traffic passes over the crust for a few days the surface is sufficiently smoothed out to take a thin film of hot tar. A subsequent dusting with slag-dust renders the surface impervious to moisture; consequently, any bad effects which would be caused by dirt, &c., are obviated.—Yours, &c.,

CRETACEOUS

March 16, 1914.

SEWAGE DISPOSAL BY DILUTION.

To the Editor of THE SURVEYOR.

SIR,—I have read Mr. Stowell's letter of the 13th inst. I am reluctant to trespass further on your space with regard to this question, but I think I ought to say that I am in complete agreement with the statement made by Colonel T. W. Harding as to the conditions of dilution which would warrant a *prima facie* case for consideration by the Rivers Board or the central authority for the relaxation of the normal standard. The example cited is perfectly correct, but it is not the only possible example. Another one is the case of a small town discharging into a river whose volume is sufficient to admit of relaxation, but the quality of which is impaired by reason of pollution from a large town higher up stream. In this case, as I have already said, relaxation might be allowed under the recommendations by the commission, as expressed in their eighth report.

I can hardly agree with Mr. Silcock's statements regarding the commission's conclusions, as given in Kempes' "Engineers' Year-book," and quoted by Mr. Stowell. In my view, both these statements are incorrect. How is the "two parts per 100,000 of dissolved oxygen" arrived at?

I think I must now let the matter rest.—Yours, &c.,

G. BERTRAM KERSHAW, M.A.M.SOC.C.E.

West Wickham,
Kent.

March 17, 1914.

CANDIDATES' EXPENSES.

To the Editor of THE SURVEYOR.

SIR, An authority within ten miles of Blackpool recently advertised for an assistant to their surveyor.

Out of the applicants six were selected to appear before the council, three having only to travel a few miles and the other three coming from a greater distance.

The gentlemen who came from the greater distance were allowed what they asked for as expenses; but the local men were told that they would not be allowed any expenses as they had only come a short distance.

May I suggest that this was unfair, as the local men, who had the trouble and expense—though this latter might be small—of attending the meeting, had as much right to their expenses as the others?—Yours, &c.,

FAIRPLAY.

March 17, 1914.

WARNINGS FOR DANCER POINTS ON ROADS.

To the Editor of THE SURVEYOR.

SIR, Referring to Mr. Atkinson's letter on the above subject, I have clamped the ordinary red reflex light on the posts of the danger signs, just

The Surveyor

And Municipal and County Engineer.

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below the triangle, at dangerous corners in the country for some two years now, and I have frequently heard motorists say that they are very useful, and, of course, the cost is very small.—Yours, &c.,

W. B. PURSER.

County Surveyor's Office,
Grantham, Kesteven.
March 14, 1914.

CONCRETE INSTITUTE.

NEW MEMBERS.

At the last meeting of the Concrete Institute it was announced that Messrs. A. Kelway Bamber, London; B. J. Day, M.I.E.E., A.M.I.MECH.E., Cardiff; H. Gayton, A.M.Q.S.A., Accra, Gold Coast; C. Fleming McDonald, Dunedin, New Zealand; L. Messy-Rhine, DIPL.ING., Brisbane, Australia; and J. F. Warden, London, had been elected as members; Messrs. H. A. Clarke, Westminster; Thomas Crowdy, A.M.S.E., A.J.I.E., Salisbury; Arthur L. Johnson, M.A.(CANTAB), Middlesbrough; Sydney J. Kelly, A.M.I.MUN.E., Port Elizabeth, South Africa; and J. Leask Manson, B.SC.ENG. (LOND.), M.R.SAN.I., Leicester, as associate-members; and Messrs. Cyril P. Crabtree, Cardiff, and G. T. Uren, London, as students.

The next meeting of the institute will take place at Denison House, 296 Vauxhall Bridge-road, Westminster, S.W., on Thursday next at 7.30 p.m., when there will be an adjourned discussion on Mr. Cyril Cocking's paper, "Calculations and Details for Steel-frame Buildings from the Draughtsman's Standpoint," some extracts from which appeared in our issue of last week.

WORCESTERSHIRE MAIN ROADS.

RECONSTRUCTION SCHEME APPROVED.

The Road Board have approved the scheme for the reconstruction and coating with bituminous-bound material of some 53½ miles of main roads in Worcestershire, estimated to cost £127,000, and have given a second grant towards the proposed expenditure.

Business Announcement.—Mr. Chas. H. Johns, formerly highways surveyor, Southampton, has, we are informed, taken over the management of the Tarred Macadam Department of Claridge's Patent Asphalt Company, Limited.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

NEW SECRETARY APPOINTED.

Mr. J. W. Dudley Robinson, B.SC.(LOND), secretary in the central offices of the University of London, has been appointed, at a salary of £400 per annum, as secretary of the Institution of Municipal and County Engineers in succession to Mr. Thomas Cole, ASSOC.M.INST.C.E., whose resignation of the office was announced recently.

Fifty-seven applications for the position were received, and three of the candidates, in the persons of Mr. H. Laurence Butler, assistant in the office of Mr. A. S. E. Aekermann, secretary of the Society of Engineers, Mr. A. Clifford Swales, secretary of the Junior Institution of Engineers, and Mr. Dudley Robinson were selected to appear before the council



MR. J. W. DUDLEY ROBINSON.

From Photo by C. E. Fry & Son, Kensington.

of the institution at their meeting on Saturday last, the choice, as stated above, falling upon the last-named.

Mr. Robinson is twenty-eight years of age. He received his education at the Mathematical School, Rochester, and at the South-Western Polytechnic Institute, and he has had altogether ten years' administrative experience under the Kent and Surrey County Councils and the University of London. He will commence his new duties at the beginning of May next.

As already stated in these columns, Mr. Cole is to be retained as consultant at a salary of £250 per annum, and will succeed the late Mr. Charles Jores as hon. secretary of the institution.

A Resolution that is Ultra Vires.—At the meeting at Bristol on Saturday last of the Council of the National Association of Local Government Officers a delegate made reference to the action of the Wallasey Corporation who had passed a resolution "That in future if any official makes any application for increase of salary contrary to standing order No. 4, and without his application being accompanied by his resignation, as provided for by previous resolution of this committee, such official be given notice to terminate his engagement." He moved a resolution asking that the association take the necessary steps to safeguard the interests of the Wallasey officials. The chairman of the General Purposes Committee said they had the matter under consideration, and no resolution was necessary. They would take all necessary action. A Bolton delegate asked if it was not a fact that the Local Government Board had already advised another district council that a resolution such as that passed at Wallasey was illegal. He was told in reply by the chairman that that was so.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction, without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

HIGHWAY CANAL BRIDGE: STANDARD OF REPAIR.

The decision of Mr. Justice Phillimore in *Attorney-General, at the relation of the Worcester Corporation v. Sharpness New Docks and Gloucester and Birmingham Navigation Company* (noted at p. 234 *ante*) has been reversed by the Court of Appeal (January 28th). Under their special Act of 1791 the company were required to make bridges over their canal, and to keep them in "sufficient repair." The point in dispute was whether the term "sufficient" fixed the standard of repair for all time measured by the requirements of the ordinary traffic at the date of the Act, or whether it implied a standard varying from time to time according to the traffic for the time being. It was admitted that the bridges (with one exception) were insufficient to bear the heavy motor traffic of the present day, and the company had had notices put up under sec. 61 of the Locomotives Act, 1861, declaring the bridges to be insufficient to carry weights beyond the ordinary traffic of the district. Mr. Justice Phillimore decided in favour of the company, being of opinion that their liability was only to keep the bridges in a state of repair sufficient to bear such traffic as was ordinary on the highways at the time of the original construction of the bridges. In the Court of Appeal Lord Justice Vaughan Williams said that, in his opinion, the statutory obligation of the company was to support and repair the bridges sufficiently to bear the ordinary traffic of the district which might reasonably be expected to pass along the highways carried by the bridges over the canal—not according to a standard fixed once and for all, but according to a standard varying from time to time sufficient to carry the traffic of the day. Lord Justice Kennedy said that if the bridges had not been constructed, as they were, for the convenience and advantage of the company, the highways in the places where the bridges now were would have been repairable by the road authority according to the standard of the requirements of traffic from time to time. Was it reasonable (his lordship asked) to assume that the Act of 1791, which authorised the cutting of the canal, could have intended that the public, who had a right to use the highways, should be placed in a worse position than would have been the case if the Act had not been passed? He did not think such a construction of the Act reasonable or right. The Act imposed on the company a duty equivalent to the right which the public would have enjoyed if the Act had not been passed. The Court gave no ruling as to any particular class of traffic, but merely decided the general principle of law. It might be that some of the bridges were suited to the present-day requirements of the ordinary traffic, whereas in other parts of Worcester—for instance, urban districts—much heavier traffic might now be the ordinary traffic. The Court desired merely to lay down a general standard of maintenance which would be flexible and adaptable to the requirements of each particular district. Lord Justice Swinfen Eady concurred, and the appeal was allowed.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as *noms de plume*. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

HOUSE DRAINAGE.—"Wight" writes: A house situated on the sea coast in a rural district has, since its erection, been drained into a cesspool, which receives the solid matter. The overflow passing into a drain together with the storm water is discharged at the foot of the cliff bordering on the foreshore at about high-water mark. The house has recently been enlarged and plans submitted to the council, who have objected to this means of disposal, which has been in use for a number of years without complaint or nuisance, as they have bathing stations on each side of the outfall at about 200 yds. distance. It was then proposed to carry an outfall into the sea for a distance

of 140 ft., but this was also disapproved. Will you inform me if the council have powers to disapprove this method of drainage, and, if so, under what Act?

If the drain from the house to the cesspool is not sufficient for effectual drainage," the authority can compel the owner to make a new drain under sec. 23 of the Public Health Act, 1875. If, however, the drain is sufficient, this power cannot be exercised. The overflow drain from the cesspool to the foreshore does not fall within the statutory definition of a "drain," because it is not made for the purpose of communicating from the house "with a cesspool or other like receptacle for drainage, or with a sewer into which the drainage of two or more buildings or premises occupied by different persons is conveyed." It is therefore a "sewer," and the council are responsible for it (unless it comes within any of the exceptions mentioned in sec. 13 of the Act).

COMBINED DRAINAGE.—"V. V." writes: Two adjoining houses, A and B, belonging to the same owner, have separate drains which join together at a point C, the combined drain then discharging into the river at a point D. The drainage of B has been found defective, and the occupier of A has complained of a nuisance caused by the combined drain discharging into the river. The owner of the property has suggested that the combined drain should be dispensed with and a fresh system substituted, the council to carry out the work of connecting with the manhole on the sewer. In what way can the council compel the owner to connect with the sewer in the street in order to obviate the laying of a sewer on his property?

The drainage of B being defective, the council can require the owner, under sec. 23 of the Public Health Act, 1875, to make a drain for that house emptying into a sewer which the council are entitled to use, within 100 ft. from the site of the house; or, if no such means of drainage are within that distance, then emptying into such cesspool or other place not being under any house as the council direct. But unless the drainage of A is also defective they cannot compel the owner to make a fresh drain for that house.

SURVEYOR TO URBAN DISTRICT COUNCIL.—"W. L. F." writes: The urban district council appointed an assistant surveyor to act as surveyor during the illness of the surveyor. The surveyor was appointed under secs. 189 of the Public Health Act, 1875, and he now wishes to resign. The question is: (1) Can the urban district council appoint the assistant surveyor to the surveyorship without advertising the appointment? (2) Will the appointment, if made, be in the nature of a contract, and come within secs. 173 and 174 of the Public Health Act, 1875?

(1) Under sec. 189 the council are bound from time to time to appoint a fit and proper person to be surveyor. The section does not expressly require the appointment to be advertised, and there appears to be nothing to prevent the appointment of the assistant surveyor, assuming him to be a fit and proper person, without advertising the appointment. (2) The appointment will be complete by election, of which a minute should be made. But if the appointment is worth £50 or upwards, there should be a sealed contract for the officer's protection in case any dispute should arise between him and the council, and should lead to litigation, in which event he would be out of Court in the absence of a sealed contract. (Lumley's "Public Health Acts," 7th Edition, page 454.)

HOUSING AND TOWN PLANNING, &C., ACT, 1909.—"W. S." writes: By sec. 17 a sleeping-room should be not less than 7 ft. in height. (1) Does this apply to rooms where the floor is above the level of the adjoining ground? (2) In case the council find certain rooms unfit for habitation, is the proper course to close the whole of the house, or only apply for a closing order for part of the house? (3) If the rural council decide to erect cottages under Part III. of the Act, is it necessary to get the consent of the county council before making application to the Local Government Board for a loan?

(1) No. This provision applies only to a room "the surface of the floor of which is more than 3 ft. below the surface of the part of the street adjoining or nearest to the room." (2) A sleeping-room to which subsection (7) of section 17 applies is to be deemed a dwelling-house; therefore the closing order should apply only to the room. In other cases the order should apply to the whole house, there being no power to close separate rooms, unless they are such sleeping-rooms as previously mentioned. (3) I presume Part III. of the Housing of the Working Classes Act, 1890, is meant. The consent of the county council does not appear to be necessary.

SOME RECENT PUBLICATIONS.*

CARPENTRY AND JOINERY. Fourth Edition. By Banister F. Fletcher, F.R.I.B.A., &c., and H. Phillips Fletcher, F.R.I.B.A. Price 6s. nett. London: Whittaker & Co.

In this well-known book the authors have endeavoured to meet the requirements of the craftsman, and at the same time to produce a work that will be useful to the professional man in the designing of the various structures. The new edition has been, to a large extent, rewritten and brought up to date, and while retaining all the main features of former editions, contains a most interesting additional chapter on artistic craftsmanship. The whole range of carpentry is dealt with in a manner which reveals the author's intimate knowledge of the subject and their skill in lucid exposition. The work is copiously illustrated, and the sketches of the best examples of the craft to which reference is frequently made are calculated to rouse and sustain the reader's interest. As a textbook for architects, engineers, surveyors, craftsmen and students for the several professional examinations, the work is to be very highly commended.

RAILROAD SURVEYING. By G. W. Pickels and C. C. Wiley. Price 10s. 6d. nett. London: Chapman & Hall, Limited.

The authors of this book have had considerable experience in the teaching of engineering students, and the work is a summary of the notes used by them for a number of years in their classes on railroad surveying. The subject is treated in a condensed form, a large reduction in space having been effected by the omission of detailed mathematical working. The assumption of a knowledge of elementary surveying and plane trigonometry on the part of the reader has enabled the writers to confine their work to outlined solutions. The work is conveniently arranged in paragraphs, the main divisions of the subject being railroad surveys, maps, distance curvature and grades, curves, earthwork and turnouts, connections and crossings. The theory of the spiral is dealt with in an appendix, while a number of useful tables complete the work, which is one of undoubted value. British readers, however, must bear in mind that certain of the matters are considered with regard to American practice.

A RHYMING SEWAGE WORKS MANAGER.

"If a body write a body,
Getting no reply,
May a body ask a body
What's the reason why?"

wrote Mr. Thomas Coleman, manager of the sewage works at Athenry, to the Loughrea Rural District Council requesting them to pay him his quarter's salary. The writer added that he had applied for his salary a fortnight ago, but had received no reply. When the assistant clerk read the postcard, the chairman remarked, "Well, what is this body going to do with that body?" "I suppose," remarked Mr. O'Loughlin, "pay him the same as any other body." "This body would have paid him before if we had a financial meeting," explained the assistant clerk. "He will be paid to-day."

Suggested Exeter Improvement Scheme.—The committees of the Exeter City Council charged with the consideration of the provision of a site for the new library and museum, towards the erection of which Mr. Carnegie has contributed £15,000, have (the *Western Morning News* states) presented to the council a report prepared by Mr. T. H. Mawson, the well-known town planning and landscape architect, in which not only is the site for the library dealt with, but a scheme of improvement for Queen-street and neighbourhood is sketched out, the execution of which, it is suggested, might be spread over a century, and which if carried out would not only provide Exeter with a noble range of municipal offices, but would at the same time open up new views of the Guildhall and Cathedral, and transform Queen-street into a great civic centre, around which would be gathered the municipal and principal educational activities of the city.

* Any of the publications reviewed or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

SANATORIA IN COUNTIES AND COUNTY BOROUGHS.

The President of the Local Government Board was asked in the House of Commons on Tuesday whether any councils of counties or county boroughs neither owned nor were now building their own sanatoria; and, if so, whether he would give their names?

Mr. Herbert Samuel said the answer to the first part of the question was in the affirmative. As he explained in an answer of February 19th, councils were empowered to provide the necessary sanatorium accommodation for their areas in various ways other than themselves building sanatoria, and in many cases were doing so. The councils of the following counties and county boroughs had not yet provided sanatorium accommodation, and were not building sanatoria at the present time:—

COUNTIES.—*Bedford, Berkshire, Buckinghamshire, *Cambridge, Isle of Ely, Cheshire, Cornwall, *Hereford, *Huntingdon, Holland (parts of), Kesteven (parts of), Lindsey (parts of), *Norfolk, Northampton, Soke of Peterborough, Northumberland, Oxfordshire, Rutland, Southampton, *Isle of Wight, Sussex (East), Sussex (West), Warwickshire, *Yorks (North Riding).

COUNTY BOROUGHS.—Barnsley, Barrow-in-Furness, Birkenhead, Canterbury, Coventry, *Devonport, Dewsbury, *Gateshead, *Great Yarmouth, Grimsby, Norwich, Oxford, Plymouth, Preston, Reading, Rochdale, *South Shields, Stockport, Sunderland, Walsall, West Bromwich, *West Hartlepool.

Of the others named in the list, seven county councils and seven county borough councils had submitted proposals for the provision of sanatorium beds, three county councils and five county borough councils were at present arranging for the provision of beds at or in connection with existing institutions, and six county councils and five county borough councils had purchased or proposed to purchase sites for the erection of new buildings.

SEWAGE DISPOSAL AT SPALDING.

THE SURVEYOR'S SCHEME.

Spalding Urban District Council have received a letter from the Local Government Board with regard to the sewage scheme, which was recently the subject of an inquiry, and on which it is proposed to expend nearly £30,000. The Local Government Board state that they are satisfied as to the necessity of carrying out the complete scheme, but they are advised that the proposals submitted require extensive revision, and for this purpose it would be desirable for the council to consult an engineer who has had considerable experience in designing and carrying out schemes of sewerage and sewage disposal. The board would be prepared to arrange for their engineering advisers to confer with the engineer appointed by the council and the council's surveyor, with a view to a revision of the scheme. At a special meeting of the council held on Friday night to consider the letter, strong opposition was taken to the proposal for the appointment of an engineer. The following resolution was unanimously passed: "That this council has every confidence in the ability of their surveyor, Mr. John Bailey, to carry out the scheme he has already spent months in planning, and are therefore of opinion that it is unnecessary to sanction the appointment of an engineer as suggested by the board."

Modern Road Surfaces.—In his annual report published recently the borough engineer and surveyor of Nuneaton, Mr. F. C. Cook, says it is evident that there will be a marked increase in the cost of road maintenance within the near future. Wages have risen, and the price of all materials has gone up considerably; while the advent of motor buses and the increase in the number of motor vehicles generally necessitates the provision of stronger and better road surfaces. The day of water-bound roads is passing by, and although tar-spraying has proved a valuable expedient during the period of transition, there is little doubt of the ultimate economy of the use of more lasting material than ordinary macadam in all cases where the traffic is other than of a purely local character.

* These councils have not yet submitted proposals for the provision of sanatorium accommodation.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Birkenhead T.C. (March 7th. Mr. Edgar Dudley).—£1,315 for the purchase of property in Holborn-square, close to the junction of Old Chester-road and Queen-street, Lower Tranmere. It was explained that at this point Old Chester-road is extremely narrow, and it is intended to demolish the present buildings and to widen the thoroughfare.

Birmingham T.C. (March 13th. Mr. A. G. Drury).—£10,556 for the purchase of Bilberry Hill and land surrounding Perry Reservoir, Perry Barr, for the purpose of public pleasure grounds.—Evidence was given by Mr. Fleetwood (surveyor) and Mr. W. H. Morter (superintendent of the parks), and the application was supported by Councillors W. Brown and Johnson.

Burley (Yorks) U.D.C. (March 11th. Mr. P. M. Crosthwaite).—£1,400 for the installation of a system of Bell's mechanical water filters, for the purpose of purifying the water supply.—The water, it was explained, is gathered from the moorland, and the object of the council is to bring the supply to a higher level of purity, to render unnecessary the regular scraping and flushing of the mains, and to obviate any plumbosolvent action.

Haslemere U.D.C. (March 3rd. Mr. F. H. Tulloch).—£1,300 for the purchase of land in West-street, and the erection of buildings thereon, for the purposes of a highways depot.—The surveyor, Mr. H. V. Snook, stated that the land to be acquired was situated near the centre of the district at a distance of 750 yds. from the railway goods station, and the contract price for carting materials from the station to the depot would be 9d. per ton.

Newport (Mon.) T.C. (March 5th. Mr. W. O. E. Meade-King).—£11,697 for the provision of a refuse destructor adjoining the Great Western Railway, and £4,263 for the purposes of street improvement in Cardiff-road and Chepstow-road. The borough engineer, Mr. H. Tremelling, explained that the proposed destructor was for dry refuse only. The committee, before finally deciding, visited several towns and examined numerous destructors, and they eventually adopted the scheme of Messrs. Heenan & Froude, of Manchester and Worcester. Mr. A. W. James, a representative of the firm, gave evidence regarding the capacity of the destructor. Three men would be employed per shift. Evidence was also given with respect to the proposed street works.

APPLICATIONS FOR LOANS.

Barnsley R.D.C.—£1,400 for a sewerage scheme.

Carlisle T.C.—£3,189 for paving works.

Hastings T.C.—£4,000 for wood paving renewals.

Hendon U.D.C.—£2,000 for an underground convenience, and £750 for road widening.

Littlehampton U.D.C.—£1,850 for sewage disposal works.

Newport (I.W.) T.C.—£1,000 for school extension.

Paignton U.D.C.—£1,210 for paving and road widening, and £150 for sewerage.

Radcliffe U.D.C.—£3,918 for electricity mains extension.

Rainford U.D.C.—£2,500 for the erection of fourteen cottages.

Rotherham R.D.C.—£1,600 for works of road improvement.

Rowley Regis U.D.C.—£2,972 for the purchase of sites for schools.

Ryde T.C.—£5,025 for the purposes of water supply.

Saltash T.C.—£750 for street improvement.

Sutton-in-Coldfield U.D.C.—£8,600 for a water supply scheme.

Ventnor U.D.C.—£160 in respect of public conveniences.

Westhampnett R.D.C.—£1,330 for the erection of dwellings at North Bersted.

West Kent Main Sewerage Board.—£35,300 for tanks and machinery at the outfall works.

Woodford U.D.C.—£11,329 for surface-water drainage.

LOANS SANCTIONED.

Atcham R.D.C.—£993 for the erection of working-class houses.

Bourne R.D.C.—£5,482 for an isolation hospital.

Brecon T.C.—£100 in respect of the market hall.

Cleckheaton U.D.C.—£2,830 for the purchase of land for recreation purposes.

Dorset C.C.—£3,000 for a new school at Ham-preston.

Manchester T.C.—£18,656 for the proposed Crow-croft Park school.

Paignton U.D.C.—£1,628 for water mains extension.

Penybont R.D.C.—£698 for road improvement.

Richmond (Surrey) T.C.—£1,000 for a public convenience.

Torquay T.C.—£4,535 for a new water main.

Worcester T.C.—£1,150 for the purchase of a site for a new school.

FORTHCOMING INQUIRIES.

MARCH.		£
23.—	Winchester. For the erection of slipper baths (Mr. R. H. Bicknell)	2,600
24.—	Bideford. For the provision of working-class dwellings (Mr. H. A. Chapman)...	2,700
24.—	Devonport. For the purposes of electricity, streets, and sewerage (Mr. P. M. Crosthwaite)	22,799
24.—	Friern Barnet. For the provision of pleasure grounds (Mr. Edgar Dudley)	5,264
24.—	Leyburn. For sewage disposal and water supply (Mr. M. K. North)	2,650
24.—	Sawbridgeworth. For the purchase of a fire engine (Mr. R. H. Bicknell) ...	186
24.—	Southall. For street improvement (Major J. Stewart)	1,410
24.—	Swansea. For bridge reconstruction (Mr. F. O. Stanford)	1,000
25.—	Cowbridge. For sewage disposal works (Mr. F. O. Stanford)	2,000
25.—	Paignton. For laying out land and the provision of shelters and convenience (Mr. P. M. Crosthwaite)	5,705
25.—	Rawtenstall. For public lighting and electricity (Mr. H. R. Hooper)...	11,000
25.—	Walsall. For works of sewerage (Mr. F. H. Tulloch)	1,700
25.—	Wharfedale. For works of sewage disposal (Mr. M. K. North)	2,741
26.—	Coventry. For works of paving and road widening (Mr. F. H. Tulloch) ...	6,675
26.—	Flockton. For the purposes of public lighting (Mr. H. R. Hooper)	480
26.—	Tonbridge. For the provision of working-class dwellings (Mr. Courtenay Clifton)	9,439
26.—	Tetbury. For work of well sinking (Mr. F. O. Stanford)	795
26.—	Wakefield. For works of sewerage (Mr. M. K. North)	17,813
27.—	Skelton. For the purposes of electrical lighting (Mr. H. R. Hooper)	—
27.—	Stoke-on-Trent. For town hall extensions and new public buildings (Mr. M. K. North)	26,263
30.—	Hendon. For private street improvement (Mr. F. H. Tulloch)	18,194
31.—	Rhyl. For the purposes of the sewer outfall (Mr. P. M. Crosthwaite) ...	3,377

Village Sanitation in Cumberland.—Dr. McLeish, in his first annual report presented recently to the Coekermouth Rural District Council, described the sanitary arrangements in many villages as mediaeval survivals. Public scavenging methods were unbusiness-like and absolutely haphazard, and a large number of water and sewerage schemes were hung up. Many had been on the tapis for years, the failure to carry them out being due to local opposition to the raising of rates involved. If the Government carried out Mr. Lloyd George's promise, and provided larger grants for the relief of the local rates, he believed the result would be the adoption of a steadily progressive sanitary policy.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Bristol £2,000, Connah's Quay £5,700, Merthyr £21,750, Sevenoaks £5,000, Sunderland; housing and town planning—Belfast £36,117, Chester-le-Street, St. Helens; refuse collection and disposal—Sutton Coldfield; roads and materials—Bromley £13,000, Notts; sewerage and sewage disposal—Billericay £9,000; water, gas and electricity—Colwyn Bay £21,000, Linlithgowshire £30,000. Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Acton U.D.C.—A public convenience is to be erected at a cost of £243, and it has also been agreed to build a cottage and shelter at North Acton playing fields, at an estimated cost of £700.

Billericay R.D.C.—Official sanction has been given to a loan for an isolation hospital.

Bristol T.C.—A municipal lodging-house for women is to be provided at an estimated cost of £2,000.

Connah's Quay U.D.C.—A scheme has been adopted for the erection of municipal buildings, at an estimated cost of £5,700.

Gourock T.C.—It is proposed to build municipal offices in Shore-street, adjoining property to be taken over by the county council for a police station.

Melrose T.C.—The question of providing a public swimming bath has been referred to a special committee.

Merthyr T.C.—It is proposed to provide new schools at Gellytaelog, at an estimated cost of £21,750.

Paignton U.D.C.—The tender of Messrs. R. Aitken & Sons, at £273, has been accepted for the erection of a public convenience on the Green, opposite the Pavilion Pier.

Scarborough T.C.—The borough surveyor, Mr. H. W. Smith, has been asked to amend plans and estimate for the proposed conveniences on St. Nicholas Cliff.

Seaton Delaval U.D.C.—The council have decided to take on lease a modern house in Avenue-road, Seaton Delaval, for the purpose of converting the building into council chambers.

Sevenoaks U.D.C.—A scheme has been adopted for the erection of swimming baths, at an estimated cost of £5,000.

Sunderland T.C.—Several costly improvements are in contemplation, including the building of the Wearmouth Bridge, at an estimated cost of £120,000, and the extension of the town hall buildings.

HOUSING AND TOWN PLANNING.

Belfast T.C.—A solution of the housing scheme in connection with the Hamill-street area improvement scheme has been arrived at by the decision of the city council to erect 252 three-roomed houses in accordance with the plans of the city surveyor, Mr. H. A. Cutler, M.INST.C.E., at a total cost of £36,117. This means the abandonment of the previous decision to erect two-roomed as well as three-roomed houses.

East Kerrier R.D.C.—The Housing Committee have been authorised to select a site for the purpose of a housing scheme.

Edinburgh T.C.—The town planning scheme for Fountainbridge and Lochrin, which include the construction of a street to connect Lochrin-place and Lochrin-terrace with Gilmore-place, and the acquisition of certain properties for this purpose, has been approved by the Town Planning Sub-Committee, and recommended to the council for adoption.

Chester-le-Street R.D.C.—A housing scheme for the provision of 100 dwellings is to be carried out in the vicinity of Harraton Colliery.

Hitchin U.D.C.—It is proposed to carry out a slum improvement scheme, at an estimated cost of £7,000.

Penzance T.C.—It has been agreed to proceed with a housing scheme for the provision of twenty-two houses, at an estimated cost of £5,784.

Ryton (Durham) T.C.—The preliminary steps have been taken with a view to the erection of twenty-five workmen's dwellings.

St. Helens T.C.—The Health Committee have passed a resolution to apply for sanction to borrow £23,000 for the purpose of acquiring two sites and erecting on one tenement dwellings to accommodate ninety families, and on the other self-contained cottages to accommodate thirty families. The Local Government Board had written asking the number of houses that were required to provide necessary accommodation for persons of the working classes, and the medical officer suggested that 1,000 additional houses were required. It was decided that the Local Government Board should be informed that 500 extra houses were required.

Seaton Delaval U.D.C.—The council had before them a development plan for the south-east portion of their area from the architect to the Seaton Delaval estates. On this was shown the proposed erection of some 600 houses, of the semi-detached villa type. As the council have, in conjunction with the Whitley and Monkseaton Urban District Council, decided to include this particular area in a town planning scheme, the plans were referred to a special meeting for consideration, and the surveyor, Mr. A. Dorin, was instructed to prepare Map I, and incorporate the architect's proposals, with necessary alterations and amendments found desirable.

PARKS AND OPEN SPACES.

Gardiff T.C.—It is hoped to obtain land for an additional park on the top of Penylan Hill, commanding a view of the Channel and of the Somerset coast. For some time negotiations have been proceeding between the Parks Committee and the Roath Court and Tredegar estate for the acquisition of 16 or 18 acres of land, consisting of a portion of the quarry and the land adjoining on the top of the hill. The city engineer, Mr. W. Harpur, stated at the Parks Committee meeting that the terms were that the corporation should make the roads and construct the sewers. The negotiations are to be continued.

Seaton Delaval U.D.C.—The council have approved plans and estimates prepared by the surveyor, Mr. A. Dorin, for fencing the recreation ground, and have instructed him to obtain tenders.

Southport T.C.—The borough surveyor, Mr. A. E. Jackson, has been instructed by the Parks Committee to prepare plans and submit a complete estimate of the cost of laying out hard tennis courts in Victoria Park.

REFUSE COLLECTION AND DISPOSAL.

Burton T.C.—New refuse destructor machinery is to be installed, at an estimated cost of £2,500.

Hinckley U.D.C.—The surveyor, Mr. E. H. Crump, has received instructions to prepare a scheme for the provision of a new pumping main, 15 in. in diameter, a refuse destructor, the necessary steam pumping engines, boilers, engine-house and chimney stack, for the council's consideration, preparatory to applying for the necessary loan.

Nottingham T.C.—There was produced last year from the Easteroft destructor 1,148,179 units of electricity, a falling off from the previous year of 24,098 units.

Sutton Coldfield T.C.—The council are considering a scheme, prepared by Messrs. Hughes & Stirling, for the construction and equipment of a refuse destructor at a cost of £5,050.

ROADS AND MATERIALS.

Armagh C.C.—The county surveyor in his report to the council last week, stated that the Road Board had agreed to contribute one-half the cost of all the proposals passed by the district councils. The total cost of these works he estimated at £3,332. Looking at the nature of the proposals, all of which were for works of improvement on first-class roads, but some of which were really only of local importance, it seemed to him that the board had dealt very fairly with County Armagh, and had even stretched their usual policy to meet the wishes of the council.

Belfast T.C.—The Land and Improvement Committee have agreed to purchase the Working Men's Institute for the widening of Castle-street.

Bromley T.C.—It has been decided to lay wood paving in High-street and East-street, at an estimated cost of £13,000.

Cannock U.D.C.—The tender of Messrs. Jukes & Co., Tipton, at £2,637 has been accepted for making up several streets.

Dalbeattie T.C.—A scheme has been proposed for dealing with the road from the burgh boundary at the railway bridge to Bellvue, a length of 1,200 yds., with tar-macadam, at an estimated cost of £729. The Road Board is to be asked to grant financial aid to the scheme.

Dublin T.C.—It has been agreed to borrow £1,000 for the improvement of the road between Dublin and Bray, at Stillorgan, conditional upon one-half of that amount being borne by the Rathdown No. 1 Rural District Council, and the Road Board providing the balance of the cost.

Edinburgh T.C.—A scheme of tree planting has been completed in various streets in the city. In all 726 trees have been planted in sixteen different streets. The trees selected are poplars, Huntingdon willow, London planes, English elm and sycamore.

Fraserburgh T.C.—As the result of a joint conference of the Streets Committee and the Cleansing Committee, the council have agreed to try the effect of using only stone chips without other blinding when remetalling the ordinary macadamised streets, and have also decided that more thorough scavenging and brushing be employed in the removal of the mud, and that additional men be engaged as scavengers when required.

Hendon U.D.C.—The tender of Mr. A. Wooster, at £911, has been accepted for making up Lockett-road and Radnor-avenue.

King's Lynn T.C.—The borough surveyor, Mr. A. J. Smith, has received instructions to proceed with several schemes of road improvement.

Manchester T.C.—The Improvements Committee last week approved of a scheme for the street improvements in the Miles Platting district. It includes the construction of a new street from Hulme Hall-lane, across Oldham-road, absorbing Wilson-street, and having an outlet in Lamb-lane, near the railway station.

Newcastle-under-Lyme T.C.—The Road Board have sanctioned a grant of £500 towards the cost of the Deansgate and Keel-road improvement. The board have also decided to make a grant of one-half the cost of tar-spraying the main roads, and three-fourths of the cost of tar-macadam for such roads.

Notts C.C.—The old Rufford-road is being entirely reconstructed of clinker-ash foundation, rough slag sub-crust, and slag for the surface. The new direct road reduces the distance from Nottingham to Bawtry to 35 miles. It is expected that the cost of the present scheme will be about £6,000, of which amount the Road Board will contribute half; but to complete the road throughout with permanent material will eventually cost from £35,000 to £40,000.

Renfrew C.C.—It was reported to the Upper District Committee that the cost of maintaining a length of 5 miles of the Kilmarnock road had increased in ten years from £83 per mile to £326 per mile, and the committee have agreed that representations be made with regard to the cost of maintenance, to which heavy motors made no contribution, and that the matter be submitted to the County Road Board with a view to its being again brought before the County Councils Association.

Roxburghshire C.C.—The details of a new scheme of main road improvement, prepared for the Hawick District Committee, and estimated to cost over £4,000, have been submitted to the Road Board with a view to a grant from that authority.

Southwark B.C.—The council have decided to construct two additional street refuges in Old Kent-road, and the borough engineer, Mr. Arthur Harrison, M.INST.C.E., has received instructions to place a temporary refuge in the Borough High-street in order that its utility might be gauged in actual practice before it was permanently established.

Staffs C.C.—The council last week agreed to a recommendation of the Main Roads Committee that the salaries of assistant surveyors of main

roads be as follows: On appointment, £175 per annum; after 1½ years' service, £200 per annum; after a further 5½ years' service, £225 per annum; with a further annual increment of £5 after each succeeding year's service until a maximum of £250 per annum is reached. Specific increases were granted to present-time officials.

Sunderland T.C.—It has been agreed to pave Newcastle-road with Durax, at an estimated cost of £4,830.

Whickham U.D.C.—It has been decided to carry out road improvement works, at an estimated cost of £1,367.

Worcester C.C.—The council are advised by the Highways and Bridges Committee to purchase a patching roller, four sleeping van, and six horse road-sweeping machines.

SEWERAGE AND SEWAGE DISPOSAL

Ayrshire C.C.—A report by the medical officer and sanitary inspector to the Northern District Committee recommends that a special drainage district be formed for Skelmorlie, with not more than two sewage outfall on the foreshore. At present there are thirty-two drains discharging on the beach.

Barnstaple R.D.C.—The General Purposes Committee reported only one tender for draining Instow back roads, and the committee, considering this much too high, recommended that it be not accepted, but the surveyor, Mr. E. G. Kingwell, be empowered to get the work done if possible by day labour. The committee's suggestion was agreed to.

Billericay R.D.C.—It is proposed to carry out a sewerage and sewage disposal scheme for Hutton, at an estimated cost of £9,000.

Chapel-en-le-Frith R.D.C.—The council have agreed to apply to the Local Government Board for sanction to a general sewerage scheme for Bamford, and have requested Messrs. Brady & Partington, Town Hall, Chapel-en-le-Frith, to prepare plans and estimates for sewerage and sewage disposal works for the district.

Hayfield R.D.C.—As the outcome of recent investigations into the sanitary conditions of Hayfield, the Local Government Board have instructed the council to cause all closets to be converted to water-carriage, to undertake public scavenging at Hayfield and Mellor, and to carry out with more vigour the inspection under the Housing Act.

Hexham R.D.C.—A sewage disposal scheme for Acomb, estimated to cost £1,400, has been prepared by Mr. A. S. Dinning, of Newcastle-upon-Tyne.

Hinckley U.D.C.—Certain requisites are to be installed at the sewage disposal works, including pump, pumping main, settling tank, and a second filter, if required.

Newhaven R.D.C.—The surveyor, Mr. A. C. Groves, has received instructions to prepare specifications and invite tenders for a scheme of storm-water drainage at Rettingdean.

Norwich T.C.—It has been agreed to lay a 21-in. surface-water sewer from Barraek-street to discharge into the river Wensum, at a cost not exceeding £350, subject to the city engineer, Mr. A. E. Collins, being able to obtain the necessary wayleaves.

Retford R.D.C.—A proposed sewage disposal scheme for Ranskill, estimated to cost £1,317, has been referred to the parish council for consideration.

Seaton Delaval U.D.C.—The council have approved the plans and estimates for the erection of thirty-three sanitary earth-closets, prepared by the surveyor, Mr. A. Dorin, and have instructed him to obtain tenders for the work.

Whitby R.D.C.—The Local Government Board have returned to the council the plans of the sewerage scheme for Sleights—concerning which an inquiry was held as to the council's application to borrow £5,700—with the request that certain alterations be reconsidered on the lines suggested by the inspector, who thought a less expensive scheme would suffice.

Willington U.D.C.—The surveyor, Mr. J. H. Gardner, has been instructed to prepare a scheme for pumping sewage on to the land at Pagebank.

WATER, GAS, AND ELECTRICITY.

Bingley U.D.C.—A municipal electricity scheme has been established at a cost of about £6,000. Current will be received in bulk under agreement from the Keighley Corporation, and will be trans-

formed to be used for power and lighting purposes in Bingley, and for the running of the tramways opened recently.

Burton T.C.—The Gas and Electricity Committee has allocated £8,000 from their profits in relief of rates.

Gardiff T.C.—The council have unanimously recommended the Waterworks Committee to consider the advisability of seeking Parliamentary powers, if necessary, to enable them to meet the demands of firms on the Bute Docks estate. This is the case in which the Bute Docks estate have made a demand for the payment of £675 per annum for easement in respect of a water supply to certain firms within the docks.

Chapel-en-le-Frith R.D.C.—The council have instructed Messrs. Brady & Partington, Town Hall, Chapel-en-le-Frith, to prepare plans and estimates for a scheme for utilising the springs at "The Nook" to augment the Fernilee water supply.

Colwyn Bay U.D.C.—A scheme prepared by the electrical engineer, Mr. Tudman, for the erection of a new electricity generating station in connection with the destructor works at Bronnant, at an estimated cost of £21,000, is to be submitted to a consulting engineer to advise thereon.

Connah's Quay U.D.C.—It has been agreed to promote a scheme for the electric lighting of the district.

Gourock T.C.—The council are recommended by the Gas Committee to build a new gasometer, at an estimated cost of £7,000.

Leicester T.C.—The nett profit on last year's working of the gas undertaking was £19,740.

Linlithgowshire C.C.—The Linlithgow District Committee, having decided to proceed with their scheme for supplying water from Riccarton Burn area for a considerable portion of the county—the initial cost being estimated at £30,000—have agreed that, for the purposes of this new scheme, the following districts shall be amalgamated as a combined special water district—viz., Abercorn, Blackness, Muirhouses, Carriden and Linlithgow rural.

Rosehearty T.C.—Messrs. Jenkins & Mare, Aberdeen, have received instructions to report upon the water supply, and especially as to the advisability of a new scheme suitable to the requirements of the district.

Spalding R.D.C.—The engineer, Mr. E. J. Silcock, of Leeds, on Monday reported that 700 yds. of 7-in. main, thought to have been laid in the parish of Weston, could not be found. It would be necessary to lay a new main, which would add about £300 to the cost of the water supply scheme.

Torpoint U.D.C.—A contract has been sealed with the local electric light company for supplying 75-candle power lamps, at £1 9s. per lamp for current only, the council to have full control.

Walsall T.C.—The annual balance sheet of the corporation gas undertaking shows a nett profit for the year ended December 31st last of £6,098, being a decrease of £3,391 compared with the previous year. The reduction is attributed mainly to an increase of £2,654 in the cost of coal, while the amount received for the sale of residual products was less by £620. It is also pointed out that a reduction in the price of gas supplied for power purposes recently came into effect.

MISCELLANEOUS.

Margate T.C.—The advisability of providing a motor fire engine, at an estimated cost of £2,000, is engaging the attention of a committee.

Royal Masonic Institution for Boys: April, 1914, Election.—The support of municipal officers is earnestly solicited on behalf of Frederick Charles Lloyd, the eleven-years-old son of the late Bro. Frederick Charles Lloyd, town clerk of Croydon, who died on July 18th last, leaving a widow and six children, five of whom are under twelve years old and dependent upon her. Before going to Croydon Bro. Lloyd was town clerk of Huddersfield, and prior to that deputy town clerk of Cardiff. He was initiated in the Bute Lodge, No. 960, Cardiff, in 1891. The candidate will be twelve years of age in July next, and will not be eligible to contest another election; this is therefore a "last-chance case." Proxies will be thankfully received by W. Bro. T. W. Wood Roberts, P.M. 1556 and 3363. L.R., 59 Park-lane, Croydon (hon. secretary).

PERSONAL.

Mr. W. D. Bell, surveyor to the Kingswood Urban District Council, has resigned.

Mr. Graham, Hawiek, has been appointed road surveyor for Liddesdale in succession to the late Mr. John Elliot.

Mr. A. C. James, surveyor to the Grays Urban District Council, has been voted an increased salary of £20 a year.

Mr. A. J. Blight, surveyor of highways to the St. Austell Rural District Council, has been voted £30 for extra services.

Mr. Duncan Cumming, sanitary and cleansing inspector of Perth, died, we regret to state, last week, at the age of sixty-eight.

Mr. Henry G. Reece, assistant surveyor to the Dulverton Rural District Council, has had his salary increased by £10 per annum.

Mr. Herbert Heap, ASSOC.M.INST.C.E., of Grimsby, has been appointed engineer and surveyor to the Scunthorpe Urban District Council.

Mr. W. Jervis, chief surveyor of main roads to the East Suffolk County Council, has had his salary increased from £400 to £500 per annum.

Mr. R. W. Burr, of the Chesterfield borough surveyor's staff, has been appointed surveyor of highways and inspector of nuisances to the Wadebridge Urban District Council.

Mr. Edward Park, Sedburgh, was on Tuesday appointed surveyor of highways for the South sub-district of the Horncastle Rural District Council, at a salary of £130 per annum.

Mr. H. A. Scott, a member of the surveyor's staff of the Esher and the Dittons Urban District Council, has been appointed general assistant to the engineer and surveyor of the Maldens and Coombe Urban District Council.

Miss Jean Wearing Brodie, eldest daughter of Mr. J. S. Brodie, borough surveyor of Blackpool, died recently, we regret to state. Mr. and Mrs. Brodie and family have the sympathy of a wide circle of friends in their bereavement.

Messrs. H. T. Chapman, county surveyor of Kent, J. R. Fothergill, borough engineer's office, Bexhill-on-Sea, J. R. Hill, borough surveyor's office, Ipswich, and R. B. Phillips, Westminster City Hall, have been elected members of the Royal Sanitary Institute.

Mr. J. Richardson, who for over ten years has been general manager and engineer of the electricity department of Dundee, has been recommended for appointment as borough electrical engineer of Salford, in succession to Mr. H. J. Hawkins, who recently resigned. The salary is £1,000 a year.

Mr. G. Winter, borough surveyor of Darlington, has been voted an increased salary of £100 a year, "in appreciation," as the mayor (Alderman J. G. Harbottle) stated, "of the able and distinguished services he had rendered to the town for a great number of years," and also because of the extra duties and responsibilities that had been placed upon him during recent years.

Mr. H. D. Blake, managing director of the Limmer Asphalte Paving Company, Limited, who, as reported in these columns, sustained somewhat severe injuries in a motor-car accident a few weeks ago, has now, we are glad to be able to state, recovered sufficiently to be able to proceed to the South of France, where he will remain until his health admits of his returning to business.

Mr. C. F. Gettings, county surveyor of Worcestershire, has had his salary increased by £150 per annum, and the following increases have been granted to officials in his department: Mr. Roland Fletcher, assistant surveyor, £25; Mr. B. C. Hammond, senior surveying assistant, £10; Mr. E. F. Gravenall, second clerk, £15; Mr. A. B. Farmer, junior clerk, £6 10s.; and Mr. G. J. Harman, junior clerk, £13.

Mr. H. Hamer, the new chief assistant to the borough surveyor of Stockport, was described last week as the deputy borough engineer of Accrington. As a matter of fact, his position was that of chief engineering assistant, the deputy borough surveyor being Mr. William J. Heard, who has held that office for eleven years. Mr. Heard is now taking over the engineering work of the department, in addition to that he has hitherto done in the architectural department.

FOR OTHER ADVERTISEMENTS

See End of Paper.

WANTED, in the City Engineer's Office, YORK, an Engineering Assistant, with Municipal experience; also an Architectural Assistant, with good knowledge of Municipal requirements. Salary £100 per annum.

Applications to be made on a Form to be obtained from the undersigned, and to be sent in not later than the 28th inst.

F. W. SPURR,
City Engineer.

Guildhall, York.

March 18, 1914.

(1.461)

URBAN DISTRICT OF FINCHLEY.

The Council of the above-named District requires the services of a Temporary Engineering Assistant (not less than 21 years of age) for Private Street Works and Road Improvements, at a salary of 2½ guineas a week.

Candidates must be accurate surveyors and levellers, and neat and expeditious draughtsmen.

Previous experience in similar work is essential, and preference will be given to candidates holding the certificate of the Association of Municipal and County Engineers.

Form of application and list of duties may be obtained on application to the Engineer and Surveyor at the Council Offices, Finchley, N.

Canvassing, directly or indirectly, will disqualify. Applications, endorsed "Temporary Engineering Assistant," and accompanied by copies of three recent testimonials, to be delivered to the undersigned not later than twelve o'clock (noon) on the 4th April, 1914.

E. H. LISTER,
Clerk of the Council.

Council Offices,

Church End,

Finchley, N.

March 19, 1914.

(1.464)

**BARNET URBAN DISTRICT COUNCIL.
APPOINTMENT OF ENGINEER AND SURVEYOR.**

The Barnet Urban District Council invite applications for the position of Engineer and Surveyor to the Council.

Commencing salary £250 per annum.

Applicants must have had practical experience in the works usually undertaken by an Urban Authority, including Private Street Works, Highways, Sewers, Sewage Works and Sanitary Works of every description, and must be competent to prepare Plans, Drawings, and Quantities for Municipal Works or Buildings, and perform all the ordinary duties of a Surveyor of Highways.

Applications, in candidate's own handwriting, stating age and experience, and enclosing copies of not more than three testimonials, must be sent to the undersigned not later than the first post on Thursday, the 2nd April, 1914.

Canvassing of any Member of the Council, either directly or indirectly, will be a disqualification.

H. W. POOLE,
Solicitor,
Barnet,
Clerk of the Council.

March 18, 1914

(1.465)

ROTHERHAM RURAL DISTRICT COUNCIL.**CONVERSION OF PRIVIES INTO WATER-CLOSETS.**

The above-named Council are prepared to receive Tenders for the work of Converting Privies into Water-closets, and the alteration of Ashpits into Sheds for Dust-bins, including the provision of the necessary Drains and Connections for (1) 58 Houses in Duncan-street, Brinsworth; (2) 62 Houses in Saville-street and Osberton-street, Dalton; and (3) 75 Houses in Doncaster-road, Whinney-hill, Cross-street and Silver-street, Thrybergh.

Plans may be seen, and Specifications, Bills of Quantities and Forms of Tender obtained, from the Engineer to the Council, Mr. B. Hey, M.A.M.V.N., Imperial Buildings, Rotherham, on payment of £1 1s. (cash or postal order), which will be returned upon receipt of a *bonâ-fidè* Tender. In the case of the accepted Tender the deposit will be retained until a

Contract and Bond have been entered into, and, in the event of a withdrawal, the deposit will be forfeited.

Sealed Tenders, endorsed "Privy Conversions," to be delivered to the undersigned not later than first post on Monday, the 30th inst.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

OXLEY & COWARD,

Clerks to the Council.

6 Westgate,

Rotherham,

March 17, 1914.

(1.462)

URBAN DISTRICT OF PENGE.**GREEN-LANE, PARISH-LANE (PART OF),
AND PENGE-LANE.****TO TARRED SLAG AND TARRED GRANITE
MACADAM MANUFACTURERS.**

The Urban District Council of Penge hereby invites Tenders for Resurfacing the above-mentioned Roads with either Tarred Slag or Tarred Granite Macadam - approximately 7,500 super. yards.

Form of Tender, Specification and Conditions of Contract can be obtained on application to the Surveyor, Town Hall, Anerley, S.E., on and after Monday, the 23rd day of March, 1914, on payment of a deposit of £1, which will be refunded upon receipt of a *bonâ-fidè* Tender.

Sealed Tenders, endorsed "Tender for Resurfacing Roads," to be delivered to me, the undersigned, not later than 12 o'clock noon on Saturday, the 28th day of March, 1914.

The Council does not bind itself to accept the lowest or any Tender.

Dated this 18th day of March, 1914.

ARTHUR E. EVES,

Clerk to the Council

Town Hall,

Anerley, S.E.

(1.463)

**METROPOLITAN BOROUGH OF
POPLAR.**

The Works Committee of the Council of the above-named Borough invite Tenders for the Supply of—

Scavengers' Brooms,

Rotary Machine Sweeping Brushes, and Refilling Old Stocks,

for the year ending 31st March, 1915.

Contractors will be required to pay Trade Union rates of wages and observe Trade Union hours of labour in respect of all persons employed in or about a Contract, and not to sublet any portion of the Contract without permission.

All particulars may be obtained on application to the Borough Surveyor, Mr. Harley Heckford, M.A.S.T.C.E., at the Council Offices, and Forms of Tender and Specifications will be supplied on payment of a deposit of One Guinea in cash, which will be refunded on receipt of a *bonâ-fidè* Tender and the return of all documents.

Samples may be inspected by arrangement.

Sealed Tenders, endorsed "Tender for Brooms," to be delivered to the undersigned on or before noon on Friday, the 3rd April, 1914.

The Committee do not bind themselves to accept the lowest or any Tender.

LEONARD POTTS,

Town Clerk.

Council Offices,

High-street, Poplar.

March 20, 1914.

(1.459)

HAVERHILL URBAN DISTRICT COUNCIL.**TO GRANITE, SLAG AND SLAG TAR-
MACADAM MERCHANTS.**

Tenders are required for the Supply of Broken Granite, Slag and Slag Tar-macadam.

Forms of Tender and particulars may be obtained from the undersigned, to whom Tenders, with Samples, must be delivered on or before April 6th, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

JOHN H. CLARKE,

Surveyor.

Haverhill,

Suffolk

March 17, 1914

(1.460)

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A R.I.B.A.,
Borough Surveyor, Great Yarmouth.

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District will be held at Wakefield to-morrow (Saturday).

PROGRAMME.

2.30 p.m.—Meet at the Town Hall, and proceed to Calder Vale to inspect the recently remodelled sewage disposal works.

4.30 p.m.—Return to the Town Hall, where tea will be provided by the kind invitation of his Worship the Mayor (Mr. J. W. Salville).

5.30 p.m.—District business—

Correspondence.

To consider and arrange for the next whole membership meeting of the institution in the North-Eastern District.

To consider nominations for (a) two district representatives on the council, (b) district chairman, (c) hon. district secretary, for the year 1914-1915.

In accordance with notice given, Mr. A. Rothera (Liversedge) will move:—

“That the members of the North-Eastern District request the council to take a poll of members and associate-members as to whether they are in favour of the issue of the Journal of the institution in parts as at present, or the retention of the annual bound issue formerly existing, and that a copy of this resolution be sent to the secretary of the institution and the hon. secretary of each of the various districts, asking for their co-operation by supporting a formal resolution to this effect.”

J. P. WAKEFORD, M.I.C.E.,
Hon. District Secretary.
Wakefield.

F. MASSIE, M.I.C.E.,
District Chairman.
Wakefield.

SOUTH-WESTERN DISTRICT.

A meeting of the South-Western District of the institution will be held at Torquay to-morrow (Saturday).

PROGRAMME.

12 noon.—Meet at the new Town Hall, Torquay.

Business: To confirm minutes of last meeting; to receive communications, if any; to decide as to nominations for district officers for the ensuing year.

1 p.m.—Inspection of the recently completed pavilion described in Vol. 37 of the “Proceedings.”

1.30 p.m.—Lunch (prepared by electricity) at the Pavilion café by the kind invitation of the Mayor and Corporation of Torquay.

2.45 p.m.—Proceed by tramcar for a visit of inspection of the recently completed town hall and municipal buildings.

3.30 p.m.—Description by Mr. H. A. Garrett, Assoc.M.I.NST.C.E., borough surveyor, of the Torquay Pavilion—public restaurant operated by electricity—with discussion.

4.30 p.m.—Tea at the Pavilion café.

D. EDWARDS, ASSOC.M.I.NST.C.E.,
Hon. District Secretary.

Municipal Buildings,
Taunton.

EASTERN DISTRICT.

A meeting of the Eastern District is to be held at Chelmsford on April 18th.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on June 13th.

THE ANNUAL MEETING.

The date for the annual meeting of the Institution of Municipal and County Engineers at Cheltenham has been fixed definitely for June 24th, 25th, 26th and 27th next. It has been decided to make a special feature of town planning and of roads, and, if possible, to arrange for an exhibition of town plans.

92 Victoria-street, S.W.

THOMAS COLE,
Secretary.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

NORTHERN AND NORTH-WESTERN DISTRICTS.

A Northern and North-Western District joint meeting will be held at Leeds to-morrow (Saturday).

PROGRAMME.

11 a.m.—Meet N.E. Station, Leeds, and proceed to Messrs. Fowler & Co.'s works.

2.30 p.m.—Leave there by special car to visit Rodley sewage works.

4.45 p.m.—Leave Rodley by special car.

5.30 p.m.—Meet at the Midland Station Hotel for short business meeting.

JOHN ROBINSON,
Darlington.

R. J. MCKENN,
Heywood.

FORTHCOMING MEETINGS.

Arrangements have been made for the following meetings: April, Birmingham; April 18, Hexham; May, Finedon and Wellingborough; May 16th, Hull; June 13th, Tisbury and Cumberland; July, Hunstanton; July 11th, Alnwick; September 12th, Harrogate; October 10th, Sunderland; November 7th, Newcastle; December 12th, Newcastle.

Next Council Meeting. The next meeting of the council will be held at Leeds on Saturday, March 21st.

B. WYAND,
Secretary.

39 Victoria-street, S.W.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

SURVEYOR AND INSPECTOR.—March 23rd.—Holywell Urban District Council. £105 per annum.—Mr. J. Kerfoot-Roberts, clerk.

BOROUGH SURVEYOR'S CHIEF ASSISTANT.—March 23rd.—Corporation of Shrewsbury. £140—£180.—Mr. A. W. Ward, borough surveyor.

CLERK OF WORKS.—March 23rd.—Pontypridd and Rhondda Joint Water Board. £3 10s. per week.—Mr. W. P. Nicholas, clerk, Geiliwasted-road, Pontypridd.

CHIEF ASSISTANT AND GENERAL ASSISTANT.—March 23rd.—Acerington Town Council. £150 and £104.—Mr. W. J. Newton, borough engineer and surveyor.

BOROUGH SURVEYOR'S ENGINEERING ASSISTANT.—March 23rd.—Corporation of Shrewsbury. £90—£120 per annum.—Mr. A. W. Ward, borough surveyor.

ROAD FOREMAN.—March 23rd.—Devon County Council. 35s. per week.—County Surveyor, 22 Queen-street, Exeter.

SURVEYOR'S ACCOUNTS CLERK.—March 24th.—Eastleigh and Bishopstoke Urban District Council. 30s. per week.—Mr. H. White, clerk, Eastleigh.

CLERK OF WORKS.—March 24th.—Littleborough Urban District Council.—Mr. G. H. Wild, clerk.

ROAD FOREMAN.—March 25th.—Wilts County Council. £2 10s. per week.—Mr. J. George Powell, county engineer and surveyor, Trowbridge.

FOREMAN PIPE LAYERS.—March 25th.—Municipality of Bombay. £30 per month.—Messrs. John Taylor & Sons, Caxton House, Westminster, S.W.

CLERK OF WORKS.—March 25th.—Staffordshire County Council. £3 3s. per week.—Mr. J. Moncur, county surveyor, Stafford.

ASSISTANT INSPECTOR OF NUISANCES.—March 25th.—Corporation of Leicester. 40s.—50s. per week.—Dr. C. Killick Millard, medical officer of health.

GENERAL FOREMAN.—March 29th.—Corporation of King's Lynn. 35s. per week.—Mr. Alfred J. Smith, borough surveyor.

SUPERINTENDENT OF CLEANSING.—March 31st.—Corporation of Glasgow. £550—£700 per annum.—Mr. J. Lindsay, town clerk.

HYDRAULIC ENGINEER.—March 31st.—Nenagh Urban District Council.—Mr. Frank R. Maloney, town clerk.

CLEANSING FOREMAN.—March 31st.—Brighthouse Town Council. £2 per week.—Mr. J. H. Rothwell, town clerk.

ASSISTANT ENGINEERS.—April 1st.—Indian Public Works and State Railways Departments.—Secretary, Public Works Department, India Office, London, S.W.

JUNIOR ASSISTANT.—April 1st.—Wanstead Urban District Council. £70—£100 per annum.—Mr. Bruce Blewitt, clerk.

WATERWORKS MANAGER.—April 6th.—Neath Rural District Council. £300 per annum.—Messrs. Cuthbertson & Powell, clerks.

SURVEYING ASSISTANTS.—April 21st.—Shanghai Municipal Council. £385 per annum.—Messrs. John Pook & Co., agents for the Shanghai Municipal Council, 68 Fenchurch-street, London, E.C.

SUPERINTENDENT ARCHITECT.—Government of Nigeria. £500—£600 per annum.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

DRAUGHTSMAN.—Sierra Leone Government Railway. £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ASSISTANT ENGINEERS.—Public Works Department, Ceylon. £300—£350 per annum.—Messrs. Gregory, Eyles & Waring, 12 Dean's-yard, Westminster, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

MOLD.—Plans for a fire station and caretaker's house, for the urban district council.—Mr. D. Thomas, surveyor, Town Hall.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

ST. HELENS.—March 23rd.—For the erection of a school, for the Education Committee.—Messrs. Biran & Fletcher, architects, George-street.

CROYDON.—March 23rd.—For the erection of a gate-house, an electricity sub-station, and additions to existing station, for the corporation.—Mr. J. M. Newnham, town clerk.

GOVAN.—March 24th.—For the erection of a tramway depot, for the corporation.—Mr. J. Dalrymple, general manager of tramways, 46 Bath-street.

BRIDGWATER.—March 24th.—For pulling down existing buildings, and erection of coach-house, lirage, slaughter-house, and offices, for the corporation.—Borough Surveyor.

OAKDALE.—March 24th—April 7th.—For the erection of a hospital for the Hospital Committee.—Mr. A. F. Webb, Blackwood, Mon.

HAMPSHIRE.—March 25th.—For the construction of a brick and concrete three-arched bridge, for the counties of Berks and Southampton.—Mr. H. Barber, clerk, Hampshire County Council, The Castle, Winchester.

NORTHANTS.—March 25th.—For building a public school, for the Education Committee.—Messrs. Blackwell & Ridley, 53 High-street, Kettering.

MANCHESTER.—March 25th.—For hospital extension works, for the corporation.—City Architect.

HOWDEN.—March 25th.—For the erection of an isolation hospital, for the rural district council.—Mr. T. S. Ullathorne, architect, Selby.

CHESHAM.—March 25th.—For the erection of twenty workmen's dwellings, for the urban district council.—Mr. Percy C. Dormer, engineer and surveyor.

BRAINTREE.—March 26th—April 6th.—For the construction of a new brick bridge over the river Blackwater at Bocking, including raising present road and making and forming new approaches to bridge, and all works in relation thereto, for the rural district council.—Messrs. Sands & Walker, Milton Chambers, Nottingham.

SPALDING.—March 27th.—For the erection of eighteen cottages, for the rural district council.—Messrs. Davis & Crowley, architects, 6 Double-street, Spalding.

HINDLEY.—March 28th.—For the erection of a transforming station and other buildings, for the urban district council.—Mr. O. P. Abbott, surveyor.

HINCKLEY.—March 28th.—For the erection of sixteen workmen's dwellings, for the urban district council.—Mr. E. H. Crump, engineer and surveyor.

GLASGOW.—March 28th.—For the extension of Belvedere Hospital, for the corporation.—Mr. J. Lindsay, town clerk.

SOUTHAMPTON.—March 28th.—For constructing concrete foundations, fencing and other work, for the county council.—Mr. A. L. Roberts, architect to the Education Committee, The Castle, Winchester.

GLAMORGAN.—March 31st.—For the erection of two cottages, for the county council.—County Hall, Cardiff.

SWANSEA.—March 31st.—For the construction of masonry and concrete approaches and piers, for a steel girder bridge of 111-ft. span, also for the supply of steelwork for the said bridge, for the corporation.—Mr. H. Howard Humphreys, 28 Victoria-street, Westminster.

WATERLOO - WITH - SEAFORTH.—March 31st.—For additions and alterations to fire station, for the urban district council.—Mr. F. Spencer Yates, surveyor.

BURNLEY.—April 4th.—For the completion of the construction of an impounding reservoir, with catchwaters, aqueducts, and meter-houses, for the corporation.—Messrs. James Diggle & Son, engineers, Hind Hide-street, Heywood, Lanes.

RUTLAND.—April 4th.—For the construction of a culvert over the brook at the foot of Wordley Hill, for the county council.—Mr. James Richardson, county surveyor, 13 Barn-hill, Stamford.

NORTHUMBERLAND.—April 4th.—For the reconstruction or widening of certain bridges, for the county council.—Mr. J. A. Bean, county surveyor, The Moot-hall, Newcastle-on-Tyne.

HUDDERSFIELD.—April 4th.—For the erection of a filter-house, for the corporation.—Waterworks Engineer.

WITNEY.—April 6th.—For the construction of a concrete lining to a dug well 82 ft. deep, laying about 1,800 yds. of 3-in. service mains, with necessary fittings, and the supply and fixing of a vertical oil engine, three-throw pump, two air compressors, air-lift plant, and necessary piping to connect existing main, for the rural district council.—Mr. H. Howard Humphreys, engineer, 28 Victoria-street, Westminster S.W.

MONAGHAN.—April 7th.—For the conversion of military barracks into eleven cottages, and the erection of sixteen new cottages, for the urban district council.—Mr. J. J. Inglis, 36 Dawson-street, Dublin.

BARNES.—April 7th.—For building a sports pavilion, for the urban district council.—Mr. G. Bruce Tomes, surveyor.

NORMANTON.—April 9th.—For the erection of seventy-six workmen's dwellings, for the urban district council.—Mr. A. Hartley, architect and surveyor.

CLOMEL.—April 11th.—For the erection of a re-tort-house and coal store in concrete or, alternatively, in stone, at the gasworks, for the corporation.—Mr. Henry O'Connor, 1 Drummond-place, Edinburgh.

KEIGILEY.—April 11th.—For the construction of a storage reservoir, filter-beds, clear-water basin, and other appurtenances, for the corporation.—Mr. Ratcliffe Barnett, engineer.

EDMONTON.—April 14th.—For the erection of a public convenience, for the urban district council.—Mr. C. Brown, engineer and surveyor.

HEREFORD.—April 14th.—For the erection of sixty-two cottages, for the corporation.—Mr. J. Parker, city surveyor.

CHESHIRE.—April 18th.—For the erection of certain new buildings and alterations, for the county council.—Mr. W. H. Lancaster, 49 Northgate-street, Chester.

WALLASEY.—April 21st.—For the erection of a town hall, for the corporation.—Messrs. Briggs, Wolstenholme & Thorneley, Royal Liver Buildings, Liverpool.

CUMBERLAND.—April 25th.—For the reconstruction in ferro-concrete of Metal Bridge, across the river Esk, for the county council.—Mr. William Finch, county surveyor and bridgemaister, The Courts, Carlisle.

Iron and Steel.

COVENTRY.—March 23rd.—For the supply of cast-iron pipes, including bends, junction pipes, and sluice valves, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

PONTYPRIDD.—March 23rd.—For the supply of cast-iron pipes and specials, stopcocks and fire hydrants, for the Joint Water Board.—Mr. W. P. Nicholas, clerk, Water Board Offices, Pontypridd.

BOURNE.—March 24th.—For the supply of cast-iron pipes and valves, for the rural district council.—Mr. T. Lake, district surveyor.

MADRAS.—March 24th.—For the supply of 2,000 cast-iron manhole covers and frames, for the corporation.—Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster.

NEWCASTLE-ON-TYNE.—March 25th.—For the supply of British standard steel rails, for the Improvement Commissioners.—Mr. J. M. Manson, general manager and secretary.

EGREMONT.—March 25th.—For the supply of cast-iron spigot and socket pipes, specials and valves, for the urban district council.—Mr. J. Cowan, engineer.

ROTHERHAM.—March 27th.—For the supply of cast-iron pipes, for the corporation.—Mr. E. V. Martin, borough engineer.

BEESTON.—March 28th.—For the supply of cast-iron pipes and special castings, for the urban district council.—Mr. W. H. Radford, engineer, Albion Chambers, Nottingham.

RUISLIP-NORTHWOOD.—March 30th.—For the supply of sixty-seven cast-iron lamp columns, for the urban district council.—The Surveyor.

SHREWSBURY.—March 30th.—For the supply of cast-iron pipes and specials, for the corporation.—Mr. W. Arnold Hewitt, waterworks manager.

BLACKPOOL.—April 4th.—For the supply of 3,000 lin. yds. of 4-in. cast-iron spigot and socket pipes, sluice valves, hydrants, and surface boxes, for the corporation.—Mr. John S. Brodie, borough engineer.

TAUNTON.—April 14th.—For the supply of sluice valves, air valves, hydrants, surface boxes, cast-iron mains, carting and laying cast-iron water mains, including fixing valves and hydrants, for the rural district council.—Mr. Sidney S. Orchard, engineer and surveyor.

Roads.

BRIGHTON.—March 23rd.—For the supply of 1,700 tons of broken granite, for the corporation.—Borough Surveyor.

SOUTHAMPTON.—March 23rd.—For laying asphalt paving in Upper Canal-walk, for the corporation.—Borough Engineer.

KING'S LYNN.—March 23rd.—For tar spraying roads, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

COVENTRY.—March 23rd.—For the supply of broken road stone, granite kerbs, granite setts, stone-ware pipes, castings, and workmen's tools, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

ALTRINCHAM.—March 23rd.—For the supply of granite macadam, Rochdale flags, kerbs, setts, and limestone chippings, for the urban district council.—Mr. H. E. Brown, surveyor.

TENTERDEN.—March 23rd.—For the supply of granite, Kentish rag-stone, beach and haulage, for the rural district council.—Mr. W. L. C. Turner, district surveyor.

SOUTHAMPTON.—March 23rd.—For laying asphalt paving, for the corporation.—Borough Engineer.

EARSDON.—March 23rd.—For the supply of whinstone, whinstone kerb, and cartage, for the urban district council.—Mr. J. R. Macmillan, surveyor, Shiremoor, Northumberland.

NORMANTON.—March 23rd.—For the supply of stone and concrete flags, kerbs, channels, setts, granite, limestone, whinstone, limestone and granite chippings, and tar-macadam, for the urban district council.—Mr. J. W. Martin, clerk.

BILSTON.—March 23rd.—For the supply of broken stone, for the urban district council.—Mr. V. Turner, engineer and surveyor.

BRADFIELD.—March 23rd.—For the repair of district roads, for the rural district council.—Mr. J. Forrester, district surveyor, Theale, near Reading.

TRING.—March 23rd.—For the supply of kerb, setts, broken granite, flints, and hoggins, for the urban district council.—Mr. S. S. Gettings, surveyor.

ATHERSTONE.—March 23rd.—For works of kerbing, channelling, and drainage, for the rural district council.—Mr. H. J. Coleby, engineer and surveyor.

THAME.—March 23rd.—For the supply of granite for the year ending March 31st, 1915, for the urban district council.—Mr. James T. Robinson, surveyor.

ORMSKIRK.—March 23rd.—For the supply of road materials, for the urban district council.—Mr. H. W. Chadwick, surveyor.

GATESHEAD.—March 24th.—For cement path work, for the corporation.—Mr. N. P. Pattinson, borough engineer.

CASTLEFORD.—March 24th.—For works of road improvement, for the urban district council.—Mr. W. Green, surveyor.

RUSHDEN.—March 24th.—For the supply of granite and slag, for the urban district council.—Mr. W. B. Madin, engineer and surveyor.

GOSFORTH.—March 24th.—For road construction works, for the urban district council.—Mr. G. Nelson, engineer and surveyor.

ORSETT.—March 24th.—For the supply of broken granite or basalt, chippings, and Kentish ragstone, for the rural district council.—Mr. F. T. Johnson, highway surveyor, 2 Orsett-road, Grays.

HAZEL GROVE.—March 24th.—For the supply of broken stone, setts, kerbs, and chippings, for the urban district council.—Mr. G. S. Doncaster, surveyor.

SUTTON BRIDGE.—March 24th.—For the supply of granite, slag, granite chippings and slag chippings, for the urban district council.—Mr. T. J. Whitehead, surveyor.

ISLINGTON.—March 24th.—For paving work with asphalt, wood blocks, and granite setts, for the borough council.—Mr. J. P. Barber, borough engineer.

NUNEATON.—March 24th.—For the supply of broken granite, for the rural district council.—Mr. C. Blakeway, clerk.

PERSHORE.—March 24th.—For the supply of stone and chippings for binding, for the rural district council.—Mr. A. E. Baker, clerk.

WALLSEND.—March 24th.—For the supply of materials, for the corporation.—Borough Surveyor.

BARKING TOWN.—March 24th.—For private street works, for the urban district council.—Mr. C. F. Dawson, surveyor.

BAGSHOT.—March 25th.—For the supply of granite, chippings, flints, gravel, and carting, for the urban district council.—Mr. O. G. Stanley, surveyor.

CHELMSFORD.—March 25th.—For stone paving certain footpaths, for the corporation.—Borough Engineer.

GREAT YARMOUTH.—March 25th.—For the supply of road materials, for the corporation.—Mr. J. W. Cockrill, borough surveyor.

CHIPPENHAM.—March 25th.—For the supply of granite, basalt, and limestone, for the rural district council.—Mr. A. H. Lapham, surveyor.

WINDLESHAM.—March 25th.—For the supply of road materials, for the urban district council.—Mr. O. G. Stanley, surveyor.

LEAMINGTON.—March 25th.—For laying concrete slab paving, for the corporation.—Borough Engineer.

ROMFORD.—March 26th.—For the supply of Guernsey granite and Guernsey granite chippings, for the urban district council.—Mr. H. T. Ridge, acting surveyor.

ST. THOMAS.—March 26th.—For repairs to dis-

trict roads, for the rural district council.—Mr. A. E. Ward, clerk, 9 Bedford-circus, Exeter.

RHONDDA.—March 26th.—For the supply of granite or basalt, road macadam and chippings, limestone macadam and chippings, for the urban district council.—Mr. E. Taylor, acting engineer and surveyor.

PETERBOROUGH.—March 26th.—For the supply of road materials, for the corporation.—Mr. J. W. Walshaw, city surveyor.

UXBRIDGE.—March 26th.—For the supply of highway materials, for the rural district council.—Mr. J. W. Harrison, surveyor.

AMESBURY.—March 26th.—For the supply of picked flints, for the rural district council.—Mr. J. T. Huxham, district surveyor.

BRIDGEND.—March 26th.—For road diversion and widening, for the urban district council.—Mr. E. Jenkins, surveyor.

HAMPTON.—March 26th.—For the supply of clean grit, for the urban district council.—Mr. Sidney H. Chambers, surveyor.

CHATHAM.—March 26th.—For the supply of granite, chippings, flints, and Kentish ragstone, for the corporation.—Borough Surveyor.

WESTMINSTER.—March 26th.—For the execution of paving works, for the city council.—City Surveyor.

KING'S LYNN.—March 27th.—For the supply of road materials, for the corporation.—Mr. Alfred J. Smith, borough surveyor.

HARROGATE.—March 27th.—For the supply of whinstone, limestone, kerbing, channelling, flagging, setts, shovels, picks, and concrete and artificial stone flagging, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

RICHMOND (Surrey).—March 27th.—For making up a certain road, for the corporation.—Mr. J. H. Brierley, borough surveyor.

CLUTTON.—March 27th.—For laying kerb and re-building culvert, for the rural district council.—Mr. T. Orchard, The Grange, Hallatrow.

WIGTON.—March 28th.—For road maintenance, for the rural district council.—Mr. T. B. Simmons, surveyor.

BLEAN.—March 28th.—For the supply of gravel, flints, chalk flints, brick rubble, and cartage, for the rural district council.—Mr. F. A. Ward, surveyor, Eddington, near Herne Bay.

SHREWSBURY.—March 28th.—For the supply of road materials, distilled tar, and tar-spraying, for the corporation.—Mr. A. W. Ward, borough surveyor.

SOUTHWICK.—March 28th.—For the supply of flints, for the urban district council.—Mr. G. W. Warr, surveyor.

STAFFORD.—March 28th.—For the supply of granite and chippings, and slag and chippings, for the rural district council.—Mr. P. Idiens, surveyor, 3 Crabberly-street, Stafford.

REPTON.—March 28th.—For the supply of broken granite, limestone, slag, broken boulders, and local gravel, for the rural district council.—Mr. T. R. Sidgwick, surveyor of highways, Willington, Derby.

ST. ANNE'S-ON-SEA.—March 28th.—For making up certain streets, for the urban district council.—The Surveyor.

WEST SUFFOLK.—March 28th.—For the supply of tar for surface treatment, for the county council.—Mr. W. L. Jenkins, Shire Hall, Bury St. Edmunds.

EAST GRINSTEAD.—March 28th.—For the supply of $1\frac{1}{2}$ -in. Quenast granite, Quenast granite screenings, tarred macadam, hand-picked surface flints (broken), Kentish ragstone, and brick rubble, for the urban district council.—Mr. W. E. Woollam, engineer and surveyor.

WORSLEY.—March 28th.—For the supply of macadam, tarred macadam, granite setts, grit setts, granite chippings, limestone chippings, grit kerbs and lankey kerbs, for the urban district council.—Mr. J. Howard, surveyor.

HORNSEA.—March 30th.—For making up certain roads, for the urban district council.—Mr. W. E. Warburton, surveyor.

WATH-UPON-DEARNE.—March 30th.—For the supply of macadam, tar-macadam, kerbs, flags, and setts, for the urban district council.—Mr. J. H. Drew, engineer and surveyor.

PONTYPRIDD.—March 30th.—For the execution of private street works, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor.

SOYLAND.—March 30th.—For the supply of granite chippings and local setts, for the urban district council.—Mr. W. Whitehead, surveyor.

KIVETON PARK.—March 30th.—For the supply of broken slag, granite, and tar-macadam, for the rural district council.—Mr. F. Hewitt, surveyor.

WANDSWORTH.—March 30th.—For making up a certain road, for the borough council.—Mr. P. Dodd, borough surveyor.

WEST ASHFORD.—March 30th.—For the supply of gravel, flints, and Kentish rag-stone, for the rural district council.—Mr. A. Sims, surveyor.

KIRKBURTON.—March 31st.—For steam rolling and scarifying, for the urban district council.—Mr. G. W. Smith, clerk, 23 John William-street, Huddersfield.

SWANSEA.—March 31st.—For work of road construction, for the corporation.—Borough Surveyor.

THINGOE.—March 31st.—For the supply of granite, for the urban district council.—Mr. James T. Robinson, surveyor.

MALDON.—March 31st.—For the hire of steam rollers, for the rural district council.—Mr. E. J. Ennals, surveyor.

EDINBURGH.—March 31st.—For the conveyance of road material, for the county council.—Mr. A. G. G. Asher, county clerk, County Buildings, Edinburgh.

WATERLOO-WITH-SEAFORTH.—March 31st.—For works of sewerage, flagging, kerbing, channelling, and paving, for the urban district council.—Mr. F. Spencer Yates, surveyor.

WOODFORD.—March 31st.—For work of road reconstruction, for the urban district council.—Mr. W. Fairington, surveyor.

EAST DEREHAM.—March 31st.—For the supply of broken granite and chippings, and hire of steam roller, for the urban district council.—Mr. F. L. Burch, engineer and surveyor.

MALDON.—March 31st.—For the supply and delivery of broken granite, basalt, slag, flints, gravel, and picked stone, for the rural district council.—Mr. E. J. Ennals, surveyor.

LEWISHAM.—March 31st.—For laying wood paving in various streets, for the borough council.—Borough Surveyor.

MALDON.—March 31st.—For the supply of materials, and hire of steam roller, for the rural district council.—Mr. E. J. Ennals, surveyor.

MARTLEY.—March 31st.—For the supply of granite and slag, for the rural district council.—Mr. L. H. Richardson, surveyor.

IFORSHAM.—April 1st.—For the supply of 4,750 cub. yds. of flints, 4,250 yds. of granite, and 1,000 yds. of gravel chippings, for the rural district council.—Mr. W. Dengate, surveyor.

EAST GRINSTEAD.—April 1st.—For the supply of about 10,000 gallons of tar, prepared in accordance with the Road Board specification for tar No. 1, for the rural district council.—Mr. Francis S. White, clerk.

SALE.—April 2nd.—For making good a certain street, for the urban district council.—Mr. W. Holt, engineer and surveyor.

HUNSLET.—April 4th.—For the supply of granite, limestone, dross, tarred limestone, limestone chippings, manufactured flags, kerbs, and setts, for the rural district council.—Mr. W. B. Pandar, clerk, Leek-street, Hunslet, Leeds.

DOVER.—April 6th.—For work of making up, for the corporation.—Mr. W. C. Hawke, borough engineer.

BULKINGTON.—April 6th.—For the supply of stone, for the urban district council.—Mr. H. W. Wilson, surveyor.

CAERPHILLY.—April 7th.—For road widening and improvement, and bridge construction, for the urban district council.—Mr. A. O. Harpur, engineer and surveyor.

HOUGHTON-LE-SPRING.—April 9th.—For the supply of blast-furnace slag road metal and slag riddlings, for the rural district council.—Mr. D. Balfour, surveyor.

ISLE OF THANET.—April 9th.—For the supply of

broken flints and broken granite, for the rural district council.—Mr. C. L. Butterworth, surveyor, Birchington.

INVERNESS.—April 11th.—For the upkeep of roads and bridges, for the Badenoch District Committee.—Mr. A. M. Grant, district road surveyor, County Buildings, Kingussie.

KIDDERMINSTER.—April 17th.—For the supply of broken granite, granite screenings, broken slag and slag screenings, for the rural district council.—Mr. G. J. Shepherd, surveyor.

Sanitary.

NORTHWICH.—March 23rd.—For the collection and disposal of house refuse, for the urban district council.—Mr. J. W. Cowley, clerk.

RUISLIP-NORTHWOOD.—March 23rd.—For the construction of roads, sewers, and subsoil drainage at cemetery, for the urban district council.—The Surveyor.

ST. HELENS.—March 23rd.—For conversions to water carriage system, for the corporation.—Chief Inspector of Nuisances.

STALYBRIDGE.—March 23rd.—For the supply of drainage tiles for circular filters, for the Joint Sewerage Board.—Mr. H. W. Stafford, manager.

KEIGHLEY.—March 23rd.—For laying pot-pipe drain, for the rural district council.—Mr. T. Burton, surveyor and sanitary inspector.

COVENTRY.—March 23rd.—For the extension of the sewage farm bacteria beds, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

LONDON.—March 24th.—For scavenging the Victoria Embankment and certain Thames bridges, for the county council.—Mr. G. W. Humphreys, County Hall, Spring-gardens, S.W.

BELFAST.—March 24th.—For the construction of stoneware sewer and drains, for the corporation.—City Surveyor.

SEATON DELAVAL.—March 24th.—For the erection of thirty-three sanitary earth closets, for the urban district council.—Mr. A. Dorin, surveyor.

MOUNTAIN ASH.—March 24th.—For scavenging and team work, for the urban district council.—Mr. W. G. Thomas, surveyor.

MADRAS.—March 24th.—For the supply and delivery of 2,000 cast-iron manhole covers and frames, for the corporation.—Messrs. James Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

HODDESDON.—March 25th.—For the construction of stoneware pipe surface-water drain and relief sewer, for the urban district council.—Mr. H. W. Flood, surveyor.

DEWSBURY.—March 27th.—For the supply of disinfecting powder and fluid, for the corporation.—Mr. H. Ellis, town clerk.

EAST GRINSTEAD.—March 28th.—For work of sewerage, for the urban district council.—Mr. W. E. Woollam, engineer and surveyor.

BEESTON.—March 28th.—For the construction of culvert, iron and stoneware sewers, manholes, Dortmund tanks, bacterial filter beds, humus tanks, and other works, for the urban district council.

NANTWICH.—March 28th.—For the construction of sewage disposal works, including detritus, settling, storm-water, and stand-by tanks, laying stoneware pipe sewers, construction of 104 manholes, and other appurtenant works, for the rural district council.—Mr. Charles E Davenport, engineer, 152 Hospital-street, Nantwich.

WANDSWORTH.—March 30th.—For constructing a sewer, for the borough council.—Mr. P. Dodd, borough surveyor.

SWANSEA.—March 31st.—For the construction of about 2,350 yds. of roads, sewers, surface-water drains, manholes, inspection chambers, gullies, and other works, for the corporation.—Borough Surveyor, 13 Somerset-place.

BRIGHAM.—April 1st.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. C. W. Kendrick, sanitary surveyor.

CAMBORNE.—April 2nd.—For the provision of and laying about 11 miles of stoneware sewers, the construction of manholes and other works, the construction of about 1,000 yds. of tunnel, the provision and laying of a 24 in. by 16 in. egg-shaped sewer

therein, and the provision and laying of about 175 yds. of 18-in. cast-iron outfall sewer, for the urban district council.—Mr. John Chadwick, engineer, Bletchley, Bucks.

NANTWICH.—April 11th.—For the construction of pipe sewers, for the urban district council.—Mr. W. F. Newey, surveyor.

KIVETON PARK.—April 15th.—For works of sewerage, for the rural district council.—Mr. F. Hewitt, engineer and surveyor.

Stores.

LEEK.—March 23rd.—For the supply of flags, kerbs, channels and setts, macadam stone and chippings, limestone and tar slag macadam, Portland cement, sanitary pipes, pitch and oil, scavenger's bass brooms, cast-iron manhole and lamphole covers, galvanised malleable step irons, and cast-iron gullies and frames, for the urban district council.—Mr. W. E. Beacham, surveyor and water engineer.

LITTLEBOROUGH.—March 24th.—For the supply of setts, kerbs, flags, granite macadam, sanitary pipes, tools, and iron castings, for the urban district council.—Mr. George H. Wild, surveyor.

KENT.—March 28th.—For the supply of shovels, forks, scavenging brooms, scoops, scrapers, cart grease, tallow, oil, and general tools and materials, for the county council.—County Surveyor, St. Peter-street, Maidstone.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted † Recommended for acceptance.
‡ Provisionally accepted.

BISHOP'S STORTFORD.—For supplying and erecting 44-h.p. gas engine and suction gas plant, making repairs to existing machinery, and erecting an engine-house at the water-works, for the urban district council.—Mr. Robert S. Scott, engineer:—

GAS ENGINE, SECTION GAS PLANT, AND REPAIRS.	
Ruston, Proctor & Co., London, E.C.	£770
Cornack, Allin & Hardman, Westminster, S.W.	768
Lund Brothers & Co., London, E.C.	760
Campbell Gas Engine Company, Halifax, Yorks	730
Keighley Gas Engine Company, London, E.C.	730
Capel & Co., London, N.E.	648
Crossley Brothers, Manchester	646
Teasdale Brothers, Darlington	579
F. Bird & Co., London, W.	570
Hornsby & Sons, London, E.C.	558
National Gas Engine Company, London, E.C.	540
Fielding & Platt, London, E.C.	530
G. R. Mather & Son, Wellingborough*	499

ENGINE-HOUSE.	
D. Robinson, Stansted, Essex	£380
Glasscock & Son's Successors, Bishop's Stortford	370
Day & Son, Bishop's Stortford	347
C. Martin's Exors., Bishop's Stortford	345
Markwell & Sons, Bishop's Stortford*	271

BLOFIELD.—For the erection of four cottages, for the rural district council:—

J. J. Howes, Norwich	£773
E. G. Bland, Great Yarmouth	740
J. Evans, Norwich	723
W. Reynolds, Overstrand, Norfolk	713
Riches & Son, Norwich	674
Sparkes & Latten, Norwich	640
A. E. Daniels, Acle, Norfolk	640
H. S. Watling, Norwich	620
J. H. Snelling, Norwich	594
E. Hayden, Norwich	550

BRACKLEY.—Accepted for the supply of granite, for the corporation.—Mr. A. A. Green, borough surveyor:—

Broken Stone.—Mountsorrel Granite Company, Mountsorrel; Enderby and Stoney Stanton Granite Company, Narborough.
Unbroken Stone.—Judkins, Limited, Nuneaton.

DOWNHAM MARKET.—For a scheme of sewerage, for the urban district council.—Mr. J. M. Jackson, surveyor:—

R. O. Fiebner & Co., Edinburgh	£7,047
R. J. May, Norwich	6,400
W. A. Bardell, King's Lynn	5,880
Lane Brothers, Mansfield	5,870
R. Shanks, Chatteris, Cambs*	5,675

EGREMONT.—For the supply of material and laying kerbs, channels and flagging, for the urban district council.—Mr. James Cowan, surveyor:—

Shap Flags.—W. Turner, Limited, Manchester.
Pipes and Fittings.—J. Woodburn, Egremont.
Spades, Oils, and Colours.—A. A. McArd & Co., Whitehaven.
Castings.—Heathcote & Son, Cleator Moor.
Brooms.—Archer, Lower Edmonton.

ELY.—For the erection of sixteen workmen's dwellings, for the urban district council.—Mr. S. Wearing, architect.
Norwich:—

Linzell & Edmondson, Newmarket	£3,297
Drever & Son, Limited, Kettering	3,074
Porren & Son, Earith, Hunts	3,053
— Shanks, Chatteris	2,850
J. & H. Morris, Ely	2,793
— Clarke, Meltou Mowbray	2,768
— Tucker, Ely	2,190
Burgess & Wykes, Ely‡	2,144

EPSOM.—For making up Rosebery-road, Cheam, for the rural district council.—Mr. T. E. Ware, surveyor of highways:—
 K. W. Swaker, Honnslow £825
 E. Free & Sons, Maidenhead 560
 H. Farrow, Brixton, S.W. 533
 J. May & Son, Ashted 495
 S. Kavanagh & Co., Surbiton 177
 W. H. Wheeler & Co., Blackfriars-road, S.E. 469
 Streeter Brothers, Croydon, S.W. 468
 Surveyor's estimate, £506.

GOWER.—For the erection of isolation hospital buildings, for the Gower and Oystermouth Hospital Committee.—Mr. H. A. Ellis, architect, Swansea:—
 J. G. Morris, Mumbles £6,869
 H. Billings & Sons, Swansea 6,750
 J. & D. Jones, Swansea 6,640
 D. Jenkins, Limited, Swansea 6,300
 G. Davis, Swansea 6,250
 Weaver, Limited, Swansea 6,200
 Lloyd Brothers, Swansea 6,196
 Bennett Brothers, Swansea 5,990
 T. Richards, Swansea 5,950
 J. Arnold, Clydach 5,900
 T. D. Jones, Swansea 5,791
 J. Mastes, Swansea 5,685
 Spragg & Sons, Swansea 5,600
 Architect's estimate, £6,130.

GRIMSBY.—Accepted for annual supplies for ensuing municipal year viz., April 1, 1914, to March 31, 1915—for the corporation.—Mr. H. G. Whyatt, borough engineer and surveyor:—

HIGHWAYS MATERIALS.

Chalk.—J. R. Mitchell & Co., Limited, Grimsby.
 Whinstone (Northumberland).—M. Jackson & Son, Louth;
 Ord & Maddison, Limited, Darlington.
 Slag.—J. R. Mitchell & Co., Limited, Grimsby.
 Artificial Flags.—Hewins & Goodhand, Grimsby.
 Yorkshire Flags.—S. Marshall & Sons, Limited, Halifax.
 Yorkshire Kerbs, &c.—S. Marshall & Sons, Limited, Halifax;
 T. Turner & Son, Lightcliffe, Yorks.
 Granite Setts.—Mountsorrel Granite Company, Limited, Loughborough.
 Whinstone Setts.—Ord & Maddison, Limited, Darlington.
 Pitch.—J. Brown & Co., Limited, Dewsbury.
 Coal Gas Tar.—Great Grimsby Gas Company, Grimsby.
 Blue Lias Lime.—Contract and Works Supply Company, Kirton-Lindsey.
 Dog-kennel Lime.—N. Blow & Co., Grimsby.
 Buxton Quick Lime.—N. Blow & Co., Grimsby.
 Portland Cement.—Dawber, Townsley & Co., Limited, Grimsby.
 Drainage Pipes, &c.—C. Revell & Co., Grimsby.

MISCELLANEOUS.

Miscellaneous Brushes.—C. Shephard & Son, Grimsby.
 Scavenging Brushes.—W. & F. Archer, London.
 Drysalteries, &c.—R. C. Johnson, Grimsby.
 Lubricating Oils.—Leeds Oil and Grease Company, Leeds.
 Oils (except Lubricating).—Leeds Oil and Grease Company, Leeds.
 Paints.—Middleton Brothers, London.
 Plumbing.—D. J. Dolby, Grimsby.
 Ironmongery.—J. Duke, Limited, Grimsby.
DISINFECTANTS.
 Bottles and Corks.—Markham Cook, Grimsby.
 Carbolic Acid.—Fletcher Brothers & Co., Grimsby.
 Carbolic Oil.—R. C. Johnson, Grimsby.
 Disinfectant Fluid.—"Sanitas" Company, Limited, London.
 Disinfectant Powder.—Fletcher Brothers & Co., Grimsby.
 Formalin.—Burt, Boulton & Haywood, Limited, London and Grimsby.
 Formalin Tablets.—Burt, Boulton & Haywood, Limited, London and Grimsby.
 SO. Tubes.—"Sanitas" Company, Limited, London.

HAYES (Middlesex).—For making up certain streets, for the urban district council.—Mr. D. C. Pidler, engineer and surveyor:—
 Clements, Knowling & Co., Brentford £6,277
 A. & B. Hanson, Southall 6,154
 T. Clayton (Paddington), Limited, Paddington 5,766
 E. Free & Sons, Maidenhead 5,581
 J. Mowlem & Co., Westminster 5,268
 M. Thacker & Co., Westminster 4,829
 Surveyor's estimate, £5,592.

HENDON.—For the erection of fifty dwellings, for the urban district council.—Mr. G. Hornblower, London, W.:—
 M. J. Allen, Biggleswade £15,232
 E. Peddle, West Norwood 15,069
 J. Wright, Hendon 14,884
 W. Tont, Hendon 11,797
 W. H. Cooper, Hammersmith-road, S.W. 11,790
 Bosworth & Lowe, Nottingham 11,551
 T. Bow, Nottingham 11,499
 Rowley Brothers, Wood Green 11,295
 F. Evans, Nottingham 11,234
 W. J. King, Golder's Hill 11,198
 W. Smyrk, Hendon 11,147
 O. P. Drever, Limited, Kettering 11,051
 G. E. Galliford, Hendon 10,980
 W. King & Sons, Watford 10,875
 J. Guttridge & Sons, Peterborough 10,040
 G. H. Gibson & Sons, High Wycombe 9,960

LETTERKENNY.—Accepted for the erection of eleven cottages, for the rural district council:—
 W. Platt, Manorcunningham £130
 J. Johnston, Letterkenny 129
 R. Gregg, Letterkenny 129
 W. Platt, Manorcunningham 128
 G. Kelly, Convoy, Raphoe 127
 P. McGrenaghan, Letterkenny 124

WEMBLEY.—For the erection of caretaker's lodge, tool house, and conveniences, for the urban district council.—Mr. C. R. W. Chapman, engineer and surveyor:—
 A. R. Cumber, Pinner £868
 W. C. Musgrove, Wembley 864
 F. Tribe & Co., Limited, Wembley 843
 R. T. Hughes & Co., Mortlake 805
 J. W. Holmes, Catford 725
 H. Pickrill, Wealdstone 711
 T. W. Palmer & Co., Merton Abbey 693
 H. V. Clogg, London 678
 H. M. Barker, Wembley 660

WINDSOR.—For the supply of tarred slag and Leicester-shire granite, for the corporation.—Mr. E. A. Strickland, borough surveyor:—

	Per ton.				
	2 in. s. d.	1 1/2 in. s. d.	1 in. s. d.	3/4 in. s. d.	Dust s. d.
Croft Granite Brick Co.	13 5	12 11	10 11	13 5	9 5
Dosthill Granite Quarries	12 6	11 10	10 11	12 0	9 6
Enderby and Stoney Stanton Granite	13 11	13 8	10 11	12 11	9 11
Griffith & Co., Limited	13 2	11 11	10 8	12 5	9 5
Mountsorrel Granite Co. (Mountsorrel Quarry)	13 3	13 9	11 6	13 0	10 9
Mountsorrel Granite Co. (Stoney Stanton)	13 3	13 9	11 0	12 3	9 6
Rowley Regis	11 4	12 6	12 6	13 4	11 4
Tytherington Stone Co. (Millstone grit)	11 6	11 3	11 0	11 0	11 0

TAR SLAG.

	Per ton.		
	Mixed gauge. s. d.	1 in. s. d.	3/4 in. s. d.
Constable, Hart & Co.	17 3	17 9	17 9
Smart & Son	16 2	16 2	16 2
	2 1/2 in. by 1 1/2 in.	3 in. by 1 1/2 in.	3 in. by 1 1/2 in.
Tarmac, Limited	17 6	16 3	16 3

YORK.—Accepted for sewerage, levelling, paving, metalling, and channelling private streets for twelve months, for the corporation.—Mr. F. W. Spurr, city engineer:—
 T. Lane, Acomb, York, Schedule.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MARCH.

- 21.—Association of Engineers-in-Charge: Annual Dinner.
- 21.—Institution of Municipal and County Engineers: North-Eastern District Meeting at Wakefield.
- 21.—Institution of Municipal and County Engineers: South-Western District Meeting at Torquay.
- 24.—Institution of Civil Engineers: Mr. T. Clarkson on "Some Recent Developments in Commercial Motor Vehicles;" Mr. T. G. Gribble on "Comparative Economics of Tramways and Railless Electric Traction." 8 p.m.
- 30.—Surveyors' Institution: Mr. W. W. Jenkinson (fellow) on "London Before the Fire: As Referred to in Sixteenth and Seventeenth Century Literature." 8 p.m.

APRIL.

- 3.—Royal Sanitary Institute: Meeting at Southampton. Discussion on "The Housing, Town Planning, &c., Act, and its Application to the County Borough of Southampton." 7 p.m.
- 20.—Institute of Sanitary Engineers: Mr. E. A. Lees, A.I.N.S.T.C.E., on "The Birmingham Waterworks." Caxton Hall, Westminster. 8 p.m.

MAY.

- 13.—Royal Sanitary Institute: Annual Dinner, Langham Hotel.
- 23.—Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham; Mr. A. S. Parsons on "Bridge Construction."

JUNE.

- 17.—Royal Institute of British Architects: Annual Dinner, Hotel Cecil.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1016) subject to later confirmation by letter.

**WANSTEAD URBAN DISTRICT COUNCIL.
 JUNIOR ASSISTANT IN SURVEYOR'S OFFICE.**

The Council are prepared to receive applications for the appointment of Junior Assistant in Surveyor's Department. Candidates must be under 22 years of age, possess a competent knowledge of surveying, building construction, sanitation, and a general acquaintance with the official routine of a Surveyor's Department.

Salary £70 per annum, rising by annual increments of £5 to £100. Applications should be made on Forms to be obtained from the Clerk to the Council, accompanied by copies of three recent testimonials, and should be delivered to the undersigned in the envelopes provided for that purpose not later than Wednesday, April 1st, 1914.

BRUCE BLEWITT,

Clerk to the Council.

Council Offices,
 Wanstead.

March, 1914.

(1,442)

WILTS COUNTY COUNCIL.**TRUNK MAIN ROAD RECONSTRUCTION.****ROAD FOREMEN WANTED.**

The County Surveyor is desirous of engaging three or four Road Foremen for work to be carried out in the reconstruction of the London and Bath Trunk Road.

Applicants must have a full knowledge and experience of all matters appertaining to the making of Roads with bituminous or tarred material. Must be accustomed to the management of men, and able to keep accounts.

Preference will be given to applicants who are cyclists. Age between 30 and 50. Salary, £2 10s. per week.

The persons appointed will be expected to commence their duties on the 20th day of April next.

Applications to be on Forms obtained from the undersigned, and to be sent in on or before the 25th instant.

J. GEORGE POWELL,

County Engineer and Surveyor.

County Offices,
Trowbridge.

March 10, 1914.

(1,426)

BOMBAY MUNICIPALITY.**WANTED: FOREMAN PIPELAYERS.**

Two Foreman Pipelayers required for the Bombay Municipality for a period of about 18 months. Age 30 to 40. Salary Rs.450/- (£30) per mensem (less income tax, about 16 shillings per month).

Free second-class passage from London to Bombay, with half-pay during the voyage, and free second-class passage from Bombay to London on satisfactory completion of period of service. The duties will be to take charge of one or more pipe-laying gangs and lay large water mains (up to 50-in.) in public roads and along an existing pipe line. Applicants must state their age and experience, giving brief particulars of works they have been engaged upon, and state the earliest date by which they will be prepared to leave for India. Before appointment they must submit a medical certificate of physical fitness. Applications, addressed to the undersigned, with copies of recent testimonials, will be received up to Wednesday, 25th March, 1914.

JOHN TAYLOR & SONS.

Caxton House,

Westminster, S.W.

(1,439)

NEATH RURAL DISTRICT COUNCIL.**WATERWORKS MANAGER.**

The Neath Rural District Council invites applications for the Office of Waterworks Manager, at a salary of £300 per annum.

The candidate must have had commercial experience of water undertakings, and must be between the ages of 30 and 45 years.

Applications, stating age, qualifications and experience, accompanied by copies of not less than three testimonials, to be sent to the undersigned not later than Monday, the 6th April, 1914.

(By order)

CUTHBERTSON & POWELL,

Clerks.

(1,447)

TO LOCAL AUTHORITIES.**EXPERIENCED SURVEYOR.****USED TO MUNICIPAL WORK.**

is prepared to make accurate surveys, plans, &c., for town planning or other public purposes.

References to many Municipal Engineers.

Address—

Box 1,403, office of THE SURVEYOR,

(1,452)

24 Bride-lane, Fleet-street, E.C.

BOROUGH OF KING'S LYNN.

General Foreman wanted; 35s. per week. Application, in candidate's own handwriting, stating age, previous experience, &c., together with copies of not more than three recent testimonials, to reach the undersigned not later than Monday, 30th March, 1914.

ALFRED J. SMITH,

Borough Surveyor.

Town Hall, King's Lynn.

March 17, 1914.

(1,454)

NENAGH URBAN DISTRICT.**TO HYDRAULIC ENGINEERS.**

The Nenagh Urban District Council invite applications from Hydraulic Engineers to inspect the Public Water Supply System (gravitation) of their District, to report on the best means to meet the increased demand on said system, and submit estimate of the probable cost of any proposed improvement.

The reservoir is situate within 5 miles of Nenagh. Line of supply pipes about 10 miles.

Applicants to submit their terms, with particulars of qualifications and experience in water supply of towns, to the undersigned on or before the 31st day of March, 1914.

Signed) FRANK R. MALONEY, J.P.,

(1,437)

Town Clerk, Nenagh

SHANGHAI MUNICIPAL COUNCIL.**PUBLIC WORKS DEPARTMENT.****FOUR SURVEYING ASSISTANTS.**

Four thoroughly qualified Surveying Assistants, with experience in town surveys and cadastral work, are required in the Public Works Department.

Candidates should be about 25 years of age and unmarried.

Salary, taels 250 per mensem, without allowances, under a three years' agreement, with first-class passage from home, half pay on voyage, and medical attendance. There is an excellent superannuation scheme.

The value of the tael at the present rate of exchange is about 2s. 7d., but it is liable to fluctuation. Taels 250 per mensem taken at Exchange 2s. 7d. is equivalent to about £385 per annum. Particulars of the appointment may be obtained of the Council's Agents, and applications, in Candidate's own handwriting, stating qualifications, experience, &c., accompanied by copies of not more than three recent testimonials, and endorsed "Surveying Assistants," should be forwarded on or before April 21st, to Messrs. John Pook & Co., Agents for the Shanghai Municipal Council, 68 Fenchurch-street, London, E.C.

March, 1914.

(1,412)

ENGINEER AND SURVEYOR to Urban District short distance from London has vacancy for Pupil. Large sewerage scheme in hand.—Apply Box 1,393, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,423)

PUPIL.—One vacancy for Articled Pupil in Offices of undersigned, Reginald Brown, M.INST.C.E., M.I.MECH.E., F.S.I., &c., Engineer and Surveyor, Town Hall, Southall, and 21 Old Queen-street, Westminster.

TENDERS WANTED.**CUMBERLAND COUNTY COUNCIL.****HIGHWAYS AND BRIDGE DEPARTMENT.****REBUILDING "METAL BRIDGE."**

The above Council invite Tenders from Contractors licensed to execute Ferro-Concrete Construction on the Hennebique System for the Reconstruction in Ferro-concrete of "Metal Bridge" across the River Esk, in the Parish of Kirkandrews-on-Esk, about 6½ miles from Carlisle, on the Glasgow main road.

Plans and Specifications, &c., can be inspected, and Forms of Tender obtained at the Office of the undersigned, on payment of £2 (which sum will be returned on receipt of a *bona-fide* Tender), on and after the 23rd of March, between the hours of 9.30 a.m. and 4 o'clock p.m.

Sealed Tenders, endorsed "Tenders for Metal Bridge," must be delivered to the undersigned before twelve o'clock noon on the 25th of April, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

WILLIAM FINCH,

County Surveyor and Bridge Master.

The Courts,

Carlisle.

March 17, 1914.

(1,448)

MALDON RURAL DISTRICT COUNCIL. SUPPLY OF MATERIALS.

Tenders are invited by the above Council for the Supply and Delivery of Materials for the year ending March 31st, 1915—viz.: Broken Granite, Basalt, Slag, Flints, Gravel, and Picked Stone.

Forms of Tender and all particulars may be obtained from the undersigned.

Tenders to be sealed and delivered at my Office, 6 Market-hill, Maldon, Essex, not later than Tue-day, 31st day of March, 1914.

Tenders to be endorsed "Tender for —."

The Council do not bind themselves to accept the lowest or any Tender.

E. J. ENNALS.

Surveyor.

6 Market-hill, Maldon, Essex.

(1,443)

MALDON RURAL DISTRICT COUNCIL. STEAM ROLLING.

The above Council invite Tenders for the Hire of Steam Rollers for the year ending June 30th, 1915.

All particulars and Forms of Tender may be obtained of the Highway Surveyor.

Tenders to be sent to me, the undersigned, securely sealed and marked "Tender for Steam Rolling," by Tuesday, March 31st, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

E. J. ENNALS.

Surveyor.

6 Market-hill, Maldon.

(1,444)

TAUNTON RURAL DISTRICT COUNCIL. WATERWORKS, NORTH CURRY.

The above Council invite Tenders for the under-mentioned Materials and Work:—

CONTRACT No. 1.

For the Supply and Delivery at Durston and Hatch Beauchamp Stations, G.W.R., of 4-in., 3-in., and 2-in. Sluice Valves, Air Valves, Hydrants, and Surface Boxes, &c., in accordance with the Specification prepared by Mr. Sidney S. Orchard, Engineer and Surveyor to the Council, Creech St. Michael, Taunton.

CONTRACT No. 2.

Also for the Supply and Delivery of about 2 miles of 4-in., 4 miles of 3-in., and 4 miles of 2-in. Cast-iron Mains, respectively, together with all necessary Specials, &c.

CONTRACT No. 3.

Also for Carting, Excavating, and Laying and Jointing about 2 miles of 4-in., 4 miles of 3-in., and 4 miles of 2-in. Cast-iron Water Mains, including Fixing Valves, Hydrants, &c., and all Works in relation thereto.

Copies of the Specifications, with Forms of Tender, may be obtained from the aforesaid Engineer, or the undersigned, on or after March 20th instant, upon payment of £2 2s., which will be returned upon receipt of a *bonâ-fide* Tender and delivery to the Engineer of all documents, &c.

Tenders, endorsed "North Curry Water Contracts" (No. 1, or No. 2, or No. 3), are to be delivered to me on or before 14th April next in a sealed packet.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

W. F. B. DAWE,

Clerk to the Council.

Union Offices, Taunton.

March 14, 1914.

(1,457)

ISLE OF THANET RURAL DISTRICT COUNCIL.

The above Council invite Tenders, to reach me through the post, marked on cover "Tenders for Materials," by 10 a.m. of Thursday, the 9th April next, for the Supply of:—

1,715 yards Broken Flints.

1,816 tons Broken Granite.

Tenders will only be considered on Forms which may be obtained by writing for them (enclosing stamped addressed foolscap envelope) to Mr. G. L. Butterworth, Surveyor, Birchington.

CHAS. TAYLOR,

Clerk.

Board Room, Minster, near Ramsgate.

March 17, 1914.

(1,455)

RURAL DISTRICT COUNCIL OF WITNEY, OXON.

BAMPTON WATERWORKS EXTENSION.

The Rural District Council of Witney invite Tenders for—

1. The Construction of a Concrete Lining to a dug well 32 ft. deep.
2. The Laying of about 1,800 yds. of 3-in. Service Mains, with necessary Fittings.
3. The Supply and Fixing of a Vertical Oil Engine, Three-throw Pump, two Air Compressors, Air Lift Plant, and necessary Piping to connect to existing Main.

The Contract has been drawn up in two parts viz.:—

(A) Lining the Well and Laying Mains, &c.,

(B) Machinery,

and will be let as two separate Contracts.

Particulars and Forms of Tender may be obtained from the Council's Consulting Engineer, Mr. H. Howard Humphreys, of 23 Victoria-street, Westminster, S.W., on 23rd, 24th, and 25th days of March, 1914, between the hours of 10 a.m. and 5 p.m.

Intending Contractors will be required to deposit a sum of Two Guineas prior to particulars being furnished, such sum being returned on the receipt of a *bonâ-fide* Tender.

Tenders, endorsed "Bampton Waterworks," must reach the undersigned not later than 11 a.m. on the 6th day of April, 1914.

The Council do not bind themselves to accept the lowest or any Tender for either of the Contracts.

N. JOHN G. RAVENOR,

Clerk to the Council.

Witney,
Oxon.

(1,416)

CAMBORNE URBAN DISTRICT COUNCIL.

The above Council invite Tenders for the following Work in connection with the Sewerage and Sewage Disposal of the District.

The Provision and Laying of about 11 miles of Stoneware Sewers and the Construction of Manholes and other Works, the Construction of about 1,000 yds. of Tunnel, the Provision and Laying of a 24-in. by 16-in. Egg-shaped Sewer therein, and the Provision and Laying of about 175 yds. of 18-in. Cast-iron Outfall Sewer.

Plans may be seen at the Office of the undersigned, and copies of the Specification, Bills of Quantities, and Forms of Tender obtained from the Engineer, Mr. John Chadwick, Bletchley, Bucks, on payment of £3 3s., which will be refunded upon receipt of a *bonâ-fide* Tender and the return of all the documents.

Sealed Tenders, endorsed "Tender for Sewerage Work," to be delivered to me, the undersigned, on or before Thursday, the 2nd day of April, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

C. V. THOMAS,

Clerk to the above-named Council.

Council Offices,

Camborne.

March 6, 1914.

(1,418)

KENT COUNTY COUNCIL.

The Bridges and Roads Committee invite Tenders for the supply of:—

Shovels,
Forks,
Seavenging Brooms,
Scoops,
Scrapers,
Cart Grease,
Tallow,
Oil,

and other Tools and Materials.

Particulars and Forms of Tender may be obtained on application to the County Surveyor, St. Peter-street, Maidstone.

Sealed Tenders, endorsed "Tenders for Tools," are to be sent to me on or before 12 o'clock noon on Saturday, the 28th March, 1914.

The lowest or any Tender not necessarily accepted.

W. B. PROSSER,

Clerk to the County Council.

Sessions House.

Maidstone.

March 7, 1914.

(1,410)

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Tenders are invited for the supply and delivery of about 3,000 lin. yds. of 4-in. Cast-iron Spigot and Socket Pipes, with a proportionate amount of Sluice Valves, Hydrants and Surface Boxes, in accordance with Specification, which can be obtained, on application, from the undersigned.

Sealed Tenders, endorsed "Tender for Cast-iron Pipes, Sluice Valves, &c.," addressed to the Chairman of the Highway Committee, care of the undersigned, should be delivered not later than 10 a.m. on Saturday, April 4th prox.

The Committee do not bind themselves to accept the lowest or any Tender.

JOHN S. BRODIE,
Borough Engineer.

Town Hall,
Blackpool.
March 17, 1914.

(1,458)

CLONMEL CORPORATION.

GAS DEPARTMENT.

TO BUILDING CONTRACTORS.

The Gas Committee of the Corporation invite Tenders for the Erection of a Retort House and Coal Store in Concrete, or alternatively in Stone, at their Gasworks in Clonmel.

Specification, copies of Drawings, and Form of Tender may be had from the Engineer, Mr. Henry O'Connor, Assoc. M.I.N.T.C.E., 1 Drummond-place, Edinburgh, on payment of £1 1s., which will be returned on receipt of a *bona-fide* Tender.

The Committee do not bind themselves to accept the lowest or any Tender.

Sealed Tender, on Form supplied by Engineer, endorsed "Retort House Buildings," should be addressed to the Chairman of the Gas Committee, Gasworks, Clonmel, Ireland, to reach there not later than 11th April, 1914.

(1,446)

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The Surveyor

And Municipal and County Engineer.

Vol. XLV.

MARCH 27, 1914.

No. 1,158.

Minutes of Proceedings.

Elsewhere in this issue we re-
produce in summary form an
excellent and comprehensive
paper on "The Comparative Economics of Tram-
ways and Railless Electric Traction," which was
read by Mr. Theodore Gribble at Tuesday's
meeting of the Institution of Civil Engineers.
The importance of the subject is manifest, in view
of the numerous and increasing applications which
are being made to Parliament for the authorisa-
tion of schemes involving the use of the trackless
trolley car. Mr. Gribble's paper consists of a de-
tailed discussion of the various economic features
of the railless system as compared with those of
tramways, with a view to defining the sphere of
usefulness of the former. The problems of modern
urban and suburban transport are in no small
measure due to the congestion of population which
followed upon the introduction of railways, coupled
with the comparative failure of the Light Rail-
ways Act to effect the purpose of its authors. The
decentralisation and distribution which have now
become matters of extreme urgency are being
effected to a considerable degree by means of
mechanical highway traction, and the tramway,
in particular, has performed a great public service
in relieving central congestion in our great cities.
That tramways are not necessarily the last word
in cheap transport has been proved by the success
which has attended the advent of the trackless
trolley car. Regarding the distinctive economic
features of the two systems, we must leave our
readers to study for themselves the analyses and
comparisons to be found in Mr. Gribble's paper,
but the general conclusion drawn by the author
that it requires no more current to carry the
passenger by railless electric traction than it does
by a tramway is worthy of special note. Other
important propositions laid down are: (1) That
with a traffic-density represented by a 2½-minute
service—that is to say, that of one of the largest
tramways—the economy of construction and opera-
tion is still in favour of railless electric traction;
as to the cost of operation by about 7 per cent, and
as to cost of construction by about 44 per cent.
(2) That the economy increases inversely with the
traffic-density; so that with a time interval of 30
minutes, the economy of operation is about 36 per
cent, and that of cost of construction about 70
per cent.

That part of the paper which deals with the
wear and tear of highways caused by mechanically
propelled vehicles, and the contribution by the
owners of the latter towards maintenance, is of
special interest. We have repeatedly pointed out
in these columns that the obligation which the
legislature has cast upon tramway companies of

maintaining the highway between their rails and
for a space of 18 in. on each side is an anachronism
since the general introduction of electric traction.
Instead of relieving the tramway undertaking from
this obligation, Mr. Gribble suggests the levy of
a contribution towards maintenance from other
special users of the highway, such as carriers pro-
viding regular services for passengers and goods
upon definite routes; and he further points out the
responsibility of the owner of the private auto-
mobile and commercial tractor. We agree with
him that to apportion the responsibility is no easy
task. In our view it is doubtful whether the case
can be met by any system of local contributions.
The tendency of highway legislation from a date
prior to the passing of the great Highway Act,
1835, when the inhabitants of every parish were
liable at common law for the maintenance of every
dedicated road in the parish, to the passing of the
Act of 1909 which created the Road Board, has
been constantly to increase the size of the unit of
area for highway administration. With the
advent of mechanically propelled traffic it became
evident that the small unit of area was no longer
fair in consequence of the vast increase in the
volume of through traffic. The creation of the
Road Board was the first recognition by the Legis-
lature that highway administration might be made,
in part at any rate, a national charge. Once this
fundamental fact is grasped, the fairest method
of securing contributions from special users of
the highways appears to be by taxation, the pro-
ceeds of the special taxes being distributed among
the various local authorities who are responsible
for the actual work of highway maintenance.

* * *

The Carpeting Principle for Surrey Main Roads.

From the summary of a re-
port of the proceedings at a
recent meeting of the Surrey
County Council, which will be
found in another part of this issue, our readers
may learn the main facts with regard to the county
surveyor's proposal for providing stronger wearing
courses for the crusts of some 26 miles of important
main roads. Mr. Dryland has evidently gone into
the matter very thoroughly, and has prepared a
scheme which has proved acceptable to his council
and meets with the approval of the Road Board.
We are glad to see that the provision of means for
supporting the edges of the road crusts is an integral
part of the scheme, this being a matter of more
than usual importance, since the life of the carpet
layer is estimated as seven years as a minimum.
In all cases the most effective means of protecting
the edges of a road crust is likely to be the most
economical, but the actual losses due to insufficient
attention being paid to this point are greater in

the case of a crust with a long life than they are when the crust is one which is frequently renewed to a considerable depth. As regards the probable lives of these 1½-in. carpets of sand and bitumen, laid on an intermediate bituminous course 2 in. thick, we are by no means so sanguine as Mr. Dryland seems to be. "A minimum of seven years, with a maximum running up to double that life, or even more," sounds somewhat improbable, and it can hardly be said that there are precedents which justify it. To begin with, the existing crusts are not to be remade, and as strength crusts they are likely to be less efficient than the 9 in. of concrete now found to be necessary for asphalt carpets in important London thoroughfares. Secondly, the traffic conditions on main roads in the country are in some respects more severe than in crowded city streets, where the winding character of the average course taken by an individual vehicle goes far to mitigate any tendency to rutting or specially severe wear along certain parts of the road width. Further, Surrey is a county in which very heavy loads per inch width of tyre are carried on horse-drawn vehicles, and although the backwardness of the county in this respect may be corrected by the adoption of suitable by-laws, the evil is one which must be reckoned with for the time being. We may here repeat an observation which we made with regard to the recent surfacing of a portion of the Bath road—namely, that it might be well to put down for a part of the area dealt with a broken stone crust with an asphaltic binder and without a carpet. Such a material would probably be suitable on gradients somewhat steeper than those which limit the use of the sand-bitumen carpet. The allowance of 5d. per square yard (2s. 6d. per yard run on a 31-ft. road, or 1s. 8d. on a 20-ft. road) is clearly no more than sufficient to provide for the effective strengthening of the edges of the crust, and clearly there is nothing left over for work of the nature of earthwork or drainage. Surrey main roads generally, or usually, are markedly lacking in some of the most important elements of security for the road crust, and, more than most other counties, Surrey needs a considerable expenditure on works which must be regarded as antecedent to crust improvement. The present proposals, however, relate to only 26½ miles of road, and future estimates for main road improvements, less urgent as regards time, will probably include a provision for works of the character referred to.

The Surrey County Council is to be congratulated upon having at last come to the conclusion that the subject of the maining of roads is one that must be taken up in earnest, and we trust that a considerable mileage of main roads will soon come under the direct management of the county. Some of these roads are badly in need of drainage works and culverting, and the local authority can hardly be expected to expend upon such improvements the sums necessary for carrying out the work in a proper manner.

* * *

Natural Soil Roads and Sand-clay Roads.

The water-bound, broken-stone road, the several types of which have all some important elements in common, provides an efficient and economical highway for an almost unlimited range of climatic, geological and traffic conditions. Only after a severe economic struggle does it give way to the stronger types of road crust rendered necessary by the severe traffic of to-day on important roads; and, on the other hand, it provides in its more modest forms an effective rival to still humbler types of road. It is not to be expected that any single development, or set of developments, will apply to the whole range of broken-stone roads, and it is by no means certain that we have within this range correctly estimated the value of particular

principles and definite types. It may be that near the lower end of the scale of importance there is a field in which the merits of several types of broken-stone roads should be reconsidered, as well as those of certain other types, the scope of which may not have been fully appreciated in the past. In some parts of the British Empire, notably in India, several other types of road have proved to be of considerable importance. The "fair-weather road" proper, crude or quite undeveloped as an earthwork, and hydraulically, demands here only a passing recognition of its usefulness during certain seasons, but another type, of which there is a large mileage in India, is worthy of closer attention in the present connection. As regards alignment, grading, culverting, and minor bridge work, a road of this type is practically in the same condition as an important, fully metalled road. It is finished, however, without metalling, or, more usually, with such metalling as may be cheaply effected by using the materials from rock cuttings or from gravelly places on the site of the road itself or close alongside it. In other cases sand is obtained from the beds of the streams and is added to the soil of the road crust, where that is clay or heavy soil, or, when the soil is very sandy, clay is brought and added to it.

In the United States considerable use has been made of sand-clay and earth roads, which are kept in good condition by dragging; and in an article, further reference to which will be found elsewhere in this issue, Mr. L. W. Page, director of the United States Office of Public Roads, strongly advocates the making of an attempt so to construct and maintain such roads that they may prove capable of economically withstanding a considerable traffic, including that of motor vehicles. We commend Mr. Page's remarks to the attention of our readers, reminding them that the principle involved is largely this—to keep a road efficient by the use of more labour and less material is sometimes economical and effective. We have advocated a trial of such a policy with respect to roads of a certain character in this country, suggesting that over some of the stretches on important roads it might be an economy to spend more money on sweeping, watering, and frequent light rolling, and less on stone and tar. To maintain, under different conditions, an earth road by such or similar means, keeping it in a condition fit for a fair amount of traffic, is a task which is by no means unlikely to meet with a fair measure of success, and we trust that Mr. Page's remarks will lead to serious attempts being made in the United States to test the value of his suggestions.

* * *

The Repair of Canal Bridges.

The Railway Clauses Act, 1845, sec. 46, which makes railway companies liable for the maintenance of bridges over their lines, except as otherwise provided by their special Act, does not apply to canals. In fixing the liabilities of canal companies, therefore, for the repair of bridges carrying highways over their canals, reference has to be made in each instance to the special Act under which the canal was made. It would appear from an old case decided in 1815 (*Rex v. Kerrison*, 3 M. and S., 526) that, even in the absence of any provision in their special Act, a canal company which cuts a canal across a highway is bound at common law to make and maintain a bridge, though this question is probably now more or less academic, inasmuch as we conceive that most canal Acts impose this liability on the company. A point of much more practical importance at the present time, and, we believe, a novel one, has recently been decided—namely, what is the extent of a canal company's liability with respect to bridges—that is to say, what is the standard of repair which these companies are bound to maintain? Are they bound, in fact, to make and keep the bridges fit to bear present-day ordinary traffic, including

heavy motor cars, or merely in such a condition as would have been equal to sustain the ordinary traffic prevailing at the date of their construction? In *Attorney-General, at the relation of the Worcester Corporation v. Sharpness New Docks and Gloucester and Birmingham Navigation Company* (noted at pp. 234 and 520 *ante*) the company's liability under their special Act, passed in 1791, was to support, maintain and keep the bridges over their canal in "sufficient repair." Mr. Justice Phillimore thought that this meant "sufficient" for such traffic as was ordinary on highways in 1791, but the Court of Appeal took the contrary view, and held that the company must maintain the bridges not according to a standard fixed once for all, but according to a standard varying from time to time sufficient to carry the traffic of the day. Lord Justice Kennedy put the matter very cogently. After pointing out that, but for the existence of the canal and bridges, the sites occupied by the latter would have had to be maintained by the highway authority according to the standard of the day, he showed how reasonable it would be to construe the special Act in such a way that the public generally, who have a right to use these highways, would be placed in a worse position than if the Act had not been passed.

The decision will no doubt be received with satisfaction by highway authorities, and it is an interesting question whether the same principle would be applied to bridges carrying highways over railways. The wording of sec. 46 of the Railway Clauses Act, 1845, is slightly different from that of the special Act in the Worcester case. The obligation under the public Act is simply to "maintain" the bridge, but it would surely be somewhat too nice a distinction to discriminate between an obligation to "maintain" pure and simple and an obligation to "maintain in sufficient repair."

* * *

St. Austell's Council and its Waterworks Loan. The very competent corps of Local Government Board inspectors, who, all things considered, lead a busy and trying life, are wont to frown with some severity when they learn that part of the work which may be the subject of their inquiry has been already undertaken. It is, of course, a very proper thing that in such circumstances a Government officer should have authority to criticise acts of anticipation which, if freely indulged in, might prove highly inconvenient, and possibly lead to an amount of confusion as between the central and local officials, which is always best avoided. But there have been instances in which extenuation, if not justification, could be pleaded for the proceedings of the local council. Big bodies do not generally move with expedition, and the Local Government Board is no exception to what may not incorrectly be called the rule. On the other hand, the pressure of circumstances must occasionally be all-powerful, with the result that works must necessarily be proceeded with and the official inquiry ordered by the Local Government Board in a measure forestalled. The proceedings of the St. Austell Rural District Council last week supply a typical instance of such a supposition. The official intimation that the Local Government Board had sanctioned the borrowing of £4,325 for the Penwithic waterworks having been received, the clerk said the announcement was a matter for satisfaction as the scheme had been a source of very great trouble and anxiety. It was, he added, more than twelve months since the board held the inquiry. Meanwhile, it appeared from the discussion that ensued, the money had been raised out of current revenue, and it was suggested that arrangements should be made in the estimates by which the parishes should be relieved to the extent of the amount now sanctioned. The chairman explained that the reason why they undertook the work was that the council were in a very great

difficulty. They were practically forced to proceed with the scheme in order to avert a water famine. If these circumstances were known to the Local Government Board, as they should have been, and presumably were, it is difficult to explain why a period of twelve months should have elapsed between the official inquiry and the granting of sanction for the loan. Can it be that the records of the scheme were duly pigeon-holed at Whitehall and overlooked? Such a thing is possible even with the Local Government Board, but whether this is the explanation of the delay is only a matter of conjecture, for the officials wisely refrain from entering into what might prove to be awkward explanations.

* * *

Lightning Conductors.

If the frequency with which buildings and engineering structures are damaged by lightning were more generally realised, the prevention of accidents of this kind would arouse much more interest as a subject for discussion than is at present the case—except among the experts. In the paper by Mr. Frederic H. Taylor, which appeared in our last issue, it was stated that the Lightning Research Committee, during the three years 1901-1904 were advised of over 500 cases of buildings in Great Britain damaged by lightning. This destructive agency is therefore responsible for no fewer than 166 accidents every year, or over twenty in each of the eight months during which lightning may be expected to occur. The experience of the past affords conclusive evidence of the effectiveness of the protection afforded by a properly designed system of conductors; for not only has observation over a given period shown that 98 per cent of damaged buildings were entirely unprotected, but that in the case of the remaining 2 per cent the accident has generally been found to be attributable either to an insufficient number of conductors, or to unintelligent placing, or to want of subsequent attention. Economists may suggest that even in the light of the statistics quoted above the risk is so insignificant that for most buildings the expense of a conductor system is not justified. Risk to human life, however, must not be left out of account, and when this is considered, we think that in many cases it will be the determining factor. Again, in buildings which are provided with conductor installations, the work is sometimes carelessly and inefficiently carried out, or, if properly done at first, becomes inefficient because of subsequent neglect. The whole question is one of importance, and the practical points in Mr. Taylor's paper—which was read at a recent meeting of the Junior Institution of Engineers—are worthy of close attention.

* * *

Superannuation. From the reports which appear elsewhere in this issue it will be seen that two district meetings of the Institution of Municipal and County Engineers were held on Saturday last—at Wakefield and Torquay—and that at the Torquay gathering a very interesting debate on the important matter of superannuation took place. As was pointed out in the course of the discussion, this is essentially a young man's question, and if this fact were more generally realised, every young official would without hesitation help to forward the matter by joining the National Association of Local Government Officers, which is doing all in its power to press the Bill forward. The meeting appeared to appreciate that superannuation and security of tenure are distinct questions, and that if the former is pressed forward alone at present this is a mere matter of tactics, and by no means involves the jettisoning of the latter, which is of peculiar importance to surveyors.

Doncaster Refuse Destructor.

DESCRIPTION OF PLANT: TEST FIGURES.

An interesting destructor installation on the "Horsfall" system has recently been set to work for the borough of Doncaster.

The population served by the destructor is 32,500, and although the water-carriage system is being installed throughout the town there are still a good many privy middens, and a considerable quantity of night-oil has to be dealt with, this amounting, approximately, to 15 per cent by weight of the total.

It had been felt by the corporation for some considerable time past that the old method of disposal by tipping was unsatisfactory, and it was eventually decided to instal an up-to-date destructor at the sewage pumping station adjoining the river Don, thus utilising the heat available to raise steam for the pumping station, while at the same time dealing with the refuse in a satisfactory manner, and, as the Germans say, "making one hand wash the other."

Tenders were invited by advertisement on a speci-

it is shovelled out and fed into the cells in the manner usual with the "back-fed" type, which is claimed to have been first introduced by the Horsfall firm at Oldham in the year 1891.

There are four grates arranged as continuous cells, each having an area of 27 sq. ft. The hot gases from the cells pass into a large combustion chamber, which is also arranged as a beast cremator, tackle being installed for drawing in a whole carcase when required. The heat maintained in this combustion chamber is very high, ranging from 1,700 to 2,100 deg. Fahr.

From the combustion chamber a by-pass flue lead direct to the dust-catcher and thence to the chimney, a suitable gas-tight damper being provided for closing it when required. The direct course for the gases through the combustion chamber, however, lead into the space below a water-tube boiler of the Babcock & Wilcox type. The boiler was designed of



DONCASTER REFUSE DESTRUCTOR. GENERAL VIEW OF DESTRUCTOR BUILDING AND ENGINE-HOUSE.

fication prepared by the borough engineer, Mr. F. O. Kirby, M.Sc., Assoc. M.Inst.C.E., and eventually the "Horsfall" system was decided upon, and a tender for that type of plant accepted.

The works were commenced in January, 1913, and completed in August, 1913.

The whole of the building work was carried out by Messrs. Holloway Brothers, Limited, the well-known London contractors, the ironwork and machinery being all produced at the Horsfall works at Pershore. Mr. G. Watson, M.Inst.C.E., M.Mech.E., was engineer for the contractors.

The site being somewhat restricted, it was decided to instal a hydraulic refuse hoist, thus permitting the carts to approach on ground level.

Just inside the entrance gates a weighbridge, weigh-house and office have been installed, so that the carts pass to and fro over the weighbridge, and an exact record of the weight of material destroyed is recorded.

On arrival at the destructor, the carts tip into a big hopper mounted on a hydraulic ram, and controlled by hand lever with automatic arresting gear at the top and bottom of its travel.

The hopper is so designed as to tip automatically when it reaches the top of its travel, delivering the refuse into a large bin at the back of the cells, whence

sufficient size to work the sewage-pumping machinery, but is not nearly large enough to absorb the whole heat of the destructor when in full operation, the heat available being considerably in excess of the requirements of the works.

The total heating surface of the boiler is 870 sq. ft., and it is arranged as a three-pass boiler, the working pressure being 120 lb. to the square inch.

The feed water is supplied by a Worthington feed pump with an injector as a stand-by. Either the injector or the feed pump draw their water from a tank arranged in the roof of the engine-house.

The steam is used mainly for driving the sewage-pumping engines in the adjoining engine-house, and is found to be adequate for the purpose, and the steam is also, as a matter of course, used for driving the forced draught apparatus, the feed pump and injector, and the hydraulic pump which actuates the refuse hoist. All this machinery is installed in a neat engine-house adjoining the destructor. The forced draught is of the special type favoured by the Horsfall firm, and consists of two positive blowers of their own make (of the Root's type), which draw the air for combustion from the ventilating duct in the roof of the main destructor building, and force it to the fires at a very high pressure. The great advantage

claimed for this type of blower over any other is that it delivers the requisite quantity of air quite independently of the thickness of the fire. In practice the blast arrangements are found to be extremely

stokers were employed, and on the second day three stokers.

The reason for the total evaporation being lower on the second day, although the quantity burned was



DONCASTER REFUSE DESTROYER. FURNACE FRONT.

effective, and it appears that the rate of burning on the grates is extraordinarily high, as will be seen from the test figures given hereunder.

Arrangements are made for heating the blast and adding steam when required. It is found better to work with dry air blast only when the nightsoil is being burned, as this is already so extremely wet, and requires no addition of moisture.

The blowers and hydraulic pump are driven from a countershaft, the power being supplied by a high-speed horizontal engine made by the Horsfall firm at Pershore.

The products of combustion on emerging either from the boiler or from the by-pass flue enter a Horsfall patent centrifugal dust-catcher constructed round the chimney shaft, any fine flying particles of dust being thrown off in this apparatus by centrifugal force, and caught in a suitable chamber, from which they can be withdrawn without interrupting the working of the plant. The dust-catcher is found to be extremely efficient, and no complaints whatever have been received during the seven months in which the destructor has been in operation.

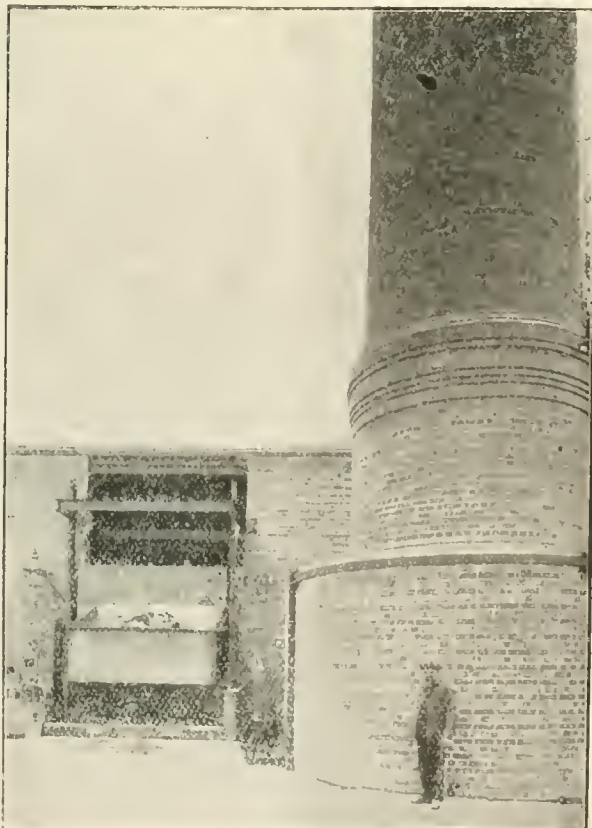
The chimney is of the "Custodis" type, and the buildings are of brick with slate roof, and have a pleasing elevation, as will be seen from the accompanying photographic view.

The guarantees, which were somewhat drastic, were more than fulfilled on all points. Exhaustive tests were held in November last on two succeeding days, the results being set forth in the accompanying table:—

	First day's test. 8 hours.	Second day's test. 6 hours.
Quantity of refuse burned	At the rate of 53 tons 6 cwt. 2 qrs. per 24 hours	At the rate of 82 tons 12 cwt. per 24 hours
Ditto per cell per 24 hrs.	13 tons 6 cwt. 2 qrs.	20 tons 13 cwt.
Average steam pressure	116 lb. per sq. in.	117 lb. per sq. in.
Average evaporation actual	285 galls. per hour	258·3 galls. per hour
Evaporation from and at 212 deg. Fah.	342 galls. per hour	310 galls. per hour (= about 20% in excess of the guarantee).
(Note.—This evaporation was over 30% in excess of the guarantee.)		
Cost of labour	8·05d. per ton	6·2d. per ton.
Percentage of clinker and ash	24·3%	23·1%

higher, was that less steam was required, and the damper in the by-pass flue was raised so as to by-pass a large proportion of the heat.

It may be remarked that the rate of burning per



DONCASTER REFUSE DESTROYER: REFUSE HOIST, DUST-CATCHER AND CHIMNEY.

cell per twenty-four hours is believed to be in excess of that obtained in any hand-fired plant hitherto

It may be stated that on the first day two

erected in any part of the world. When this result is considered in combination with the other figures given, it must be conceded that the efficiency of the plant is quite remarkable. It may be mentioned that, the period of maintenance having expired, the repairs required were found to be practically nil, and the authorities are thoroughly satisfied with the wear and tear of the plant under somewhat onerous conditions.

SURREY MAIN ROADS.

THE PROVISION OF SAND-BITUMEN ROAD CARPETS.

At a meeting of the Surrey County Council held on Tuesday of last week the Highways and Bridges Committee presented a report on the subject of main road maintenance. In the preliminary memorandum the county surveyor, Mr. A. Dryland, drew attention to the effects of heavy motor traffic on the main roads of the county. During the last four years the number of heavy motor cars registered in the county has increased by 132 per cent, and in the County of London, whence considerable streams of such traffic emerge and traverse the Surrey roads, the increase has been 201 per cent. Motor-omnibus services are now being extended to considerable distances from London, and from such centres as Aldershot, Reigate, and Guildford; with the probability of further developments of this kind. Water-bound road crusts are not adequate, nor economical, and Mr. Dryland has come to the conclusion that the best form of crust is likely to be one with a wearing surface layer of dense asphaltic composition. This is a favourable development for Surrey, where good road stone of the harder and tougher kinds is costly, but sand, with which good bituminous carpets can be made, plentiful and well distributed. By setting up suitable plant the cost can be reduced to 20 or 25 per cent below the cost of such work when carried out by contractors. Mr. Dryland submitted another report, in which he referred to the use of asphaltic carpets, and pointed out that during the past thirty years many pavements had been laid in which the bitumen was mixed with a suitably graded sand, providing a surfacing which approaches, if it does not equal, rock asphalt carpets in durability, and is less slippery. It has been found that a concrete foundation is not necessary, and with a suitable strength crust the life of such a carpet may be estimated as seven years as a minimum, with a maximum ranging up to fourteen years or more, without the necessity for annual surface dressings. There are already 500,000 sq. yds. of tar-macadam on the main roads of the county (equivalent to about 66 miles of 20-ft. road), and a comparatively thin coating of asphaltic materials will probably be the cheapest method of surfacing these roads when that becomes necessary. There are 2,000,000 sq. yds. of water-bound road, and a large part of this area will undoubtedly have to be provided with bituminous surfaces in a few years.

In a further report the county surveyor pointed out that the work already done on the Portsmouth and Great Western roads has mainly provided for the immediate needs of the western part of the county, and that the eastern part now needs to be taken in hand, especially the roads between Merton and Epsom, Mitcham and Surrey, the Brighton road from Croydon through Redhill to Crawley, and the northern part of the London and Eastbourne road, all of which roads have motor-omnibus services and a considerable heavy motor-car traffic. These lengths amount to about 26½ miles, and nearly 400,000 sq. yds. of surface, and the conversion will probably take about three years. Mr. Dryland recommended that the plant should first be set up in the eastern part of the county. He proposes to provide side support for the crust, and to put down a 2-in. intermediate course of bituminous-bound material, as well as the 1½-in. wearing carpet. It is not intended to lay this material on steep hills. The estimate for two complete plants, one portable and one semi-portable, is £2,650, and Mr. Dryland recommends the purchase of two rubber-tyred petrol lorries for the distribution of the material, each costing about £750. Including provision for contingencies, the total of the estimate is £5,000 for an output of 12,000 tons of the carpet material per annum. The cost of the intermediate crust, which will rest on the old surface, is estimated at 1s. 3½d. per sq. yd.; of the 1½-in. carpet, 2s. 7d.; side supports, 5d.; contingencies, 2½d.; or a total of

4s. 6d. per sq. yd. This is about 1s. a square yard less than the lowest quotation obtained from the contractors. On the part of the Great Western-road which will have to be dealt with, about a tenth of the total area, a further allowance is made to provide for additional material which will be required for the undercoat. The Road Board are prepared to lend £5,000, free of interest, and repayable in five equal instalments. In the financial scheme the initial costs are estimated as: For 1914-15, £28,839; for 1915-16, £46,742; for 1916-17, £12,391; total £87,972. Allowing £34,556, Road Board grants and for the repayment of loans, the cost to the county would be £57,750, spread over a period of seven years. The Highways and Works Committee recommended the scheme for adoption, and the Finance Committee recommended that the Highway and Bridges Committee should be empowered to take the necessary steps to purchase the plant and carry out the work. The report was adopted by the council.

THE MAINTAINING OF ROADS.

The Highways and Works Committee reported on the subject of "maining" roads, and recommended that the district road authorities should be asked to state what lengths should, in their opinion, be declared to be "main" roads. Alderman Pain pointed out that there are only 222 miles of main road in Surrey, which compares unfavourably with many of the counties near London. The volume and severity of the traffic have increased very much, and the subjects of maining roads and of Government grants should be gone into very thoroughly. There would probably be grants to assisted roads as well as to main roads. The recommendation of the committee was adopted, as was the further recommendation that weigh-bridges should be purchased in order to check the axle-weights of vehicles.

A SANITARY INSPECTOR'S SALARY.

QUESTIONS IN THE HOUSE.

In the House of Commons on Monday the President of the Local Government Board was asked whether the Rural District Council of Torrington were required by the board to appoint a whole-time inspector of nuisances; if so, would he state the increase of salary given to the officer so appointed on the salary paid to the officer employed part-time, also the total amount of the salary now paid; whether the officer had to pay his own travelling expenses out of his salary; and whether, where a local sanitary authority, in complying with the request of the board to appoint a whole-time inspector of nuisances, refused to pay at least £100 per annum, clear of travelling expenses, he would consider the advisability of preventing a moiety of the salary being refunded to such authority by withholding the board's consent to the appointment.

Mr. Herbert Samuel said the Local Government Board in August last requested the Torrington Rural District Council to consider the question of arranging for their inspector of nuisances to give his whole time to their service at an adequate salary. The council appointed the inspector as a whole-time officer in November, at a total salary of £80, which was £8 in advance of his previous salary, and he had to pay his travelling expenses out of his salary. The board, in giving their assent to the appointment, informed the council that they considered the salary a low one, especially as no allowance was made for travelling expenses, and they trusted that the council would take an early opportunity of reconsidering it. Mr. Samuel added that he was again drawing the council's attention to the matter.

Waterproofing of Cement.—It will be of interest to many architects and builders to know that Pudlo was used in the cement work of the recently opened Midland Adelphi Hotel at Liverpool.

Commons Enclosure and Regulations.—Mr. Runciman was asked on Monday if the Government contemplated the introduction of a Bill during this Session dealing with the question of enclosure and regulation of commons, and founded upon the report of the Committee which considered the matter last year. In reply, he stated that a draft of a Bill was now under consideration, but he could not say at present whether it would be introduced this Session.

Institution of Municipal and County Engineers.

SOUTH-WESTERN DISTRICT MEETING AT TORQUAY.

A meeting of the South-Western District of the Institution of Municipal and County Engineers was held at Torquay on Saturday. The visitors were officially welcomed by the Mayor (Councillor C. T. Towell), who was accompanied by the town clerk (Mr. F. S. Hex) and the assistant town clerk (Mr. P. H. W. Almy). Mr. J. Paton (Plymouth) presided in the absence of the district chairman (Mr. H. T. Chapman), and there were present Messrs. D. Edwards (Taunton), hon. district secretary, E. Stead and E. Y. Saunders (Barnstaple), T. Moulding, W. Robinson and R. H. Dymond (Exeter), H. A. Garrett and C. Gillard (Torquay), C. D. White and R. A. Rogers (Newton Abbot), C. Owen Baines and C. D. H. Vanstone (Paignton), J. Siddalls (Tiverton), F. W. E. Vanstone (Teignmouth), W. J. Goode (Buckfastleigh), W. Merritt (Redruth), A. Warren (Totnes), S. Hutton (Exmouth) and R. H. Beaumont (Torpoint). In addition to the town clerk and assistant town clerk, the visitors present included Messrs. J. Silley (Brixham), R. G. Foster, H. S. Ganderton, and the borough electrical engineer (Mr. C. W. Salt).

The MAYOR, on behalf of the Corporation of Torquay and himself, expressed pleasure in welcoming the visitors. As they all knew, the engineering profession—and their branch in particular—had many and various duties, and each district had its own. He considered those meetings in different parts of the kingdom must be beneficial, because each district had its own way of going on, and different materials to deal with. The first meeting held in Torquay was in 1894. Those who were present on that occasion would notice the very great advance Torquay had made since that time. They had sewerage and water works and now a pavilion, which was a tribute to the great efforts and skill of their engineer and architect, Mr. Garrett.

Mr. PATON proposed a vote of thanks to the Mayor and Corporation of Torquay for extending to them such a hearty welcome. It was not the first occasion on which they had participated in their hospitality, and not only in their hospitality, but in the interesting matter always placed before them when they visited Torquay. It was a long way back now, but he happened to be there in 1894, when the harbour works were in full swing, and a great many of them then obtained some very useful information. He took a very great interest in Torquay, from the fact that he looked upon the corporation of Torquay as a most progressive body. Whatever they did they did well, and the Pavilion, which they were going to inspect, reflected the greatest credit not only upon the architect, but upon the corporation. He had visited the Pavilion, and it struck him that the details had been very well thought out.

Mr. C. OWEN BAINES (Paignton) seconded, and the resolution was carried by acclamation.

Apologies for absence were announced from a number of members, including Mr. H. T. Chapman (Wells), now county surveyor of Kent, who, in the course of his letter, wrote: "May I take this opportunity of expressing how much I appreciate the honour of having held the office of district chairman for the last two years, and the pleasure I have derived from attending the meetings? I feel I have, through the instrumentality of the institution, made many good friends among the members, from whom I part with regret. I should like you to convey to the members my best wishes for their future, both in official and private life, and also my hope that the South-Western District will increase in strength and usefulness. I am sure you will have a pleasant and successful meeting at Torquay, which is equalled by few and excelled by no other watering-place in the country, and whose engineer and surveyor is one of the best."

SUPERANNUATION.

Mr. THOS. COLE, secretary of the institution, wrote that he was instructed by his council to forward a copy of the representation with regard to superannuation provisions for local government officers made by the National Association of Local Government Officers, and he asked that the members would do their utmost to secure the support of the Members of Parliament of the several divisions of their district.

The CHAIRMAN said he supported what the secretary had to say. Although some of them did not see eye

to eye with the majority on the council, they must be loyal and support them on that matter. The question of superannuation was one of the most important matters that had come before them for a long time, and it had been before them far too long. The National Association of Local Government Officers had been working away on the matter, but they had not made much progress. When the last General Election took place they circularised and interviewed candidates and got their views, and tried to get their promise for some kind of Bill for superannuating corporate officers. At Plymouth they waited upon the four candidates, and they expressed surprise at the anomalous position they were placed in compared with officers of other departments. As a matter of fact, they were all under the impression that they did enjoy some kind of superannuation scheme. They all promised to give their support, but, of course, they could not then go into details in the absence of a scheme. Since then some years had passed, and they did not seem very much nearer the point. He thought the secretary's suggestion was a good one. When there would be a General Election they did not know, but it was well to be prepared with something definite so that they could move in the matter should an election come along. He impressed upon members of the various districts the advisability of interviewing candidates and laying their case before them. He was quite sure that it only required a reasonable superannuation scheme on a fair contributory basis to meet with their approval. It was a matter of very deep interest, more particularly to the younger members of the profession. "We older men, getting towards the end of our tether, won't receive any benefit, or very little," added Mr. Paton, "but for the younger members it should be pressed forward." He thought it a great shame that officers should serve the public a good number of years with the possibility of being thrown aside like a sucked orange. He noticed that Mr. Samuel, President of the Local Government Board, expressed surprise that there was no superannuation scheme, and expressed approval of the principle of such a scheme. There was therefore some cause for hope. Mr. Burns, the former President of the board, had always been averse to a superannuation scheme, and more particularly to the security of tenure. Personally, he (Mr. Paton) would be prepared to drop that in order to secure superannuation. There were many good reasons why security of tenure should be dropped, because, in his opinion, if an officer was not in sympathy with his authority, good work could not be done. The mere interests of an officer should not be allowed to stand in the way of the public interests. There had been cases, as they knew, of harsh treatment, and it was possible to avoid it. But, taking municipal servants as a whole, he thought they were treated in a fair and generous way. Personally, he would strongly suggest the dropping of the security of tenure part of the scheme, and simply going for all they were worth for the superannuation scheme.

The CHAIRMAN asked Mr. Moulding what had been done in the council with regard to it.

Mr. T. MOULDING (Exeter) said they were moving as fast as they could, but it was a very difficult thing. A deputation waited upon the late President of the Local Government Board, but got no sympathy whatever. There was now a movement on foot with regard to security of tenure in an insurance form.

Mr. BAINES took it that the dropping of the question of security of tenure was more or less a matter of tactics.

Mr. PATON: I don't know that it is to be dropped. I said personally I should be prepared to vote for dropping it.

Mr. BAINES: So should I; but I do hope, if it is dropped, it will be only for a time. Security of tenure (he proceeded) was a very important thing, especially to those employed by small authorities. A surveyor who was employed by a large authority was out of the reach of anyone who wished to be vindictive, because the surveyor had carried out the instructions of his council. He certainly thought that the question of superannuation was far and away the most important matter.

Mr. H. GARRETT (Torquay) said one point was whether the officers of local authorities could see their

way to support the National Association of Local Government Officers. In that district they had got in touch with each other socially, but incidentally they desired to become associated with the association to help forward the work they were doing to get a superannuation Bill pushed through Parliament. He would strongly advise all officers of local authorities in small districts to join the association, because the larger the numbers the greater effect it would have on those promoting the National Association's Bill. The feeling was spreading throughout the country that such a Bill should be promoted.

Mr. D. EDWARDS (Taunton) said the Somerset Surveyors' Association—an association of fifty members—recently became affiliated with the National Association of Local Government Officers. He believed that was the only way to do it. They hoped for better results from the new President of the Local Government Board.

The CHAIRMAN said he thought it was a matter that might very well be referred to the Executive Committee to deal with. An election might be sprung upon them. If so, they ought to be in a position to move forward on some recognised lines. He proposed that the matter be referred to the Executive Committee of the Western District.

Mr. R. H. DUMOND (Exeter) asked if affiliation to the National Association of Local Government Officers would meet the case. Their Bill was already drafted. They had made representation to the different districts, and in each district where there was only a small society they had approached the members of Parliament they were in touch with. That had been done throughout the kingdom, and nearly all who had been approached had promised their support to the Bill.

The CHAIRMAN said they already had two members on the council of the institution. As an institution they were affiliated with the National Association. "This," he said, "is more to work up influence in support of the scheme when it comes before Parliament."

Mr. J. SIDDALLS (Tiverton) seconded, and remarked that they were all agreed that they would like superannuation to take the premier place in the matter. But as a matter of reasoned policy there was something to be said for getting security of tenure. Among the older officers it might have the effect of getting the man superannuated, whereas if there was security of tenure, and the man could claim to continue as an officer, unless there was extraordinary deficiency in his work—which would not be likely to develop after thirty years' service—it would put him in a stronger position. Without security of tenure it might have the effect of driving him from his position on the eve of his maximum pension. With security of tenure that would not come in. That was why the National Association was keeping security of tenure to the front. He thought it required very careful consideration before they requested them to drop it. If the two could be carried, well and good.

The resolution was agreed to.

ELECTION OF DISTRICT OFFICERS.

Mr. J. PATON was elected chairman for the district in succession to Mr. Chapman, Mr. T. Moulding, district representative on the council, and Mr. D. Edwards, hon secretary (re-elected), and Mr. Hutton a member of the Executive Committee.

LUNCHEON.

Following the business meeting the members inspected the Pavilion, where they were afterwards entertained to an excellent lunch, prepared by electricity, his Worship the Mayor presiding.

The MAYOR having proposed the loyal toasts, which were enthusiastically drunk.

Mr. J. PATON proposed the health of the Mayor of Torquay, and said they highly appreciated the honour he had conferred upon them by welcoming them and sitting through their formal business. They also highly appreciated his generosity and hospitality in inviting them to lunch in that beautiful building. That lunch had two objects in view. The mayor had had a secret opportunity of showing them the results of electric cooking. So far as he could see, the lunch had been entirely successful. The corporation were to be congratulated on their departure in municipal cookery, which would be to the benefit of the digestive organs of the ratepayers. (Laughter.) In conclusion, Mr. Paton said the fame of the Torquay Pavilion had travelled far and wide,

and all were unanimous in saying that the corporation had established a branch of municipal trading which tended to promote the health of the community and its good temper and general enjoyment.

The MAYOR, in responding, said that before the Pavilion café was opened there was not a place of the kind in the town.

Mr. T. MOULDING proposed the health of Mr. Garrett, who had made the arrangements for the day, and the latter, in reply, said he was delighted to see them in Torquay once more. When they were there in 1891 the spot on which they were that day assembled was nothing but sea. He never thought then that they would have such a place to meet in as the Pavilion. When he first propounded his scheme in 1892 it was only for a little plain shelter for those people who liked to patronise what was then the Princess Garden. Since then they had developed to such an extent that the Pavilion had been reared on the site. They hoped it would be a great attraction to the town, and a benefit to those who came to reside among them.

The members were afterward shown over the new town hall by Mr. Garrett.

TORQUAY PAVILION.

On re-assembling in the council chamber, Mr. Garrett made some supplementary remarks with regard to his paper (which he delivered prior to the luncheon interval) on the recently completed Torquay Pavilion.

In this interesting paper Mr. Garrett said that, although he had already given a general description of the building, and the members had visited it during its construction, he thought that as considerable additions and improvements were made during the progress of construction a further statement might now be of interest, and would assist in completing the history of an undertaking which had been the means in a great measure of placing Torquay in the forefront of health resorts.

The total area of ground covered by the building was 19,377 super. ft., and the area of the main or concert hall was 12,300 super. ft. The recess for the stage or platform was 36 ft. wide by 20 ft. deep, and projected beyond the main wall into the hall 10 ft. 6 in. It was widened out along the front to 37 ft. The building stood upon a portion of the Princess Gardens, which were formed by reclamation works, the material carrying the foundation of the building being dredged up from the harbour area, and averaged a depth of 20 ft., and retained in position by a massive sea-wall built in concrete. The framework of the building was of steel stanchions resting upon a reinforced-concrete roof covering the whole site. The roof was formed of elliptical and semi-circular lattice girder ribs. The whole of the framework was quite invisible, the space between the stanchions being of brickwork, externally faced with Doulton's Royal Lambeth Carrara ware, and internally covered with highly enriched fibrous plaster work, and oak panelling. The whole of the roof was covered with copper, 16 oz. to 1 ft., at an extra cost of £775, instead of No. 15 V.M. zinc, as originally proposed. The centre portion of the building, of an area of 60 ft. sq., was surmounted by a dome, the highest part being 45 ft. from the floor line. The two main aisles, branching north and south, were of 30-ft. width, and 34 ft. high, with transepts to each side of 18 ft. in width and 18 ft. high. The chief peculiarity about the building was the variety of heights of the interior. This variation was unavoidable owing to the restrictive covenants in the title deeds of the properties adjoining and overlooking the site of the building. Many "wise-heads" predicted that the acoustic properties of such a building would be a failure, but it was gratifying to record that, on the contrary, the properties had been a perfect success, and the softest passages of any music might be heard at the furthest corners of the building. There is seating accommodation in the building for 1,800 persons.

Referring to the restaurant attached to the building, Mr. Garrett said it had been claimed that it was the first of its kind to be operated entirely by electricity, and he believed that that was the first occasion upon which a municipal surveyor had been called upon to associate himself with such an extensive and so novel an undertaking as cooking by electricity. The Pavilion was constructed throughout from his (Mr. Garrett's) designs, and under his personal supervision. He pointed out that the whole of the electrical installation was laid out and equipped by the

borough electrical engineer (Mr. C. W. Salt), and added that it was intended to provide accommodation for the service of afternoon tea only in a "café" on the ground floor of an area of 60 ft. by 18 ft. As the building operations developed, the size of this café, with its service room, was commented upon. When the extent of the area of ground covered began to be realised, the subject of improvements and introducing a large up-to-date public restaurant engaged the serious attention of the council. It was subsequently determined practically to double the size of the space set apart for the café, and to enclose it by a handsome oak glazed screen, at an extra cost of £700, and to provide additional kitchen accommodation, equipped with suitable cooking plant for the full service of an up-to-date restaurant. The size of the café was thus increased to an area of 79 ft. by an average of 32 ft. The town council, being the owners of the borough electrical and power undertaking, were approached by that department, and strongly urged by them to instal complete electrical cooking apparatus instead of ordinary kitchen ranges or apparatus for cooking by gas. It could readily be understood that, as cooking by electricity was an entirely new undertaking, considerable opposition was raised by those who hitherto had pinned their faith to gas as being the only substitute for the older method of cooking by coal or coke fires. Owing to the situation of the building, it was undesirable to erect any unsightly chimney, which, at the best of times, would probably emit objectionable smoke and fumes, which might become an annoyance to the frequenters of the roof promenades. It therefore resolved itself into a question of gas versus electricity. There was, and probably always would be, a difference of opinion, but eventually the arguments in favour of electricity, and of utilising the town's electrical supply for the purpose, were so strong that consent was given to the borough electrical engineer to equip the whole buildings with apparatus for supplying not only afternoon teas, but sufficient for full-course luncheons, dinners and suppers.

The decision to embark upon such an ambitious scheme demanded extensive additions. Certain stores on the adjoining quay, the property of the council, were acquired, and the position of the building containing the heating installation was raised an additional story to provide a second kitchen on the level of the roof promenade. The kiosk, or shelter, on the south-east corner of the roof was enclosed, thus forming a second service room for use in the service of afternoon teas on the roof during the summer months. Additional accommodation for the increased staff, by way of lavatories and cloakrooms, was also provided by rebuilding a portion of the stores referred to, and thus arranging one of the most extensive and up-to-date restaurants to be found in any health resort; in fact, it was, on its completion, described by the electrical profession as the then "largest all-electrical restaurant" in the country. Subsequent events had proved that the decision to embark upon such an ambitious undertaking was the right one, for, with all these additions, it was found, within a year of the opening, during a certain part of the summer season, to be inadequate, and although further extensions had not yet been undertaken, serious consideration would probably be given to this point, especially in view of the disadvantages to which the staff were now working. The current was obtained from a special high-tension service of 2,000 volts alternating current, transformed to a secondary current of 200 volts for cooking operations. The current was supplied by meter, and paid for at the rate of less than 1d. per unit.

"It has no doubt occurred to many," added Mr. Garrett, "that this is a case of municipal trading, and how are the council able to carry on such an undertaking? The answer to this is a very simple one. By the Torquay Waterworks Act, 1903, sec. 45, the corporation were empowered 'to erect, maintain, furnish and equip pavilions, refreshment rooms, conveniences, &c., in any park or garden belonging to them.' This restaurant is therefore a 'refreshment room' within the meaning of this Act. The Local Government Board not only sanctioned the loan for the building, but for the electrical cooking installation also without question; hence the council are able to carry on the business of a public café and restaurant. It is true that some of the local tradesmen have raised objections to this restaurant, but it is nevertheless true that since the commencement of its operations local 'restauranters' have either reconstructed their premises or improved them to bring

them up to date, while at least two new cafés have been constructed, and two additional cafés, at no great distance from the Pavilion, are shortly to be constructed, thus amplifying the old axiom 'that the supply creates the demand.'"

Mr. Garrett mentioned that the first year's total income was £16,000. Although that amount did not cover the first year's expenditure, which included large non-recurring amounts, it was hoped that in the current year, with careful administration, the receipts would cover the full outlay.

The CHAIRMAN, in proposing a vote of thanks to Mr. Garrett for his excellent paper, said the full value of it was really in completing the record so far as their proceedings were concerned. It was three years ago, when the foundation works were in hand, that they had a description of the building. Now it was consummated, and they saw the building in its complete form, Mr. Garrett's paper was of great value. He thought it would add to the value of the paper if the cost of the building could be added. The excellence of design, of course, could not but strike one, while he had also been impressed with the enormous amount of detail involved. The corporation of Torquay were to be congratulated on the completion of such a scheme having regard to all the circumstances of the case. The site was not an ordinary one. As Mr. Garrett had explained, the land upon which the building had been erected had been reclaimed from the sea. The difficulties of building on a sandy foundation were very great. It was satisfactory that no cracks were to be seen in the building. The engineer had taken precautions that there should be no infiltration or outfiltration, and that it should not take away any of the subsoil. In that way it could not move at all. The wisdom of covering the roof with copper would be proved in years to come, not only from the point of view of the less cost of maintenance, but from an æsthetic point of view. The copper, in time, would become a beautiful colour, and at a distance add a charm to the building which ordinary observers, perhaps, did not notice. He had noticed it in other buildings where domes and roofs had been covered with copper. The Pavilion was also peculiar in another way, because he did not know another place in England where a corporation had power to run a restaurant and supply refreshments. The corporation of Torquay were fortunate in having powers under a municipal Bill empowering them to do the work. The success of such an institution showed that it was badly wanted in Torquay. They got a wealthy class of people in Torquay, and previous to the building of the Pavilion there was no place where they could hear first-class music. Added to that they had a place where they could get excellently cooked food at a reasonable rate. It was a departure even in these days, when so many things were carried on by the corporations. The progressive spirit of Torquay was also seen in the municipal buildings they had not inspected. The same spirit of thoroughness had actuated the council in putting up buildings not only convenient and commodious, but buildings which were excellently built, and were of the most substantial character. There was no question that the work of the borough could be carried on better and more economically than under the old arrangement, where the municipal offices were scattered. With regard to that branch of municipal trading which related to the restaurant business, it was a moot point how far that should be carried on. In most cases private enterprise was sufficient to meet the wants of the neighbourhood; but there were cases—and that was one of them—where there was a want, and the corporation had been well repaid for their progressive policy in supplying it. He understood that they were going in for medical baths in Torquay. That appeared to him to be absolutely necessary in such a town, and he was looking forward with a great amount of interest to the result. He had not the slightest doubt that the medical baths would pay handsomely. Swimming baths might pay, though they did not pay in many boroughs. As the bath in Torquay was to be in conjunction with medical baths, he had no doubt that it would be largely used by visitors and others, and that it would prove a good investment for the ratepayers.

Mr. J. SIDDALLS (Tiverton) seconded, and observed that Mr. Garrett was an ideal municipal officer in that whenever they got into any little difficulty, or wanted any advice, if Mr. Garrett was in possession of the information, he ungrudgingly gave it.

In answer to questions by Mr. Edwards and Mr. Siddalls as to the working cost of the Pavilion café,

MR. SALT, borough electrical engineer, stated that they could safely say that three meals were served at a cost of electricity of 1d. There was no concession granted to the Pavilion undertaking that was not granted to any other consumer of electricity in the town. The average cost of production of electricity in Torquay was 1.21d. per unit, but it did not follow from that that current was being supplied at a loss by reason of the flat rate of 1d. being charged for heating, cooking and domestic purposes, as some unit-cost considerably less than the average and others might cost a little more.

MR. GARRETT, replying to the chairman's question as to the cost of the Pavilion, said the actual cost was £19,000. The amount of the loan was £17,500, and of the £1,600 in excess the copper roof cost £775 and

the new café screen £700. The actual cost of the building came out at the amount they originally intended spending.

The vote of thanks was unanimously agreed to, and on the motion of the chairman, Mr. Salt was also thanked.

It was suggested that Exeter should be the next place of meeting.

The Corporation of Torquay were heartily thanked for placing the new town hall at the members' disposal, Mr. Paton again expressing appreciation of the mayor's presence.

His Worship said he hoped the members had enjoyed their short stay, and that they would one day come to Torquay again.

NORTH-EASTERN DISTRICT MEETING AT WAKEFIELD.

On Saturday last, the members of the North-Eastern District of the Institution of Municipal and County Engineers met at Wakefield, the attendance including Messrs. J. E. Acfield (Leeds), J. Andrews (Dewsbury), R. Archer (Brighouse), G. Atkinson (Leeds), A. Beaumont (Beverley), Edmund J. P. Bedford (Cleckheaton), H. L. Bottomley (Brighouse), S. E. Burgess (Middlesbrough), W. E. H. Burton (Wakefield), H. A. Butterfield (Batley), H. Dearden (Dewsbury), W. Dixon (Leeds), J. H. Drew (Wath-upon-Deerne), H. M. Driver (Tadcaster), H. P. Foster (Leeds), W. Fowlds (Keighley), T. H. Hailstone (Birstall), H. L. Hall (Batley), Geo. A. Hart (Leeds), S. S. Haywood (Brighouse), Frank Hewitt (Kiveton Park), A. C. Hodge (Sheffield), H. Holmes (Ossett), L. Ives (Wakefield), William T. Lancashire (Leeds), A. E. Loach (Wakefield), C. Lund (Cleckheaton), E. B. Martin (Rotherham), E. Picker (Beverley), W. H. Price (Leeds), Thos. H. Rawnsley (Ossett), C. E. Rivers (Harrogate), Leslie Roseveare (South Shields), A. Rothera (Liversedge), J. Saville (Heckmondwike), J. F. Smillie (Tynemouth), J. Southward (Rothwell), F. W. Spurr (York), W. J. Steele (Newcastle-on-Tyne), W. Sugars (Horbury), Fred. J. Thackray (Hoyland), G. Wharton Thompson (Hipperholme), D. C. Thwaites (Ossett), T. Waddingham (Hebden Bridge), J. P. Wakeford (Wakefield) and Charles F. Wike (Sheffield). The guests included Councillors T. C. Tattersall and P. Mountain, Mr. A. C. Allibone (town clerk), Dr. E. M. Chaplin (city analyst) and Mr. S. Atkinson (former chairman of committee having charge of sewage works).

After assembling at the town hall, the party proceeded to Calder Vale, where they inspected the recently remodelled sewage disposal works, Mr. J. P. Wakeford, M.INST.C.E., hon. district secretary, the city surveyor of Wakefield, taking charge of the party and explaining the principal features of the works. Later, by the kind invitation of his Worship the Mayor (Mr. J. W. Saville), the party partook of tea at the town hall.

MR. FRANK MASSIE, M.INST.C.E., district chairman, presided at the business meeting which followed.

THE CHAIRMAN announced that Mr. E. R. Matthews (Bridlington) had resigned his position as district representative on the council, upon his appointment to a professorship at the London University. While congratulating Mr. Matthews upon his success, the executive accepted his resignation with great regret. The executive suggested that Mr. E. B. Martin (Rotherham) should be nominated, and asked to continue in his position as one of the representatives on the executive. They had also done him (the chairman) the honour of suggesting his name to the meeting as the second representative for the North-Eastern District. He need hardly say that he thoroughly appreciated the honour they had done him. That was how the executive had dealt with the matter, but it was open to that meeting to suggest any other names.

The meeting adopted the recommendations.

MR. MASSIE proposed the election of Mr. W. J. Steele, city engineer of Newcastle, as his successor in the office of chairman. He was sure they would all agree that Mr. Steele would make an excellent chairman, and one who would uphold the dignity of the position, and succeed in promoting the usefulness of the institution. He also proposed the re-election of Mr. J. P. Wakeford as district secretary. Mr. Wakeford had done excellent work during the past two years, and he could assure them that the new chairman would find his labours very much lightened by the assistance he would receive from Mr. Wakeford.

In returning thanks, MR. STEELE said he would spare no effort to fill the position to the satisfaction of the

members. He was afraid he would fall very short of the dignity and ability which had been displayed by the present chairman. If Mr. Massie would have accepted the position for another year, there was no doubt he would have been elected unanimously.

MR. WAKEFORD said that, while he was extremely obliged to them for again electing him to the post of hon. secretary, he should have been quite willing to have handed the position over to someone else. However, during the two years he had held the position he had endeavoured in every possible way to further the interests of the institution, and that would be his aim in the future.

On the suggestion of the chairman, a collection was made on behalf of the Orphan Fund, a sum of £3 7s. 6d. being realised.

On the proposition of the chairman, a vote of thanks was accorded Mr. Matthews for his past services, and the members congratulated him upon the appointment he had received in the University of London.

The retiring chairman was also thanked, and it was remarked that he had performed his duties in an ideal manner.

MR. MASSIE said he had thoroughly enjoyed holding the position. It was in the best interests of the institution that the position should go round, and that was the reason why he had vacated the position. He thanked them for the kindly consideration that had always been extended towards him.

THE INSTITUTION "JOURNAL": MR. ROTHERA'S MOTION.

In accordance with notice given, MR. A. ROTHERA (Liversedge) moved:

"That the members of the North-Eastern District request the council to take a poll of members and associate-members as to whether they are in favour of the issue of the 'Journal' of the institution in parts as at present, or the retention of the annual bound issue formerly existing, and that a copy of this resolution be sent to the secretary of the institution and the hon. secretary of each of the various districts, asking for their co-operation by supporting a formal resolution to this effect."

MR. ROTHERA said that, in moving the resolution set down in his name, he did so with the very earnest desire to do what was best for the institution and for the bulk of its members. He desired to say, in order to disarm any criticism of his action, that it mattered not one iota whether the step taken by the council in publishing the "Journal" had in effect the swamping of any professional paper, because he had not, nor had he ever had, the slightest financial interest in any professional paper connected with their profession, and in denying that his word must be taken to applying to any American company, if such existed, so as to make it as wide-spreading and as definite as he possibly could. He particularly asked them not to leave that meeting until some definite vote had been taken on the resolution he had moved, because in all fairness to the bulk of our members it was very undesirable that a question of that importance should be delegated and settled by 100 or 150 members who might attend the annual meeting at Cheltenham. In his opinion the most desirable and fair way was to let everyone have an opportunity of voting by means of a poll. Their different branches were formed to serve in a great measure to help their council, and to indicate to them what was really needed for the good of the whole of its members. The postponement of the resolution passed at the Paignton meeting, when it was read at the Manchester meeting, evoked even from members in favour of the "Journal" many smothered complaints—another reason for some

decision to be come to at the present meeting. The backbone of their institution was composed of wise members, whom he knew, at some self-denial to themselves, willingly paid their subscriptions, and it was not right to put them to further expense in binding the volumes, when a year or two ago the subscription was advanced to meet the added cost of the institution in many ways. What was the matter with the "Proceedings"? They were well printed, well edited, and made a handsome-looking volume, and he could say they were the most treasured of his professional books. They came once a year, ready for reading and well bound. On the other hand, the new "baby" would never be the equal of its "good old daddy." It was much larger, and awkward to handle; it found a place on the desk and table of the busy professional man, and possibly eventually went into the waste-paper basket, or on to the shelf unbound. It was supposed to keep them up to date, yet that week he had received an issue containing the report of the Manchester meeting, which some of the professional papers had finished with nearly a month ago. Vital facts concerning the institution had to be learnt from sources other than their "Journal." One resolution had evidently been marked "not for publication." He referred to the retiring allowance of £250 a year to their esteemed secretary. The "Journal" had caused a new official to be created at a cost of no doubt not less than £150 a year, making a salary list of about £900 a year, with an income of £2,725, or possibly he might say, £3,000 per annum. Were their councillors as generous to them? They knew better! The old volume cost £40 a year in postage, while the new one would cost £320, making a total extra expenditure of nearly £500 a year, and he doubted whether the advertisements would reach that figure. There were three past-presidents against the change, two past-members of the council, two—and possibly more—members of the council, for a certainly one district chairman, nine county surveyors, four London borough surveyors, the assistant county surveyor of London, eight city surveyors, and about fifty borough surveyors, besides a host of the class he himself represents—the "young and obscure members"—so if he was erring he did so in good company. Let him again ask them to give a vote on the question of that important change in the procedure of their institution, and so give some lead to the council with regard to taking a poll, which was the surest way of enabling each member to have a say. It was not right to take such an unconstitutional step as had been done without first consulting those who paid the piper. Most of them never knew the decision had been come to until a few days before the last annual meeting, and it would not then have been allowed but for a statement made by the president to the effect that all arrangements had been made for printing, and that a great wastage of money would be caused if the meeting rejected the recommendation of the council. The professional journals had well represented them in the past, and he was pleased to say were still doing so, inasmuch as their meetings are fully reported before the "Journal" was issued. He hoped anything he had said would be received in the spirit in which he gave it. He had no axe to grind, and up to now his efforts to secure what his resolution aimed at had cost him both time and money, though for that he cared not one jot, so long as the council deal with the matter in a fair and popular way. Should the result be for the new order of publication, he would willingly bow to the majority, and go on still striving for what was best for the institution.

Mr. H. HOLMES (Ossett) seconded, and said that, after the very able speech of Mr. Rothera, few words on his part in support of the resolution were necessary. He took it that the minutes of their proceedings were intended for reference in after years. As far as he could see, the "Journal" was going to be after the nature of a trades journal. He thought every engineer had sufficient trade literature among his correspondence every morning without the "Journal" being added to it.

Mr. G. A. HART (Leeds) said it would be of material assistance to himself and other "dim and obscure" members if they could have an expression of opinion from one of the members of the council. They would like to hear the reasons which influenced the council in making this alteration.

Mr. W. T. LANCASHIRE (Leeds) said he was not a member of the Journal Committee, and at the beginning he felt opposed to the proposed change. How-

ever, since he had had some experience of the "Journal" in comparison with the annual volume, he must say that he was a convert to the new order of things. Their inability to provide anybody on this occasion who could put the case strongly on behalf of the "Journal" suggested to him that the best thing would be to wait until the annual meeting for a full discussion of this question. The Journal Committee would then have an opportunity of placing the facts before the members. Personally, he never used to read the old volume, and when it arrived he put it in his bookcase for reference when required. Now he took up the new "Journal" and at once read anything which took his fancy. The new volume gave them all that the old volume used to give, and a great deal more. He did not see why they could have any objection to the introduction of trade advertisements, because they need not read them unless they liked, and when the "Journal" was bound at the end of the year, all the trade advertisements could be cut out. The council were not taking an untried step, because the Royal Institute of British Architects, the Society of Architects, the Royal Sanitary Institute, and, he believed, a great many other societies which originally issued volumes like their old volume had found it desirable to change, and were now doing what the Municipal and County Engineers were doing. It was perfectly true that the parent institution, the Institution of Civil Engineers, and the Mechanical Engineers, and possibly others, were going on in the old way, but that was no reason why they should not vary if they could receive advantage by any new procedure. He thought they were differently constituted to these old institutions. They, as executive officers for municipalities, needed very constant intercommunication, and their information should at all times be fresh and new. In comparison with the old volume, there was no doubt that the new "Journal" gave them a greater advantage in that respect. Mr. Greatorex some little time ago thought it would be to the advantage of the members of that institution if they could be posted up in all the Bills and all the Acts that had been obtained with regard to trackless trolleys. That information had been given, and was proving extremely useful to those authorities who were projecting Bills in Parliament. The information was published in the "Journal" a short time ago, which was an instance of the advantage to be derived from the new order of things. The "Journal" was not yet perfect, but it seemed to him that, with satisfactory management, it could be made to meet a long-felt want. With the additional staff they would soon see considerable improvement in the editing of the "Journal." The speaker concluded by saying that it would be to the advantage of the institution to leave this matter unsettled until the next annual meeting.

The CHAIRMAN said this matter had been talked about for the last twelve months, and it was time it was definitely settled—in that district, at any rate. He wanted the members to express what was passing in their minds, and what action they wished the council to take.

Mr. E. B. MARTIN (Rotherham) said that, when he first went on the council, the scheme for the "Journal" had practically been settled. At that time he was bitterly opposed to it, and at several meetings of the council he was afraid he made himself rather a nuisance over it. But he had a large measure of support among older and more experienced men than himself who were members of the council, and although there was a majority in favour of the more modern system of distributing their literature, there was a very strong minority against it. Now, since the "Journal" had appeared, he had spoken to many of the men who formerly shared his views, and he must say that practically all of them were converts in favour of the new order of things. He admitted quite candidly that he had been converted. He welcomed the matter being brought up at this meeting, for he should like to tell the management in London what were the views of the members of the North-Eastern District. He was not a member of the Journal Committee, but from what he had heard, he believed the paper would pay its way. He did not object to the insertion of advertisements, because he gained a variety of information by reading them. He thought the matter they now got was fresher and more readable. He should oppose the resolution.

Mr. W. FOWLEDS (Keighley) opposed the motion, and said he could go on for half an hour answering the points raised by Mr. Rothera. All the same, he complimented that gentleman upon the reasonable way

in which he had introduced his subject. He contended that the "Journal" met all the points raised by Mr. Rothera. As to advertisements, they had them already in the technical papers, and they were mixed up more than in the "Journal." He now knew a great deal more about what was going on in the institution than ever he did before. He had a number of the annual volumes on his shelf. They looked very nice, but he never looked at them, as he had read all they contained in the technical papers. They were all partly conservative by nature, and did not like change. Before he even saw the "Journal" he was convinced that it would be a great improvement, but since it had been issued he did not think there could be a shadow of doubt about the matter. He was surprised that there had been so much opposition to the change. He thought it was a case of much ado about nothing. Mr. Rothera seemed almost to worship that old bound volume. At the beginning he was against the "Journal," but now he was fully persuaded it was a good thing. The question was too trivial for them to make such a fuss about it. It would be a different thing if it were a matter of life and death to the institution. He had been a full member for six or seven years, and it seemed to him that they had been altering by-laws and regulations from that day to this, and he sometimes wondered whether they were ever going to settle down.

Mr. T. H. HAILSTONE (Birstall) supported the resolution, and said there seemed to be a great deal of discontent about the whole thing. It had been said that they got information more quickly in the "Journal," but seeing they got that information from the technical press, it was really old when they got it in the "Journal," which was a strong point in favour of Mr. Rothera's resolution.

Mr. T. WADDINGHAM (Hebden Bridge) said he should support the proposal, for that would be the only means of giving the full membership an opportunity of saying which method of publication they supported.

Mr. F. HEWITT (Kiveton Park) said he agreed that the better way would be to leave the question over until the general meeting. He believed that the opposition was largely due to that which was inherent to all English people—a feeling of opposition to change. He was against it when it was first mooted, but he had been converted since, and was convinced that it was very much better than the old method. The old volume looked very pretty on the bookshelves, but surely they could take care of the parts and have them bound at the end of the year, getting the benefit of all information while it was quite fresh. He did not think Mr. Rothera was right in saying that the copies of the "Journal" would find their way to the waste-paper basket. Personally, he was in favour of a poll, but he hoped the new members would give the new system a trial and see how it worked.

Mr. F. J. THACKRAY (Hoyland) said that many of the speakers had admitted that they were not in favour of the "Journal" when it first came out. He was in favour of it, and since the eight parts had been issued he was more convinced than ever that the council were doing the members a good service by issuing it in parts instead of as before. He thought Mr. Rothera's attitude was rather like that of many gentlemen who, if they did not like a thing, would not have it at any price.

Mr. J. E. ACRIELD (Leeds) said the financial aspect of the question would have to be settled when more information had been placed at their disposal, but now was not the time to revert to the old system. They should wait and see what the new secretary could do to make the "Journal" a success. Until then he thought it would be very unwise to revert to the old system of things unless the financial situation demanded it. Certainly the "Journal" was capable of much improvement.

Mr. G. HART (Leeds) said he came to the meeting with a perfectly unbiassed mind on this question. He had listened very attentively to Mr. Rothera and every other speaker, and the conclusion he had come to was that it would be a very serious mistake indeed if they took the line of action which Mr. Rothera suggested. The whole question would be gone into again at the annual meeting, and that afternoon they were simply putting ammunition into a gun and firing it before they came to the fray. He felt strongly that if they took up a definite stand now they would be seriously hampering the discretion of the executive in London. The executive had not made the change without having given the matter

mature consideration, and he thought it would be very inopportune to take a line of action which would indicate that the executive had acted erratically and ill-advisedly.

Mr. ROTHERA, in replying on the debate, said he was very pleased indeed that his resolution had provoked so much discussion. As he said at the commencement he wished to be perfectly fair, and did not want to thrust his own opinions down the throats of others. They all had a right to their individual opinions and to vote as they thought best. He did not believe in his resolution being put on one side, and the matter being dealt with by delegates at the annual meeting. The "Journal" had now been tried for many months, and the members had ample opportunities for making up their minds whether they liked it or not. If a poll were taken the council would get the unbiased opinions of the members, and if they were in favour of the "Journal" he would bow to the decision of the majority. It cost £340 a year to send the "Journal" to the members. They were told at the beginning that an advertisement manager was going to be appointed, and he did not suppose that that gentleman would receive less than £150 a year, whereas the old volume only cost £40 a year for distributing. With regard to what Mr. Lancashire said about various other bodies publishing their journals monthly, he had spoken to several gentlemen, and several others had written him saying they wished they could go back to the old system, as they thought that was the most sensible way of publishing their "Proceedings." He did not understand why the members wanted in a way to disenfranchise themselves by taking this matter to the annual meeting. What were the District Committees for? They were to form definite opinions to air their grievances, and to discuss matters of interest to the institution. That was why he thought a definite vote should be taken that night on the question of a poll.

A vote was then taken, when eight hands were held up in favour of the resolution and twenty-two against.

The meeting closed with a vote of thanks to the chairman, and to Mr. Wakeford for the excellent arrangements he had made for the gathering.

The Utilisation of Solar Energy.—Mr. A. S. E. Ackermann, B.Sc. (Engineering), is to read a paper before the Society of Engineers on "The Utilisation of Solar Energy," embodying the results of his forty-eight trials of the engines for using the sun-produced steam. The plant tested has cost some £30,000, the investigations cover nearly four years, and though many experiments with sun power have been made during the last fifty years, this is the first paper of its kind. The meeting is to be held at the Institution of Electrical Engineers, on Monday, April 6th, at 7.30 p.m.

East Sussex Roads.—At the annual general meeting of the Sussex Branch of the Roads Improvement Association held at Lewes on the 11th inst., Mr. F. J. Wood, county surveyor for East Sussex, gave some interesting facts concerning his proposals for the improvement of his roads during the ensuing year. He said that the estimated cost of maintenance of main roads had increased to £90,000, and £12,000 would be spent on tar surface treatment of roads, and 150 miles would be treated. Of the latter sum the Road Board was contributing £5,000, and the other £7,000 would be raised by the county, and represented something like a rate of 1d. in the £. He went on to speak of the proposals to widen the road between Newhaven and Lewes, and treated upon the drainage and improvement of certain other roads.

Housing Schemes.—In the House of Commons on Monday, the President of the Local Government Board was asked the number of housing schemes submitted to the board by local authorities during each of the last three years. Mr. Herbert Samuel said he assumed that the hon. Member referred to applications for sanction to loans for the erection of houses under Part III. of the Housing of the Working Classes Act, 1890. He could not readily state the number of such applications received in the year 1911, but the number of schemes for which loans were sanctioned in that year was twenty-seven. The number of such applications received in the year 1912 was ninety-two, and the number of schemes for which loans were sanctioned was eighty. The number of applications received in the year 1913 was 163, and the number of schemes for which loans were sanctioned 132.

ASSOCIATION OF ENGINEERS-IN-CHARGE.

ANNUAL DINNER.

The nineteenth annual dinner of the Association of Engineers-in-Charge took place on Saturday evening last in the King's Hall of the Holborn Restaurant. The president, Dr. R. T. Glazebrook, C.B., F.R.S., occupied the chair, the company, which numbered over 300, including Surgeon-General Sir Alfred Keogh, K.C.B., F.R.S., Rector of the Imperial College of Science and Technology, Dr. H. S. Hele-Shaw, F.R.S., M.INST.C.E., immediate past-president, Sir Boverton Redwood (president of the Junior Institution of Engineers), Sir Thomas D. Pile, LL.D., J.P., Captain H. Riall Sankey, R.E.(RET.), M.INST.C.E., Messrs. W. H. Patchell, M.INST.C.E., M.I.MECH.E., Leslie S. Robertson, M.INST.C.E. (secretary, Engineering Standards Committee), W. Slings, M.I.E.E., B. A. Raworth, WH.SC., M.I.MECH.E., H. C. Guntton, M.I.E.E., H. Percy Boulois, M.INST.C.E., M.I.MECH.E., H. A. McFerren, M.I.MECH.E., Alex. Siemens, M.INST.C.E., M.I.MECH.E., H. C. H. Shenton (president of the Society of Engineers), Henry Adams, M.INST.C.E., M.I.MECH.E., F.S.I., J. S. Critchley, M.I.MECH.E., M.I.A.E. (president of the Institution of Automobile Engineers), Alex. Ritchie, J.P., S. A. Cooper, M.A., M.INST.C.E., W. Noble Twelvetrees, M.I.MECH.E., W. H. Booth, F.O.S., M.A.M.SOC.C.E., Frank Broadbent, M.I.MECH.E., M.I.E.E., H. D. Wilkinson, M.I.MECH.E., M.I.E.E., F. W. Bridges, H. E. Neale (chairman of association), J. R. Manning (vice-chairman), Hy. Swann (hon. treasurer), A. Davey, M.I.MECH.E., Hy. Capsey, W. H. Ball (hon. Social secretary), Wm. McLaren, J. E. Watkins, R. Thorp, A. J. Adams and W. A. Lester.

The toast of "Science, Practice and Technology" was proposed by Mr. B. ALFRED RAWORTH, who said that, as a former engineer-in-charge, he could lay claim to having undergone some of the trials and anxieties that fell to the lot of the man that had to take charge of machinery made by others who had not afterwards to work it under commercial conditions.

Sir ALFRED KEOGH, in replying, said he thought that in the various departments of the State they were exceedingly slow in taking advantage of discoveries, whether in the realms of science, political economy, or any other directions whatever. Those gentlemen engaged in such industries as were represented at that gathering held that our college institutions had not done so much for them as they might have done. He thought there was a great deal of truth in that, though, at the same time, he thought that much of the blame for the deficiency lay at the door of the industries themselves. The Imperial College of Science and Technology had been established to alter all that, and he thought they were proceeding on the right lines. They took the advice of the great leaders of industries in this country—the most celebrated men—and he believed the education given to young engineers in the City and Guilds Engineering College would commend itself to the profession.

Mr. LESLIE T. ROBERTSON and Sir THOMAS PILE responded to the toast of "Kindred Institutions and our Guests," proposed by Mr. Alfred E. PENN. Sir Thomas said he rejoiced at the success of the Association of Engineers-in-Charge, which he attributed to the boundless energy and organising skill of their admirable secretary.

Sir BOVERTON REDWOOD proposed "The Association." Their body, he said, was making steady and satisfactory progress, and was becoming of greater value year by year. The increase in numerical strength had perhaps not been conspicuously rapid, but that was clearly explainable by the circumstance that they very properly required from every candidate for admission to their ranks the production of proof of practical experience. At the same time it appeared that the conditions under which appointments were made were such as to lead to the introduction into their ranks of men who, in a great many instances, at any rate, possessed qualifications that were not comparable with those of their own members. The responsibility rested not with them, but with those who made the appointments, and he felt bound to say there was a lamentable lack of sense of proportion in weighing the merits of those who were to occupy positions of trust as engineers-in-charge. Mr. Penn had brought to his notice an object-lesson of that character which had fairly surprised him. He had shown him an advertisement recently inserted in the newspapers by the guardians of an important workhouse—an engineer and a cook being

required. The engineer was required to take charge of three steam boilers, and he was to be able to keep in repair and to renew or extend when necessary all steam, hot water, gas and sanitary fittings. It was therefore evident that the person wanted was a man not only of good education, but of some standing in his profession, a man of practical experience, in fact. There were no specified requirements in regard to the cook, though he did not suppose any great culinary skill was expected in his case. But he observed that the salaries and emoluments were the same in each case. What he wanted to know was how it was possible in these circumstances to get the men of experience that were required. Such things were managed better on the Continent, where it would be necessary for a man to produce a certificate of efficiency and practical experience before taking up a post, and his feeling was that something of the same kind was needed here. It was only in that way that the position of the engineer-in-charge could be defined, and by which a man would receive proper recognition on his merits. The engineer-in-charge himself could also help. He should not be tempted to do just as little work as was necessary to keep the place he was filling, but he should take every possible opportunity of showing how much more he was worth than the amount at which his services were improperly assessed. Looking to the time when their services would be properly appreciated, what they had to do was to see that there was an adequate supply of men of education and experience to fill positions when the great awakening took place. They knew, of course, that a good education—a scientific education—was necessary, but it was important to add to that practical experience. He found that all their functions, both recreative and educational, were highly successful. The papers read before the association were all excellent of their kind, and he especially commended their discussion evenings. It was quite impossible for the engineer-in-charge to keep himself up to date in regard to the multifarious matters which came under his purview unless he took advantage of the opportunities afforded by that association for intercourse and the exchange of views with his fellow members. The practice of some of leading isolated lives was a mistaken one. It had been the custom of the association to secure for the office of president some distinguished man directly or indirectly connected with some branch of the engineering profession, and he was quite sure that there was no one who better fulfilled the duties of the position than the present occupant of the chair. Dr. Glazebrook, who had had a distinguished scientific career, and who since he had been at the head of the National Physical Laboratory had demonstrated how much science could do for industry and matters of every-day life in which they were all largely interested. Dr. Glazebrook had brought his mind to bear on the solution of a vast number of important problems, and he (the speaker) did not hesitate to say that the work he had carried out in the department over which he presided had been of incomparable value to science and industry. With all the many and exacting claims on his time he had, nevertheless, been able to interest himself actively in the work of that association. He had followed it closely from day to day, and on no occasion had his sympathetic co-operation been lacking, and they were to be congratulated on having secured the services of so admirable a president.

Dr. GLAZEBROOK, in reply, said it had been a pleasure to him to help in some way the prosperity of the association. They of the Engineers-in-Charge had joined themselves together for good and useful purposes. The work they undertook was an arduous one, and their duties were of a responsible nature. Many of them occupied positions of trust, and the help and support they obtained by mutually combining in that institution, and the work done by their meetings, lectures and social evenings, all assisted them to carry out their arduous duties more efficiently. Speaking of the rapid growth of the association, Dr. Glazebrook said there were demands for branches in the Provinces and the Colonies, and the council had under careful consideration how better to make the usefulness and value of the association known.

Proposed Waterways Board.—Mr. John Burns, President of the Board of Trade, has consented to receive on Tuesday next a deputation from the Waterways Association, which will urge him to appoint a Waterways Board.

Comparative Economics of Tramways and Railless Electric Traction.

PAPER AT THE INSTITUTION OF CIVIL ENGINEERS.

At a meeting of the Institution of Civil Engineers on Tuesday Mr. Theodore Graham Gribble, M.INST.C.E., dealt in a paper with the comparative economics of tramways and railless electric traction.

Commencing by pointing out that in several large cities the system of transportation variously designated as "railless electric traction," the "trolley bus," or "the trackless trolley," already formed an extension to the tramways, and that numerous applications for the authorisation of similar lines were before Parliament, Mr. Gribble said his present purpose was to discuss the economic features of the system in general, as compared with tramways, with a view to definition of the sphere of usefulness open to the railless system.

There were still many who maintained that the tramway was more economical than the "trolley bus," although the latter was now being widely adopted in preference to tramway extensions. By others railless traction was regarded as a makeshift to save present capital expenditure with possibly no actual ultimate economy. He believed that such a view was not now held by those who had made installations, although it might have been held when they projected the lines.

It was worthy of notice that the initiation of the railless electric system had not been undertaken in England by private companies, but by municipal tramway committees, and in that respect it formed an exception to otherwise universal custom. From great railways down to taxi-cabs, the introduction of new forms of transportation had, with this exception, been left by the State or the municipalities to private enterprise. In the case of railless electric traction, however, special commissions were appointed by some of the municipalities to investigate what had been done on the Continent, with the result that, after considerable modifications had been made to suit British requirements, services upon this system were opened in Leeds and Bradford about two years ago, to be soon followed by others.

The numerous extensions and new lines projected pointed to satisfaction on the part of the respective public bodies with the results obtained so far, and to the possibility of the application of electric transportation by this method to public service on the highways.

The British tramway system, immense boon as it was to the general public, had involved colossal expenditure, mostly met by municipal borrowing. Many of the undertakings could not be described as remunerative. Moreover, the tramway, owing to its cost, had been limited in its service of suburban populations.

The object of the paper was to submit evidence that for urban and suburban transportation track laying had been carried far enough in this country, and in many cases too far. It was further contended that wherever overhead wires could be employed railless electric traction, on account of its greater economy and consequent wider sphere of application, was the most natural and efficient method of extending the tramways.

THE LIGHT RAILWAYS ACT.

The Light Railways Act, which was framed with the object of facilitating the extension of subsidiary communication, had not produced the results expected from it.

The utilisation of the highways for public mechanical transportation on a comprehensive scale was necessary, not only for progress, but as a relief. The railways—prime factor in the growth of national prosperity—had at the same time entailed great evils in the over-centralisation of the population, and the congestion of its life and movement. The problem now calling for solution was decentralisation and distribution, and as regarded suburban transportation, the application of electricity thereto, without the heavy burden of permanent way, was an accomplished fact. There was no reason, however, why the railless system should not be applicable also to intercommunication between railways to serve rural districts, and thus fulfil, in all respects, the objects

of the Light Railways Act, while at the same time bringing the various collateral advantages of electricity within the reach of sections of the population which at present lacked them.

Mr. Gribble went on to say that in his paper the economics of railless electric traction would be studied only in comparison with those of tramways; therefore the transportation of goods, which would be essential in the application of the system to communication between railways, was not touched upon. The final conclusions had, however, a direct bearing on that matter. Whether passengers or goods, or both, were carried, the line required to earn a certain sum per mile of route to cover working expenses, fixed charges, and a certain profit, in order to become remunerative. The author's object was to determine that sum.

It should be noticed, however, that, in contrast to the tramways, railless electric traction possesses the advantage that the carriage of goods in vehicles or trains specially adapted for the purpose, and running at a much lower speed than the passenger cars, need in no way impede the latter.

GENERAL FEATURES OF COMPARISON.

Railless electric traction differed from the tramway commercially in two main features: The capital expenditure on permanent way was saved, and the cost of maintenance of rubber tyres was added. The other expenses—of electrical energy, administration, traffic and maintenance of rolling stock—might, for practical purposes, be taken as equal in the two cases. If, therefore, the capital and working expenses of tramways could be stated in the form of normal figures for average circumstances, comparison would be simple.

The statistics of British tramways were ample, but the figures were extremely divergent. One tramway spent more than six times as much as another per electrical unit. One spent 125 times as much as another upon the maintenance of its track. In the first place, therefore, an attempt must be made to suggest a normal standard. The generalisation which was inevitable could not be expected to hold good for all circumstances; nevertheless, avoiding plainly abnormal figures, it might represent what would probably correspond, under average circumstances, with an engineer's estimates.

The three factors which governed the commercial efficiency of a transportation system were: (1) Capacity, (2) capital expenditure, and (3) working expenses. The comparison would therefore be made on these bases.

(1) *Capacity*.—The question of the relative carrying power of the tramway and the omnibus was not a simple one. The capacity of a vehicle, as expressed by the number of seats, was distinct from its carrying power. The terms would be synonymous if the people were always there to be carried. That, of course, was not the case, and it was the character of the traffic which mainly fixed the carrying power.

It would not be correct, when making a comparison of a tramway service with one by the "trolley bus" as regarded carrying power, to measure this by the relative seating capacity. For this purpose it was necessary and sufficient to consider whether the railless electric car, when compared as to receipts and expenses with the tramcar, could be regarded as capable of carrying the same average number of passengers per car-mile.

The railless electric cars put in service in this country up to the present time were of the single-decked type, and had seats for twenty-eight passengers.

A double-decked car with thirty-eight seats had been constructed and tested on the public roads with satisfactory results. Its general adoption was therefore quite probable.

The average number of passengers per car-mile on British tramways ranged from 5.39 to 12.92. If, therefore, nine passengers per car-mile were assumed as a traffic of average density, under all ordinary circumstances in this class of traffic it could be carried by even the single-decked railless car.

Before leaving this subject something should be said as to the respective merits of the top-seat car and the power-car with a trailer attached. In England trailers were only permitted to be attached to road tractors for goods traffic, the argument being, no doubt, that there was less risk to personal safety if they did not carry passengers. If, however, one of the goods trailers in the London streets were to collide with a motor omnibus, it would not be the goods alone that would suffer. If they were in themselves specially risky, trailers ought to be banished altogether. As to obstruction of the general traffic, it might be disputed whether a passenger omnibus and trailer, capable of deviating, would obstruct the general traffic as much as one of the long London County Council cars limited to a fixed track.

The covered top-seat tramcar was too large a vehicle for one conductor to control properly. The open top-seat car, whether on rails or not, was dependent on fine weather for the use of half its accommodation. In the omnibus, restricted as to size and weight, the winding stair to the top deck was a risky and undignified means of access. The most to be said for this type was economy in traffic expenses, and in quantity of rolling stock, also popularity of the top seats in very warm weather.

As regarded the effect upon working expenses, the use of trailers, which was general upon the Continent, could not be said to lessen materially the profit on the business. Should the use of an attached trailer be permitted in England, it would much enlarge the capacity of railless electric traction for handling special traffic. It would permit the weight of the power-car to be reduced—a matter of much importance in the maintenance of roads—and also facilitate better adaptation of the accommodation to the demand.

(2) *Capital Expenditure.*—An analysis of the capital expenditure on British tramways was embodied in the paper.

It had not been possible to collate every British tramway. Either from the absence of some essential data, or on account of inexplicable discrepancies, several cases had to be neglected. As to capital expenditure, forty-three cases had been available.

A further method of analysis had been to arrange the cases according to their traffic density, expressed in terms of the car-mileage per mile of route per day. Certain items varied, normally, in direct proportion to the traffic density, such as the power-station, rolling stock, and buildings. The cost of the permanent way and of the electrical equipment also increased to a considerable extent with the traffic density, although not in proportion. The permanent way ranged from single track with light rails and cheap paving to double track of the heaviest description and paved in the most substantial manner. The electrical equipment increased in cost on account of heavier copper sections, more feeders, and more expensive sub-stations.

The general result of the analysis had been to show a curve of total expenditure considerably lower than that which would result from a graphical averaging of the cases cited. The principal reason for this was the extremely high expenditure of the tramways on power stations and land and buildings, as compared with what would be estimated under ordinary circumstances.

The foregoing statement was not intended to reflect in any way upon the cost of construction of the tramways, the circumstances which had led to heavy expenditure in any particular case being unknown to the author.

With regard to rolling stock, in the cases cited the average number of car-miles per day per car in service was approximately 105, and per car in stock 70, so that the spare cars amounted to about one-third of the whole number in stock. The 105 car-miles were supposed to be performed in a traffic-day of fourteen hours, and at a scheduled speed of 7.5 miles per hour. The average time interval of service corresponding with a traffic-density expressed in car-miles per day per mile of route was given by the formula $I = 1680 \div D$, in which I denoted the time interval in minutes, and D the traffic-density.

Abnormalities of expenditure were least noticeable in the case of the rolling stock.

The general conclusion from the analysis of capital expenditure was one of surprise that the variations should be so great. If the analysis had been drawn from the statistics of private companies, in which promotion expenses figure, and the expenditure was by no means wholly on the construction, it would have

been easier to explain. In all the cases cited, however, the undertakings had been financed by municipal loans, effected at a low rate of brokerage. Why the cost of some items should be three times as much in one case as in another of equal traffic-density the author was without any clue to explain.

With regard to fixed charges, it had been assumed that the capital would be redeemed by a sinking fund placed at $3\frac{1}{2}$ per cent. compound interest, producing amortisation in thirty years. As a necessary profit, at which the undertaking could be described as remunerative, 5 per cent had been assumed. Although municipalities could borrow at a much lower rate of interest than 5 per cent, their loan had a par value on account of the collateral security of the rates, and not from the value of the property alone. As a private undertaking, a tramway would have to make 5 per cent profit in order to have its shares quoted at par.

(3) *Working Expenses.*—With regard to the working expenses of tramways, forty-seven cases had been available, and the results had been tabulated in detail by aggregating and averaging. Three digests of the tabulation were given in the paper. First, of all the forty-seven cases; secondly, of all the cases in which the total expenses exceeded 75d. per car-mile; thirdly, of all the cases in which they did not exceed 55d. per car-mile. Finally, a generalisation was attempted of a table of normal working expenses under ordinary circumstances.

As a rule, the results went to show that low working expenses were not the exclusive privilege of large undertakings. In many cases they were noticeable in small tramways, and appeared to be due to "cheeseparing," because the concern could not afford to spend more. Here, again, the general conclusion was one of surprise that the variations should be so great.

The most striking points of variation were the following:—

(1) *Cost of Electrical Energy.*—The effect of modern improvements had been not only to lower the cost of generation by all kinds of plant, but also to make it possible for small plants to produce current at a cost which only a few years ago was only possible in the largest stations. Further, in many cases the price debited by a municipality to the tramway departments for power supplied from a joint station appeared to be arbitrary, and thus to obscure the conclusions of the statistics.

(2) *Maintenance of Permanent Way.*—As a rule, the results appeared to warrant the conclusion that tramways which could afford to do so spent about 0.5d. per car-mile upon maintenance of track; in the cases cited this item ranged from 0.01d. to 1.25d. per car-mile. A tramway which began by keeping down track maintenance to 0.01d. would certainly end by having to spend 1.25d.

(3) *General Expenses.*—The general expenses of British tramways averaged more than six times as much as those of the Amsterdam Corporation tramways.

Renewals.—It would be impossible to find from the statistics a basis for generalisation in the matter of renewal funds. For the purpose of these estimates, the amounts which must be set aside for the replacement, at the proper time, of each kind of material had been dealt with as sinking funds, although in most cases renewals must be made by instalments. For instance, some portions of the permanent way lasted four times as long as others.

CORRESPONDING ESTIMATES FOR RAILLESS ELECTRIC TRACTION.

For reasons stated later, the cost of construction, in the case of railless electric traction, had been taken as being that of a tramway (including the power station) minus its track. The difference in the cost of the overhead equipment, due to two trolley wires instead of one, was negligible. The two positive wires were connected, and furnished available feeder section. The cost of the rolling stock was about the same in the two cases.

As regarded general and traffic expenses, maintenance of overhead wires, power station and buildings, the working expenses of the "trolley bus" were practically the same as for the tramway.

With regard to the consumption of energy, it was necessary to go further into detail.

Consumption of Energy by Railless Electric Traction.—In conjunction with Mr. Bertram D. Fox, Assoc.M. Inst.C.E., the author made some experiments in 1908 to determine the consumption of energy by an electric omnibus which then plied between Liverpool-

street and Victoria stations, London. Again, in February, 1912, the author, in conjunction with Mr. Fox, Mr. Lydall, of Messrs. Siemens Brothers, and a gentleman representing Mr. Christopher Spencer, the general manager of the Bradford Corporation tramways, made experiments upon a railless electric car in the service of that corporation.

The tests made in London might, as a whole, be taken as indicating the minimum consumption of energy for railless electric traction. The average consumption of four east-bound complete trips was 1441 watt-hours per ton-mile, and of four west-bound trips 1233 watt-hours per ton-mile, the difference being mainly due to the Ludgate-hill and Charing-cross ascents on the east-bound trips. The resistance on wood pavement was found to be perceptibly less than on asphalt.

The conditions under which the Bradford tests were made were very different. The road—a macadam one in a good state of maintenance—was covered with snow, which, at first fairly hard, thawed during the day into a thick slush. These tests might be taken to represent, although not the maximum possible resistance, still a resistance much above that of average conditions of road surface, and therefore calculations made from them indicated a conservative estimate of the current consumption on country roads.

The tests were taken at speeds ranging from a walking pace to 15 miles per hour, and on gradients ranging from the level to one of 6½ per cent.

The resistance of the vehicle, including gears, was found to increase after the speed of 8 miles per hour was reached.

Tests were also made at Bradford to determine the tractive resistance by finding upon what gradient the car would just run without accelerating or retarding, and with and without connecting the chain drive.

The car was driven by a Siemens equipment of two motors, having both series parallel and field control. The motors were wound for 550 volts, but could also be guaranteed for 600 volts. The line voltage was very variable, ranging from 450 to 495 volts, and in one isolated case jumping up to 520 volts. The normal starting current of the equipment was 33 amperes per motor. The car was loaded to a total weight of 5½ tons, that being then the average weight, including passengers, when in service. A table prepared by the author showed the capacity of this equipment as propelling the railless electric traction car now constructed, which weighs only four tons. With an average of ten passengers, and driver and conductor, the total average weight of the loaded car was taken as 5 tons.

Line losses were not allowed for, because this was purely a local question, chiefly dependent upon the positions and number of the sub-stations. The only possible way to state the consumption was in the form of input from the line to the motors. It was, in most cases, economical to keep down the line losses to within 12 per cent. Even when assuming such a drop, however, the results given in the table afforded no ground for the supposition that, even on a rough road surface, it required any more electrical energy—whether maximum demand or average consumption—to transport the same number of passengers by railless electric traction than it did upon a tramway.

Another table gave a further comparison of current consumption of a tramcar and a railless car under such conditions of road surface as were shown by the Bradford and London tests respectively, on the level and on a 5 per cent gradient.

In the case of single cars, in Case 1, with road surface A, the maximum demand of the tramcar on the line was 49 per cent more, and the consumption of energy per car-mile 1½ per cent less than that of the railless car. With road surface B, the maximum demand and consumption of energy of the tramcar were 76 per cent and 43 per cent respectively more than those of the railless car. In Case 2, with road surface A, the maximum demand and consumption were, respectively, 68 per cent and 48 per cent more; with road surface B, 86 per cent and 81 per cent more respectively.

When, however, a number of cars were in service, of which only a few are accelerating at the same time, the proportional maximum demand would approximate towards the relative demand when running at full speed.

The estimate of £500 per car in service for either tramway or railless electric traction was much less than would be represented by a graphic mean curve of the actual average expenditure on power stations

of the tramways cited, and could not, therefore, be taken as an unfair comparison towards the latter.

With regard to power in relation to working expenses, for purposes of generalisation the high results shown by many of the tramways had been neglected. The figure chosen was 0.765d. per car-mile, which was arrived at by assuming a price of 0.85d. per unit, and a consumption of 0.9 unit per car-mile.

With regard to railless electric traction, the traffic density and local conditions would affect the cost of power as much as they did in the case of tramways. The above generalisation might be taken as applicable, under average conditions, to a service at intervals of about ten minutes, or about 165 car-miles per mile of route per day. Under the most favourable conditions of railless traction, and with a price of 0.48d. per unit, the cost of power would be 0.3d. and 0.42d. per car-mile in the two cases cited. Under no conditions in England did there appear to be any necessity for it to exceed 1.25d. per car-mile for tramways.

MAINTENANCE OF RUBBER TYRES.

The figure chosen (1.5d. per car-mile) was dependent for its general application upon the very fluctuating price of rubber. It also depended greatly upon the condition of the road surface and on the weight and speed of the vehicle. Contracts had been made at as low a figure as 1d. per car-mile. The cost in the case of the petrol-driven motor omnibuses was generally estimated at 1.5d. per car-mile, but the character of the propulsion was not the same in the case of railless electric traction.

ROAD MAINTENANCE.

The subject of the wear and tear of highways caused by mechanically propelled vehicles, and the contribution by the owners of the latter towards maintenance, was one which called for special and comprehensive legislation. That everyone who uses a road should contribute towards its upkeep was obviously fair.

A tramway was usually bound to pave between and outside its track. It therefore relieved the road authority from expense as to a certain width of the road. An owner of mechanically propelled vehicles could not do this, but it was reasonable that he should make some contribution in proportion to his use of the road.

The parties who were thus liable were:—

- (1) The Government, which used the roads for military and postal purposes.
- (2) Public carriers, who carried on regular services for passengers and goods upon definite routes.
- (3) The general public, who used the roads for walking, riding and driving, both for private and for commercial purposes.

The Government had done its share by making the roads.

Public carriers' use of roads could be determined in car-miles in most cases.

The general public were by far the largest users, and the extent of their use could not be determined precisely. The private automobile and commercial tractor were, in most cases, more severe upon the roads than was the motor omnibus. The rapidly moving automobile destroyed the upper surface by attrition. The heavy commercial tractor produced settlements of the foundation. The two effects interacted. Unevenness increased the shock or dynamic effect of impact.

To apportion the responsibility was no easy task. The world was passing through a revolution in highway transportation, the converse of that which took place at the commencement of the nineteenth century. That generation gave railways to the neglect of the highways; this generation was confronted with the task of adapting the highways and maintaining them in a suitable condition for mechanical transportation.

The difficulty was increased by the decentralisation of government. The constructors of the roads were the supreme government, but they were no longer the custodians of them. Each local authority maintained such portions of them as were situated within the area of its jurisdiction by means of rates levied on the inhabitants of that area. That was a very practical arrangement as long as the traffic of a district corresponded approximately with its population. But what was expedient in the days of stage coach and gig might not be the most practical or fair arrangement in the days of the motor car. The users of the roads were to-day not even approximately the inhabitants of the respective districts. Consequently, one county had to maintain its road for the benefit of the inhabitants of a dozen other counties. For instance, the counties through which the road between London and Brighton passed maintained it princi-

pally for the benefit of the urban populations at its extremities.

There seemed to be a *prima-facie* case for united action on the part of the county and district councils to obtain comprehensive legislation by the Government.

The Bill promoted last Session for facilitating the authorisation of railless electric lines under the Light Railway Act was wrecked on the shoal of road maintenance. It was suggested by the Opposition that a contribution towards road maintenance should be made an essential condition of authorisation. Seeing, however, that motor omnibuses were not thus burdened, such a condition was regarded by the promoters of the Bill as unfair. There were no inherent expensive features of railless electric traction which would prevent it from contributing, but the contribution ought to be a fair one. At present it was handicapped severely as compared with the motor omnibus in the following ways:—

(1) Overhead wires for a new undertaking could as yet be authorised only by a special Act of Parliament. Apart from some uncertainty as to obtaining sanction of the petition, the expense involved was equal to that incurred for a tramway, and thus formed a much heavier item of expenditure, in proportion to the cost of construction, than in the case of a tramway.

(2) Popular sentiment was still strongly adverse to overhead wires. In any form except aviation, public transportation was not picturesque, but overhead wires disturbed the æsthetic sense more than rails.

In spite of these disabilities, railless electric traction was making rapid strides, and it was probable that the effort would be renewed to obtain authorisation under the Light Railways Act, and incidentally supply a field of usefulness for that torpid enactment.

Some of the recent authorisations included a provision that the railless electric service should be responsible for the extra cost of maintenance of the roads used, the amount not to exceed 3d. per car-mile; others fixed that amount. In either case, as the determination of "extras" was proverbially difficult, the "trolley bus" would probably expect them to come to 3d. precisely.

A service at intervals of thirty minutes would involve, on the above basis, a contribution of about £32 per annum per mile of road: a 2½-minute service nearly £400 per mile.

If all the route-mileage of British tramways were worked by the same amount of car-mileage using railless electric traction, the contribution, at the above rate, would amount to more than £250,000 annually, and to an average of about £215 per mile of road per annum.

The revolution in highway transportation was proceeding with more rapidity than anyone ever expected, and the subject of road maintenance and the equitable distribution of its cost did not admit of postponement.

FINAL COMPARISONS.

The general conclusions were:—

(1) That with a traffic-density represented by a 2½-minute service, equal to that of the largest British tramways, the cost of working was still in favour of railless electric traction, although only to the extent of about 7 per cent. The cost of construction was, however, about 44 per cent less.

(2) That the saving increases inversely with the traffic-density, so that with a time interval of thirty minutes the cost of operation was about 36 per cent less, and that of construction about 70 per cent less. The frequently expressed opinion that, owing to the supposed greater current consumption and the cost of tyre maintenance, the economy of the "trolley bus" ceased at a service frequency of about ten minutes, was, in the author's opinion, quite unfounded. A large number of British tramways now labouring under the burden of an annual deficit would, if their services had been worked by railless electric traction, be now showing a surplus.

There was, however, another and a wider point of view to which special attention should be drawn. The saving of money was important, but the serving of the public was much more so. The ratepayers could spend or save money as they pleased. If they preferred to incur the greater expense of a tramway because they regarded it as a greater convenience, no one had any right to interfere with them. The point of greatest importance was, however, that the tramway could not serve the public as comprehensively as the "trolley bus." In order to serve the city best, the aim should be to reach the farthest suburb, and to supply the greater frequency of service

in the centre of the city by means of overlapping services radiating to the suburbs, precisely as was done by the London General Omnibus Company. The cost of tramway construction set a limit to suburban extension which was not set by railless electric traction. In order to comply with the fundamental principle of providing the greatest benefit for the greatest number, the preferences of the wealthier occupants of the city should not be allowed to outweigh the claims of the less wealthy dwellers of the suburbs to obtain at least some adequate means of transportation.

MUNICIPAL INITIATIVE.

Concluding, Mr. Gribble said there was no intention whatever in his paper to criticise, still less to disparage, either the British tramway system as a whole or any unit of it. The organisation, especially in the municipal form, was admirable. The publicity given to the results by the free disclosure of statistics, and the frequent conferences of the responsible administrators under the auspices of the Tramway Association, all made for the excellence of the service to the public. Every new economy and every new invention was made use of within its powers. The individuals entrusted with leadership, both in technical and commercial matters, were men of exceptional ability. It was the municipal tramway which had fathered and fostered railless electric traction, and in a most enterprising manner. If the infant's future was one of greater promise than many yet anticipate, and if that future was speedily realised, it was to the initiative of municipal tramway managers and engineers that the honour would be due.

Hayward Brothers & Eckstein, Limited, 187-201 Union-street, Borough, S.E., ask us to state that they are not in any way connected with Haward Brothers, Limited, of Waltham Cross, against whom a winding-up order has recently been made.

Taxation of Motor Lorries.—The District Councils of Axminster, Barnstaple, Bideford, Crediton, Holsworthy, Honiton, Kingsbridge, Newton Abbot, Okehampton, Plympton, St. Thomas, Tiverton, and Totnes have invited the Devon County Council to call the attention of the Government to the urgent necessity which exists for the fair taxation of motor lorries, suggesting that the money so raised be spent in the localities in which the lorries are used, and that a definite weight be prescribed.

"Fluxphalte" and "Mexphalte."—A second edition of "Twentieth Century Roads," published by the Anglo-Mexican Petroleum Products Company, Limited, Finsbury-court, E.C., has been issued, and all concerned with road work will do well to obtain copies. We gather from this interesting little publication that "Fluxphalte" was used during 1913 on the roads of no fewer than twenty-seven different counties of England and Wales, in addition to a quantity laid in Scotland, and it would appear also that the efficacy of "Mexphalte" for grouting work is now very generally recognised, several excellent stretches of road on this system being constructed during the twelve months in question. This class of road construction is of great advantage where municipal engineers intend to lay down short sections of road employing their own workmen, and is a comparatively simple process with which apparently highly satisfactory results can be obtained.

Heating Apparatus in Cottage Flats.—On the occasion of the visit which the King and Queen paid to Kennington last Saturday in order to see for themselves the improvements which are being carried out on the Duchy of Cornwall estate in South London, her Majesty evinced special interest, during her inspection of the cottage flats in Cardigan-street, in the kitchen arrangements and the heating apparatus by which it is possible to obtain hot water for the ordinary taps, for the bath, and for the self-filling copper from the kitchen fire. The fittings in question, we understand, are the well-known housing specialities of Messrs. Cornes & Houghton, 240 High Holborn, W.C., and were supplied and installed by that firm. The new buildings are of two floors, being really two self-contained houses superimposed one on the other, each having an independent street door. In order that the King and Queen might see how the two floors are entirely distinct they visited a ground-floor flat and a first-floor flat, the latter consisting of a kitchen, a living-room, two bedrooms, and a combined scullery and bathroom, the rent being 11s. a week.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

385. Chimney Design.—Design a brick chimney shaft 130 ft. in height from ground level, the internal diameter at the base being 10 ft. (F. S., *Plumstead*.)

386. Storm Overflow Weir.—A 9-in. diameter stone-ware pipe, laid on a gradient of 1 in 281, carries a mean dry-weather flow of 33,300 gallons per day. It is required to construct a storm overflow weir, in a manhole, to pass all above six times the dry-weather flow. At what height above the invert of the pipe should the lip of the weir be set? (H. V. O., *West Bromwich*.)

387. Boring.—Describe, with sketches, the appliances necessary in carrying out borings to a depth of 100 ft. for the purpose of ascertaining the character of the soil. (W. N. B., *Cambridge, N.Z.*)

388. Reactions on Beams.—Show how to find (graphically or otherwise) the pressures on the two supports of a horizontal beam which is loaded at any given point. If the distance between the supports be 20 ft., and if one of the loads be 12 cwt., find the changes in the pressures produced by shifting this load through a space of 5 ft. along the beam. (A.M.I.C.E.)

389. Design of Floors.—What loads should be allowed for in designing a floor (a) in a general warehouse, and (b) in a platform to which the public are to be admitted? What factor of safety would you adopt in each case?

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

381. Town Planning.—An area of 1,000 acres, chiefly undeveloped, in an urban district, is to be included in a town planning scheme. The approximate number of owners, occupiers and lessees is 250. Assuming that the referencing is to be done by the staff of the urban district council surveyor's office, state the information which should be sought, and the best method of ascertaining and recording it. Give an estimate of the cost of the work if done by professional referencers. Compare the advantages and disadvantages of the two methods, both in the above case and in the case of an area of 1,500 acres in the same district, which includes a considerable extent of partially developed building estates, and is to form the nucleus of a later scheme. (Togun.)

The task of compiling a reference of the various owners, lessees and occupiers of property contained in an area of 1,000 acres, mainly undeveloped, is a comparatively simple one, and one with which the surveyor's department might easily be able to cope without the aid of the professional referencer.

A good deal of preliminary information may be gleaned from the rate-book. The referencer should then interview the various occupiers, and obtain from them the names of the owners or agents. The next step will be to interview the owners or agents as a matter of confirmation of information already received. Should it be impossible or inconvenient to obtain an interview, an excellent plan to adopt is to send out notices. These notices should explain the reasons for which the information is desired, requesting a reply as early as possible, and attached to them should be questions as to ownership, if lessee or sub-lessee, if held in trust, if premises are underlet, &c. By this means a great deal of useful information can be obtained. If any of the land is

in the hands of builders or estate agents, these people would no doubt supply all the information required.

A professional referencer would charge £20 to £25 for an area of this description.

For entering up the information, an ordinary-sized notebook is desirable in the first place, with a larger book for making the fair copy afterwards. These should be printed, with headings and columns as follows:—

Reference number.	Description of property.	Ordnance numbers.	Owners or reputed owners.	Lessees or reputed lessees.	Occupiers	Remarks

The small 25-in. ordnance sheets, made to fold, are practically indispensable in ascertaining the various owners' boundaries, &c., each property being hatched in different colours, in addition to being numbered in conjunction with the reference book.

Regarding the second part of the question—viz., 1,500 acres of land in course of development, the main source of information would, no doubt, be derived from the various estate agents or builders.

Should it not be desirable to do the work from the surveyor's department, a course sometimes adopted is to invite quotations from various estate agents and others in the locality for doing the work.

In conclusion, it is, perhaps, as well to point out that referencing is purely a matter which concerns the clerk's department, and as such should be undertaken by his staff, although in a large number of cases this work is forced on to the surveyor's shoulders. (H. W. R., *Hendon*.)

382. Fire Hydrants.—Fire hydrants, 2½ in. in diameter, are taken from a 4-in. and a 12-in. main. What will be the ratio of discharge in the two cases, assuming that the initial pressure is the same in each main? (X. X., *Hounslow*.)

The pipes are assumed to be running full. The mode of procedure is to determine the ratio of the discharges from the 4-in. and the 12-in. mains, and then determine the discharge from the hydrant when connected to each main. The case is identical with a water main running full, and having branch pipes fitted to it, the branch pipe in this case being the standpipe to the fire hydrant.

The discharge from a water main, when running full, is obtained from the formula—

$$G = \sqrt{\frac{(3d)^5 h}{L}}$$

in which G = Discharge in gallons per minute

d = Diameter of pipe in inches

h = Head of water in feet

L = Length of pipe in yards

[NOTE.—In using this formula, great care must always be exercised as to the units employed, for it will be seen from the above that no symbol is expressed in the same unit as another.]

Now it is not given in the question what h and L are, but it is given that the initial pressure is the same in each case; hence, considering first the 4-in. main, we see that—

$$G_1 = \sqrt{\frac{(12)^5 h}{L}} = \text{discharge of the 4 main} \dots (1)$$

Again, if G₂ is the discharge of the 12-in. main, we get that—

$$G_2 = \sqrt{\frac{(36)^5 h}{L}} \dots (2)$$

Dividing (1) by (2) gives—

$$\frac{G_1}{G_2} = \sqrt{\frac{12^5}{36^5}}$$

The Surveyor

And Municipal and County Engineer.

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$$\begin{aligned}
 \text{i.e. } \log \frac{G_1}{G_2} &= \frac{1}{2} (\log 12^5 - \log 36^5) \\
 &= \frac{1}{2} (5 \log 12 - 5 \log 36) \\
 &= \frac{1}{2} (5 \cdot 39590 - 7 \cdot 78150)
 \end{aligned}$$

$$\begin{aligned}
 \text{i.e. } \log \frac{G_1}{G_2} &= \bar{2} \cdot 80670 \\
 \therefore \frac{G_1}{G_2} &= 0.64076 \text{ or } \frac{1}{15.6}
 \end{aligned}$$

that is to say, the discharge from the 12-in. main is 15.6 times as much as that from the 4-in. main, both having the same initial pressure.

For the sake of argument, we will now assume that the 4-in. main discharges 100 gallons per minute. It is at once evident that the 12-in. main will therefore discharge 1,560 gallons per minute.

Now, since the lengths of the branch pipe is so short, the loss of velocity due to frictional resistances is small enough to be neglected (since the amount of work necessary to be done in overcoming friction is proportional to the length of the pipe), so that the discharge at each nozzle can be calculated from the ratio of the square of its diameter to the square of the diameter of the main from which it draws its supply.

Hence, discharge from 2½-in. branch from 4-in. main

$$\begin{aligned}
 &= \frac{100 \times (2\frac{1}{2})^2}{(4)^2} \\
 &= \frac{100 \times 25}{4 \times 16} \\
 &= 39 \text{ galls. per min.}
 \end{aligned}$$

Similarly, discharge from 2½-in. branch from 12-in. main

$$\begin{aligned}
 &= \frac{1560 \times (\frac{5}{2})^2}{(12)^2} \\
 &= \frac{1560 \times 25}{4 \times 144} \\
 &= 68 \text{ galls. per min.}
 \end{aligned}$$

Hence, the ratio of the discharge from the 4-in. main and the discharge from the 12-in. main is $\frac{39}{68}$

—that is to say, the discharge is about 1½ times as great from the 2½-in. branch if it draws from the 12-in. main as it would be if it drew its water from the 4-in. main. (T. W. P., *Bexhill-on-Sea*.)

ST. AUSTELL HOUSING SCHEME.

FIVE-ROOMED DWELLINGS.

Particulars are given in the annual report of Mr. E. D. Groves, the surveyor to the St. Austell Urban District Council, of the scheme of housing which he was recently instructed to prepare, following a decision of the local authority to close a number of defective dwellings.

A suitable site having been obtained, it was agreed to proceed with the erection of twenty-two five-roomed houses.

In laying out the site care was taken to avoid a cold and mechanical uniformity. For this reason the houses are not all placed fronting the adjoining roads, but some are arranged at angles to the others. The houses are arranged in five blocks—four of the blocks each having four houses and one having six houses.

In considering the actual accommodation to be provided in the houses themselves, the requirements of the probable tenants have been considered. In all houses no living-room will be entered directly by the front door, there being a small lobby giving access to the stairs before the living-room is entered.

The houses consist of a living-room 14 ft. by 13 ft., scullery 13 ft. by 8 ft., with coal-store, cupboard, larder and water-closet on ground floor.

On the first floor are three bedrooms measuring respectively 16 ft. 3 in. by 10 ft., 12 ft. by 8 ft. 9 in., and 8 ft. 9 in. by 7 ft. 3 in. The first two have fireplaces. All rooms are 8 ft. high.

The cost of the site is £325. It is proposed to take a portion of the site for widening the existing

	Estimated Annual Revenue.		Estimated Annual Expenditure.	
	Per House.	22 Houses.	Per House.	22 Houses.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
52 weeks' rent at 5/4 per week	13 17 4	305 1 4		
Less losses and empties	0 5 4	5 17 4		
			Repayment of loan (principal and interest combined at 3½ per cent—	
			(a) In respect of land, &c., £407 for 80 years	0 13 10 15 4 2
			(b) In respect of buildings, &c., £4,663 for 60 years	8 10 1 167 2 0
			Rates at 7/8 in the £ (R.V. 47) less Poor 15 per cent, District 25 per cent, Poor 4½, District and Water 3/8	2 3 0½ 47 6 11
			Property tax asst., say 4/ each	0 8 2 8 19 8
			Fire Insurance, £4,516 at 1/6	0 3 1 3 7 10
			Repairs and maintenance, 7½ per cent net rental	1 0 4½ 22 8 5
			Supervision and collection of rents, 2½ per cent	0 6 9½ 7 9 5
			Contingencies	0 6 7½ 7 5 9
				£13 12 0 £299 4 0

highways. The cost of the land taken and charged to street works will be £18, therefore the nett cost of the site to the housing scheme is £307.

The whole scheme has received the sanction of the Local Government Board. The contract for the buildings, sewers, roads and fencing has been let to Mr. F. J. Stanbury, of Devonport, for the sum of £1,594 10s.

The loan will be obtained from the Public Works Loan Commissioners at 3½ per cent interest, and repaid as follows: Cost of land, mortgage, &c., eighty years; cost of buildings, roads and sewers, sixty years.

The estimated annual receipts and expenditure in connection with the scheme is shown in the accompanying table.

New Baths at Birmingham.—New public baths for women, forming an extension of the Kent-street establishment, Birmingham, have been completed. The buildings provide one large swimming bath, 75 ft. in length by 30 ft. wide. On each side of the main entrance nine first-class and nine second-class private baths have been constructed. The internal walls are lined throughout with glazed bricks, the scheme of colour being silver grey and white with green carrara for moulded work. The building was designed by Messrs. Cossins, Peacock & Bewlay, architects, Birmingham, and erected by Messrs. B. Whitehouse & Sons. The engineering work was carried out by the engineering staff of the baths department, under the direction of Mr. J. Cox.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

HIGHWAY: DEDICATION.—The decision of the Court of Appeal in *Brockman v. Folkestone Corporation* (noted at p. 232 *ante*) has been reversed by the House of Lords (February 6th). The question in dispute was whether the Lower Sandgate-road, Folkestone, was or was not a highway repairable by the inhabitants at large. The road was made in 1827 by the then Earl of Radnor, and in order to determine the question it was necessary to decide whether it had become a public highway by informal dedication before March, 1836, when the Highway Act, 1835, came into operation. The matter came, in the first instance, before the Divisional Court upon appeal from the decision of the magistrates disallowing the objection of a frontager to a provisional apportionment under the Private Street Works Act, 1892, the objection being "that the road was a highway repairable by the inhabitants at large." That court thought that the case should be remitted to the magistrates to decide whether there had been a dedication of the road as a public footway prior to March, 1836. But the Court of Appeal (Lord Justice Fletcher Moulton dissenting) held that there had been dedication before that date, and consequently they allowed the frontager's objection. There was no evidence that the road was required for any other purpose than the use of the occupiers of houses which were erected on each side of it on building plots leased by the Earl. From the year 1831, however, it had, in fact, been used to a certain extent by other inhabitants of the neighbourhood. There was a gate across the road, with a toll-box annexed, and from before 1835 to the present time tolls had been levied for horses and vehicles, but spaces were left on either side for foot passengers. Notice boards were affixed with particulars of the tolls, and prohibiting the passage of motor cars, cattle and sheep, but not of foot passengers, and other boards described the road as a "private road." Before 1835 the road was left in a bad state of repair, but since that date it had been kept in repair by Lord Radnor or his lessees, and it had never been repaired by the local authority, nor had it ever been formally dedicated under sec. 23 of the Highway Act, 1835. The House of Lords having (as already stated) overruled the Court of Appeal, the frontager's objection is finally disposed of, and the provisional apportionment stands. This long-drawn-out litigation is another illustration (if one were needed) of the fact that it is impossible to give a general answer to the apparently simple question "When is a road repairable by the inhabitants at large?" The history of the road must be first known, and even then doctors may disagree.

QUERIES AND REPLIES.

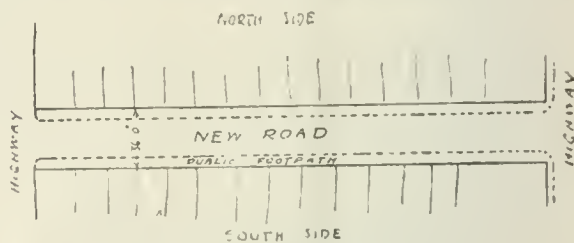
In order to avoid confusion querists are requested to use distinctive words as *noms de plume*. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

STREET SCAVENGING: HEAPS LEFT IN STREET: ACCIDENT: LIABILITY.—"Ford" writes: The highways in a borough are under the jurisdiction of the town council, and are kept in repair and scavenged by the said borough. It has been customary either to brush or scrape the mud off the roads, and to leave it in small heaps in the roadway close to the footpath for collection the same day or, where this is not possible, on the following day. An action is threatened against the borough for damages for negligence caused to a person falling over one of these heaps of mud at night-time and suffering damage. The heaps of mud were almost in a liquid state, and each covered quite a small area. Is there, in your opinion, any negligence on the part of the corporation, and can any claim be made against them for damages. I shall be pleased if you can give me any authority for or against any such claim.

I think it is highly probable that the corporation would be held to have been guilty of negligence in leaving the heaps unlighted and unguarded, and that damages could be recovered against them. In the Scotch case of *Nelson v. Lanarkshire County Council* (19 *Rettie*, 311), the council

were held liable for injuries sustained by a foot passenger tripping over a heap of road scrapings left by the council's workmen on a dark night. And there are several English cases in which local authorities have been held liable where accidents have occurred through heaps of stones, &c., being left on the road. See, for example, *Foreman v. Canterbury Corporation* (L.R., 6 Q.B., 214); *Gould v. Birkenhead Corporation* (74 J.P., 105).

PRIVATE STREET WORKS: PUBLIC FOOTPATH.—"Oughty" writes: My council are about to make up a new road under the Private Street Works Act, 1892. The path on one side of the road is a public one, and extends the whole length of the road. When the road is made up the urban district council have agreed to pay for the cost of repairing the footpath, but not for the kerbing and channelling which will be neces-



sary. I shall be glad if you will kindly inform me how this will affect the apportionment with regard to the following matter: (1) Are the council bound to pay for the kerbing and channelling which it will be necessary to put along the edge of the public path when making up the road? (2) Can the council, after deducting their contribution towards the cost of repairing the public path, apportion the cost of making up the road equally among the frontagers on both sides of the road? (3) Some of the owners of property on the south side of the road contend that they do not front, adjoin or abut on to the road, and are therefore not liable to be apportioned for any of the cost of making up the road. I shall be glad of your valued opinion on the above matters.

(1) Assuming that the footpath is repairable by the inhabitants at large, the frontagers cannot be charged with any work thereon, but only with what is done to the rest of the street. The kerbing would presumably be placed on the footpath itself, and the channelling on the adjoining roadway, in which case the channelling could be charged to the frontagers, but not the kerbing. (2 and 3) The cost of making up the street, exclusive of the public footpath, is apportionable among the frontagers on the north side only. The contention of the frontagers on the south side is correct.

LAYING OUT A NEW STREET.—"W. L. F." writes: About three years ago the owner of a piece of land built four houses thereon, the only approach to the houses from the public road being along a private road, about 14 ft. wide, belonging to the owner of the houses. The plans for the houses only were approved by the council. The owner of the road has given a right of user of the road to a local builder, who has a large piece of land abutting to the road, one house thereon has been built, and the remainder of the land offered in plots. Please advise: (1) Does the road come within the meaning of sec. 4, Public Health Act, 1875? (2) Can the owner be made to widen it to 36 ft. in accordance with the by-laws?

(1) The road is undoubtedly within the definition of a "street" contained in that section. (2) This depends upon whether he is laying out the road as a "new street." The cases as to what constitutes the laying out of an old road as a new street are not easy to reconcile with one another, and it is difficult, if not impossible, to deduce from them any general rule applicable to every possible combination of circumstances. But having regard to some of the more recent decisions, it would appear that the mere erection of a few houses fronting on an old road will not in itself amount to the laying out of that road as a new street. See *Gozzett v. Maldon Urban Sanitary Authority* (1891, 1 Q.B., 327); *Bushell v. Creer* (64 J.P., 600); *Deronshire Corporation v. Tozer* (1903, 1 Ch., 759).

PRIVATE STREET WORKS: APPORTIONMENT.—"Troy" writes: In the case of works carried out by a local authority under the powers of sec. 150 of the Public Health Act, 1875, should the cost of replacing defective kerbing, channelling and paving to footpaths

(laid down at the time the houses fronting the street were built) be charged to the owners of those houses only in front of which such replacement is found necessary (the work in front of the other houses being satisfactory and not requiring to be replaced)? Or should such cost be added to that of the carriageway, sewers, &c., and divided up between all of the owners in proportion to frontage?

Under this Act the expenses of executing the works referred to in the notices is recoverable from the owners in default according to the frontage of their respective premises, and there is no power (as there is under the Private Street Works Act, 1892) to have regard in making the apportionment to the amount or value of any work already done by the owners or occupiers of any premises. The entire cost of the works should therefore be lumped together, and apportioned according to frontage.

AUTOMOBILES AND IMPROVED ROADS.

[From an article by L. W. Page, Director of the United States Office of Public Roads, in the *Scientific American*.]

The total number of motor vehicles upon the roads of the United States last year was about 1,000,000, and during the year the sum of \$5,638,878 was paid in registration and licence fees. The mileage of improved roads amounts to about 222,000, including a large mileage of graded and shaped natural soil roads. There is therefore an average of about $\frac{1}{2}$ motor vehicles for each mile of such highways, and with a daily run of 25 miles, each mile of road would be traversed by 113 motor vehicles. The improved macadam roads are not able to withstand the action of the motor vehicle, and although there are many places where such roads may be made with economy and with confidence as to their service, this is not the case in densely peopled areas. The construction of bituminous-bound roads, and of concrete and brick roads, which has taken place since 1906 is almost entirely due to the effects of motor vehicles on the old water-bound macadam road. The improved roads are sustaining an amount of traffic several times as great as that of ten years ago, and the cost of maintenance per unit of traffic has probably not increased. The substitution of bituminous-bound crusts for water-bound macadam has increased the first cost from 20 to 40 cents per square yard, and has apparently increased the cost of maintenance from \$500 to \$600 or more per mile, including all charges.

THE NATURAL SOIL ROAD.

The natural soil road well drained and crowned is a most comfortable road during a large part of the year. Such roads have not been scientifically cared for in the past, but might now be given a thorough trial. "It is now known that, with persistent dragging, natural soil roads may be kept in splendid condition except in the very worst weather. It has not yet been demonstrated that an earth road built with the same care for grading, alignment and drainage structures that would be given to a bituminous macadam road, or a brick road, may not, after all, be a very economical type of road if properly maintained. If traffic on such a road develops in future there will be an excellent foundation for a superior surface. One reason that natural soil roads have not been considered by modern highway engineers is because such roads have never been maintained with sufficient continuity and care to demonstrate what they can do. There is no doubt that a well-built, sand-clay road, where the materials are carefully selected, is a most excellent highway. It will stand up under considerable traffic, and is very comfortable for automobiling. Of course, such a road must be maintained by skilled labour continuously."

Business Announcement.—The Barnstone Blue Lias Lime Company, Limited, Barnstone, near Nottingham, have appointed Mr. J. T. Hockley, of Grantham, as sole agent for "Vianex" in England, Ireland and Wales. The firm's Scottish agents are Messrs. Eben, More & Co., of Glasgow.

A District Council Without a Rate.—At their last meeting Louth Rural District Council accepted a recommendation of the Finance Committee that there should be no rate levied for the ensuing half-year. The chairman of the committee (the Rev. T. Longley) said that apparently they had raised nearly £3,000 too much. They had received from the county council £540 more than they expected. In road material alone they had spent £1,800 less than they expected, and, with the difference in labour, there was a total of £2,200 less than estimated for the roads.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bideford R.D.C. (March 23rd. Mr. H. A. Chapman).—£2,700 for the purchase of land and the erection of ten cottages, two in Buckland Brewer, four in Hartland (on two sites), two in Parkham, and two in Woolsery. It was stated that the plans prepared by Mr. W. H. Heal provided a large living-room, scullery, three bedrooms, sanitary accommodation, and pig shed and toolhouse. The council had been assured that every site would produce an adequate water supply. The council applied for an eighty years' loan for the land, and sixty years for the buildings. It was estimated that the rental would not exceed 3s. per week inclusive.

Blackpool T.C. (March 10th. Mr. F. H. Talloch).—£2,700 for the enlargement and improvement of the Cocker-street baths.—The borough surveyor, Mr. J. S. Brodie, said that under the Act of 1910 the corporation had power to borrow £10,000 for the acquisition and improvement of the baths. One of the main reasons for obtaining the power was that the old proprietors of the baths had a sea-water main down under the foreshore for the purpose of pumping sea water into the baths, and with the promenade extension scheme it was very desirable that that should be done away with. The excess expenditure for which the loan was required was partly due to the unsoundness of the walls below the ground level, which necessitated a good deal of underpinning, and the walls enclosing the large swimming bath were found to be defective and in a very leaky condition.

Bucklow R.D.C. (March 19th. Mr. W. M. Cross).—£1,624 for works of sewerage for the township of Baguley.—It was stated that the proposed scheme would do away with the existing works at Baguley sanatorium. The proposal was to connect a sewer to an existing culvert which ran through Baguley, Sale, and Ashton-on-Mersey and discharged near the river Mersey. This, it was argued, was the most economical method of dealing with the situation. The Manchester Ship Canal Company opposed the scheme on the principle that the company objected to any scheme which would add sewage to the silt which had to be removed from their waters. The Mersey and Irwell Joint Board also submitted that the Local Government Board should not sanction a scheme by which untreated sewage would be discharged into the Mersey.

Burnham-on-Crouch U.D.C. (March 13th. Mr. M. K. North).—£550 for building public conveniences and shelters, and for adapting an existing shed for the storage of the fire engine.—The plans were explained by the surveyor, Mr. J. Cook, and evidence in favour of the scheme was given by Mr. Edward Read (chairman) and Mr. C. T. Steward.

Dewsbury T.C. (March 4th. Major C. E. Norton).—£2,650 for the purchase of 17 acres of land in close proximity to Mitchell Laithe's sewage farm, for sewage disposal purposes.—The borough surveyor, Mr. H. Dearden, explained the scheme in detail, and there was no opposition; March 12th. Mr. P. M. Croftwaite).—£350 for the purchase of land in Wakefield-road, Earlsheaton, for the purposes of a refuse tip.—The town clerk, Mr. H. Ellis, said the site consisted of 16,020 sq. yds. of freehold land, and it was very suitable for the purpose to which it was to be devoted. It was not proposed to tip night soil, but only trade rubbish and street sweepings. He asked for sanction to repay the money in sixty years.

Hebden Bridge U.D.C. (March 11th. Mr. A. W. Brightmore).—£2,900 for the extension of the sewage outfall works at Mytholmroyd.—The clerk, Mr. S. Ogden, stated that the council had had to meet considerable opposition in their efforts to satisfy the demands of the Rivers Board. They had done that so well that no complaint had ever been received from the board. After the council had arranged to take in and treat part of the sewage of the Todmorden rural district early in 1912 the Rivers Board called attention to the need for extension. Mr. Newton, engineer, who has prepared the scheme, said that if the pumps were kept working longer hours it would do away with the objection that when the receiving

tank overflowed the sewage percolated into the land and thence into the river without treatment.

Leicester T.C. (March 11th. Mr. R. H. Bicknell).—£377 for the purchase of land for the widening of Bonner's-lane, and £1,006 for works of sewerage in and the widening of, Evington-road.—From the statement of the town clerk, Mr. H. A. Pritchard (with whom was the borough surveyor, Mr. E. G. Mawbey), it appeared that it is proposed to widen Bonner's-lane to 25 ft. With respect to the Evington-road proposal, Mr. Pritchard said that they had to pay very expensively for the lack of foresight of their predecessors, and the corporation felt that it was desirable in regard to the development of the outskirts of the town to make arrangements for the requirements of the future. This was eminently a case of that character, although it more approximates to meet the requirements of the present. There was a large development on that side of the town for residential purposes, and it was likely to continue.

Manchester T.C. (March 17th. Mr. W. M. Cross).—£50,000 for the purpose of the municipal hydraulic undertaking.—It was stated by the deputy town clerk, Mr. P. M. Heath, that the money was required for the provision of additional plant, the alteration and extension of buildings, and the extension of trunk and distributing mains. The corporation had established three power stations, one at Whitworth-street West, another at Pott-street, and the third at Water-street, and in those stations the most up-to-date plant for dealing with hydraulic pressure had been installed, and in addition over 26 miles of hydraulic mains had been laid. In 1895, the first year of the undertaking, 423 machines were connected with the hydraulic mains. To-day the number was 2,310, and the income derived from the undertaking was £35,431.

APPLICATIONS FOR LOANS.

Brierfield U.D.C.—£500 for electricity works extension, and £3,128 for private street works.

Cambridge T.C.—£450 for laying out the recreation ground.

Dagenham P.C.—£2,656 for street works.

Hayes U.D.C.—£4,500 for the purchase of land for workmen's dwellings, and £300 for the purchase of land for road improvement.

Rochdale T.C.—£700 for road widening.

Rowley Regis U.D.C.—£10,000 for the paving of footpaths.

Ryde T.C.—£5,025, supplemental loan for works of water supply.

Southend T.C.—£1,847 for sewer extensions.

Spalding R.D.C.—£300, supplemental loan for a water main.

Stanley (Yorks) U.D.C.—£14,000 for sewerage works.

Teddington U.D.C.—£700 for making up a street.

Walsall T.C.—£2,092 for electricity purposes.

Wilts C.C.—£270 for school extension at Wootton Bassett.

LOANS SANCTIONED.

Barnes U.D.C.—£1,250 for street and sewerage works, and fencing in connection with the Malthouse area improvement.

Blean R.D.C.—£580 for drainage extension.

Chester-le-Street R.D.C.—£3,833 for private street works.

Foots Cray U.D.C.—£2,050 for new municipal offices.

Hastings T.C.—£11,778 for the purchase of land for pleasure grounds.

Holywell U.D.C.—£12,500 for water supply and drainage schemes.

Hoylake and West Kirby U.D.C.—£7,200 for a cemetery, allotments, and a recreation ground, and £515 for the purchase of land for a refuse tip.

Kingsbridge U.D.C.—£250 for the purchase of land for a cattle market.

Lindsey (Lincs) C.C.—£1,655 for the purchase of a site for a new school.

Mansfield T.C.—£5,000 for the electricity undertaking.

Oakworth (Yorks) U.D.C.—£280 for road improvement.

Rochdale T.C.—£65,000 for the extension of the electricity works.

St. Austell R.D.C.—£4,325 for the Penwith water-works.

West Riding Asylums Board. £20,000 for asylum extension and other purposes.

FORTHCOMING INQUIRIES.

MARCH.		£
31.—	Bognor. For the provision of dwellings and a public convenience (Mr. H. S. Stewart)	1,128
31.—	Bolton. For the purposes of sewage disposal (Major J. Stewart)	5,400
31.—	Cheadle. For the purposes of water supply (Mr. A. G. Drury)	1,900
31.—	Chester-le-Street. For burial ground extension (Mr. R. H. Bicknell)	3,170
31.—	Christchurch. For works of sewerage (Mr. R. G. Hetherington)	—
31.—	Durham. For the purchase of land for a school (Mr. Edgar Dudley)	1,800
31.—	Higham Ferrers. For works of sewage disposal (Mr. W. M. Cross)	1,650
APRIL.		£
1.—	Chorley. For street and gas supply purposes (Mr. A. G. Drury)	32,083
1.—	Hebburn. For works of sewerage (Mr. R. H. Bicknell)	350
1.—	Llandudno. For works of sewerage (Major J. Stewart)	736
1.—	Towcester. For works of water supply (Mr. W. M. Cross)	80
1.—	Westbourne. For works of water supply (Mr. A. W. Brightmore)	6,402
2.—	Audlem. For works of water supply (Mr. A. G. Drury)	21,750
2.—	Blyth. For the provision of stables and depots (Mr. R. H. Bicknell)	2,750
2.—	Chippenham. For a housing scheme (Mr. H. S. Stewart)	2,460
2.—	Colwyn Bay. For road improvement (Major J. Stewart)	7,172
2.—	Hayes. For works of sewerage (Mr. W. M. Cross)	2,700
2.—	Middlesbrough. For the provision of a recreation ground and storeyard (Mr. Edgar Dudley)	10,240
2.—	Narberth. For the provision of dwellings (Mr. Edward Leonard)	6,012
3.—	Beaconsfield. For a housing scheme (Mr. H. S. Stewart)	8,600
3.—	Castleford. For road improvement (Mr. Edgar Dudley)	1,500
3.—	Failsworth. For private street works (Major J. Stewart)	5,694
3.—	Lymington. For works of sewage disposal (Mr. A. W. Brightmore)	11,772

Loans to Local Authorities.—The President of the Local Government Board stated in the House of Commons on Tuesday, in reply to a question, that the number of loans to local authorities sanctioned in each of the last three years is as follows: In 1911, 5,363; in 1912, 6,210; and in 1913, 6,382.

Town Planning Schemes.—Asked in the House of Commons last week as to the number of town planning schemes submitted to the Local Government Board for each of the last three years, Mr. Herbert Samuel stated that in the year 1911 authority was given for the preparation of ten schemes. In the year 1912 authority was given for the preparation or adoption of fourteen additional schemes, and three schemes were formally submitted for approval. In the year 1913 authority was given for the preparation of twenty-eight additional schemes, and two schemes were formally submitted for approval.

Concrete Institute: Junior Meetings.—It has been decided to hold informal meetings once a month during the session for the benefit of junior members of the Concrete Institute. The first meeting will take place on Friday, April 3rd, at 7.30 p.m., in the Council Room on the first floor at Demison House, 296 Vauxhall Bridge-road, Westminster, S.W. (close to Victoria Station), when Mr. E. Piander Etchells, F.PHYS.SOC., M.MATH.A., A.M.I.MECH.E., member of council of Concrete Institute, will take the chair. The business before the meeting will be the inauguration of the series of meetings and a discussion on problems proposed by the junior members attending.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Edinburgh £5,500, Esher and the Dittons £5,100, Glasgow £17,500, Southend; housing and town planning—Hendon; roads and materials—Camberwell, Edinburgh £12,743; sewerage and sewage disposal—Aldershot, Grimsby £19,107, Hull; water, gas and electricity—Greenock £50,000, Sleaford.—Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Birmingham T.C.—The Northfield public library, which was destroyed by fire, is to be rebuilt.

Bodmin T.C.—The borough surveyor, Mr. R. T. Buscombe, has prepared a detailed plan and estimate of the proposed new fire station which is to be erected on a site adjacent to the free library, at an estimated cost of £350.

Cambridgeshire C.C.—The Public Health and Housing Committees are about to consider the desirability of erecting cottages for the housing of the council's employees in those districts in which there is a shortage of suitable accommodation.

Dorset C.C.—The council have approved the proposal of the County Works Committee to extend the retaining wall along Preston beach a further 100 yds. towards Weymouth, at an estimated cost of £300, and to increase the length of the groynes not done last year at a cost of £300. It was stated that the groynes lengthened last year had helped to keep the shingle in position and from being washed away.

Edinburgh T.C.—It has been decided to build public washhouses in McLeod-street, at an estimated cost of £5,500.

Esher and the Dittons U.D.C.—A special meeting is to be held to discuss the proposals of a committee recommending the acquisition of a site for the centralisation of offices and depot, at an estimated cost of £5,100. The surveyor, Mr. H. C. Fread, estimates that in addition to other economies there would be a considerable saving of labour through having the depot in a central position.

Glasgow T.C.—The council have agreed to reconstruct the Couper Institute, Cathcart, at an estimated cost of £17,500.

Hastings T.C.—It is proposed to construct a public convenience at White Rock.

Northampton T.C.—The tender of Messrs. Souster & Son, at £1,699, has been accepted for the extension of the tramway car sheds.

Southend T.C.—The borough surveyor, Mr. E. J. Elford, has been instructed to obtain tenders for a corrugated iron building for tramcars, and to build at the depot a temporary shed for six buses.

Troon T.C.—The Duke of Portland has asked the corporation to accept a gift of £2,000 for the erection of a town hall.

HOUSING AND TOWN PLANNING.

Hendon U.D.C.—Subject to the sanction of the Local Government Board, the council have accepted a tender of £9,960 for the erection of fifty cottages at Child's-hill.

Kingstown U.D.C.—A housing scheme is to be carried out at an estimated cost of over £40,000.

Newcastle-on-Tyne T.C.—The council on Tuesday last affirmed the principle of providing municipal dwellings on a site adjoining Walker-road recent on ground, and in City-road.

Risca U.D.C.—A scheme has been adopted for the erection of 200 workmen's dwellings.

Stratford-on-Avon T.C.—The borough surveyor, Mr. R. Dixon, has submitted a site plan of the proposed new cottages, and the council have decided that all necessary plans for thirty-six cottages should be sent in draft to the Local Government Board for their suggestions before definitely settling them.

PARKS AND OPEN SPACES.

Bacup T.C.—The tender of Messrs. Cheal & Sons, Crawley, at £1,250, has been accepted for laying out the new public park.

Edinburgh T.C.—A bowling green is to be constructed at Morningside, at an estimated cost of £340.

REFUSE COLLECTION AND DISPOSAL.

Colchester T.C.—The council have adopted a scheme prepared by the acting borough surveyor, Mr. E. A. Slater, for the construction at the Hythe Quay depot of a raised tram-road on which to run the tipping wagons into the depot, so that they may discharge their loads of road material on to specially constructed concrete surfaces, from which the material can then be carted direct to the required locality without the expense of trimming the material, which would be necessary if it were carried and tipped on the level.

ROADS AND MATERIALS.

Ayrshire C.C.—The Northern District Committee are considering the question of improving the roadway at Routenburn Bridge, Largs, by widening the bridge from 10 ft. to 18 ft., straightening the east parapet, and raising the roadway in order to cope with the increased traffic. The cost is estimated at £250.

Barnes U.D.C.—The surveyor, Mr. G. Bruce Tomes, has prepared plans for the widening of Upper Richmond-road.

Barnoldswick U.D.C.—The council have approved a scheme for the construction of a new road, 36 ft. wide, commencing from Park-road to join the highway at Helbrook, and the Road Board and the West Riding County Council are to be approached with a view to obtaining a grant towards the cost of the work.

Camberwell B.C.—In the course of a discussion upon the annual estimates it was reported that the borough engineer, Mr. W. Oxtoby, M.INST.C.E., proposed an expenditure of £34,000 upon the roads, but the Works Committee cut down the amount to £15,000.

Cardiff T.C.—The Public Works Committee have decided to ask the Finance Committee to obtain a loan for the cost, estimated at £1,500, of treating with asphalt-macadam Park-place from Queen-street to the road contiguous to the Welsh National Museum site. It has also been agreed to lay down similar material in Kingsway, at an estimated cost of £864.

Garmarthenshire C.C.—A committee has been appointed to consider the desirability of constructing a new road through the valley between Ammanford and Pontardulais.

Devon C.C.—When it was proposed at the council meeting last week to appoint a surveyor of the northern district, the chairman stated that the Road Board had offered to "lend" the council one of their engineers as a friendly arrangement for the next two or three months. They had tried to get the board to give the county more than one-half of the cost of their improvement scheme, but the deputation were given to understand that the board would not increase their contribution unless the scheme was well thought out, including efficient superintendence of the work. In the circumstances the council decided to postpone filling up the vacancy in the northern district.

East Grinstead R.D.C.—The surveyor, Mr. C. Turton, has prepared plans and estimates for private street works which it is proposed to carry out at Three Bridges.

East Ham T.C.—It has been decided to carry out repairs in High-street, at an estimated cost of £4,000.

Edinburgh T.C.—Street works in hard wood, compressed asphalt, mastic asphalt and granite setts, involving an estimated expenditure of £12,743, have been approved by the council.

Exeter T.C.—The borough surveyor, Mr. T. Moulding, has prepared an estimate, at £2,995, for paving a portion of Sidwell-street.

Langholm T.C.—It is proposed to pave High-street with whinstone setts, at an estimated cost of £2,400, and the Road Board is to be asked to make a grant in aid of the work.

Mid-Lothian C.C.—It was reported recently to the council that the road surveyor had made suggestions for removing the cause of the complaint with respect

to the slipperiness of tarred roads. These suggestions would be put into operation in future treatment of the roads, and the surveyor had been instructed to inquire how the difficulty was being dealt with in other parts of the country.

Rhyl U.D.C.—It has been decided to support the scheme of the county surveyor, Mr. S. Evans, for the construction of a new road from Gronant to Rhyl, a distance of 5 or 6 miles. The estimated cost of the scheme is from £18,000 to £20,000.

Rochester T.C.—The tender of Messrs. Griffith & Co., at £500, has been accepted for repaving a portion of the Maidstone-road.

St. Columb R.D.C.—The question whether the council should retain the two surveyors, Messrs. T. T. Strongman and S. Gilbert, having regard to the fact that the county council will take over the main roads after March 31st, has been decided in the affirmative, it being considered that the district roads require the attention of the surveyors more than previously. The surveyors are to be paid the same salaries as before.

Taunton R.D.C.—It has been agreed to divide the district into two divisions for road purposes—one to be called the Eastern and the other the Western. At the same time it has also been decided that the salary of Mr. T. G. Crump, senior surveyor, be increased by £20 a year to assist him to provide a motor cycle, and that the salary of Mr. S. S. Orchard, the other surveyor, be increased by £40 on account of increased work, and also to meet the cost of a motor cycle.

Warrington T.C.—For the purpose of experiment, and in view of a silent pavement being desirable around the Oakwood-avenue school, it has been decided to pave several streets with granited asphalt.

SEWERAGE AND SEWAGE DISPOSAL.

Aldershot U.D.C.—A resolution has been passed to sub-divide the works connected with the sewerage scheme into three contracts—viz., contract No. 1 to embrace the reconstruction of the main sewer in Ash-road; contract No. 2 to comprise the works of subsidiary sewerage; contract No. 3 that connected with enlarging the pumping station and refuse destructor buildings; provision of extra boiler pump and pump well extension.

Chertsey R.D.C.—Plans for a surface-water drainage scheme, estimated to cost £1,643, have been forwarded to the Local Government Board.

Chesterfield T.C.—The medical officer of health has received instructions to report upon the sanitary condition of the town so far as closet accommodation is concerned, and also upon the water service in houses. It was stated by a councillor that in some instances one privy was used by the occupants of four houses, and that the sanitary conditions were "a disgrace to a civilised society."

Grimsby R.D.C.—The council have agreed upon a sewerage scheme for Immingham, at an estimated cost of £19,107.

Hull T.C.—The Health Committee have adopted a scheme for the conversion of privies into water-closets, using the powers under the Public Health Acts Amendment Act of 1907, which came into force in Hull in August, 1911. About 2,500 conversions are suggested as a first instalment, and this will need a sum of £20,000. When this has been expended a report on the work done will be submitted, and an application for a further loan will be considered.

Mid-Lothian C.C.—The council have acceded to the application of the Gala Water District Committee to borrow £1,150 for sewage purification works within the Gorebridge special drainage district.

Skipton U.D.C.—The construction of additional filters is receiving the attention of the Sewage Disposal Committee.

WATER, GAS, AND ELECTRICITY.

Barnoldswick U.D.C.—The council have engaged the services of Mr. E. J. Silcock, M.INST.C.E., of Westminster and Leeds, to report upon the water-works of the town with a view to increasing the supply which, owing to the rapid growth of the population, is at present insufficient.

Bodmin R.D.C.—The medical officer, Dr. A. G. Salmon, in his annual report, emphasises the need for water supplies in the scattered villages of the district, and for Port Isaac in particular.

Colchester T.C.—From a report by the acting borough surveyor, Mr. E. A. Slater, it appeared that

the cost of the 766 gas lamps for the past year averaged £2 13s. 8d. each, against £2 13s. 3d. the previous year, the 294 100-candle-power electric lamps £3 17s. 5d., against £3 18s. 7d., and the 65 50-candle-power electric lamps £2 4s. 11d. against £2 5s. 3d.

Fraserburgh T.C.—The council have approved the construction of a new water main from D. L. Lydford-road to Shore-street, for conveying the old water supply for distribution in the Shore-street and new harbour area.

Greenock T.C.—It has been decided to carry out extensions at the gas-works, at an estimated cost of £50,000.

Holywood U.D.C.—In addition to the £1,560 already authorised for water-works, a further sum of £500 is to be expended in raising the height of the embankment, flushing the filter-beds and other works.

Mid-Lothian C.C.—The council have acceded to the application by the Lasswade District Committee to borrow £460 for works of water supply within the Inveresk special water district.

Penrith U.D.C.—Improvements are to be carried out at the gasworks, at an estimated cost of £9,600.

Rye T.C.—The waterworks extensions at Cadboro have been completed, and both the new main and the reservoir have been subjected to satisfactory tests. The cost of the scheme is estimated at £4,300, and it has therefore been found necessary to apply for a supplemental loan of £400. The council have passed a vote of thanks to the water superintendent, Mr. W. J. Burnham, for the efficient manner in which he has supervised the work.

Sleaford R.D.C.—The question of water supplies for various parishes is under consideration, and meanwhile the Local Government Board have advised the council to resort to compulsory powers for the purchase of bores.

Tanderagee U.D.C.—As a result of the recent inquiry into the alleged defective water supply, the Local Government Board have given directions for the preparation of an order, under seal, directing the council to set about the provision of a proper water supply within a period of six months.

Wednesbury T.C.—The tender of the South Staffordshire Waterworks Company has been accepted for laying 760 yds. of main for the purpose of supplying the Delves with a supply of water.

MISCELLANEOUS.

Brighouse T.C.—After applying unsuccessfully to the West Riding chief constable for police old clothing, the council have purchased a quantity of policemen's overcoats from a dealer. They are to be served out to the street sweepers, whom the corporation recently promised to provide with overcoats.

Deptford B.C.—The council have resolved to support the view of the Wandsworth Borough Council that district surveyors' fees should be revised so that those payable in respect of additions and alterations to buildings should bear some relation to the value of the work executed instead of, as at present, being calculated upon the area of the buildings.

Richmond (Surrey) T.C.—The following revised scale of wages has been adopted: Drivers from 28s. to 29s. per week; refuse collectors and general labourers from 26s. to 27s. per week; scavengers from 25s. to 26s. per week, if and when they shall have completed five years' service with the corporation, subject in every case to the employee being able-bodied and to the borough surveyor reporting that his work is satisfactory; non-able-bodied scavengers from 22s. 6d. to 23s. per week, subject to all the above conditions being fulfilled, except that relating to able-bodied condition.

Todmorden T.C.—The council on Wednesday decided to adapt Centre Vale mansion for the purposes of a public museum. It was also resolved to establish municipal bowling greens. A special committee was empowered to purchase a motor fire engine for £1,150.

Brighton and Hove Railless Traction Differences.—While Brighton Council have decided in favour of the under-running system of railless trolley traction, owing to the necessity of crossing tramway tracks, the Hove Council appear to prefer the over-running system. Brighton Council therefore suggests that the matter should be referred to the arbitration of the Board of Trade.

PERSONAL.

Mr. W. F. Loveday, borough engineer of Stoke Newington, has been granted an increase of salary.

Mr. T. Bowes, assistant surveyor to the Brompton Rural District Council, has been voted an increase of salary.

Mr. Francis Bergin, Kildare, has been appointed temporary county surveyor for Kildare for a period of six months.

Mr. John H. Clarke, surveyor to the Haverhill Urban District Council, has been voted an increase of his salary of £20 per annum.

Mr. J. Hammond, surveyor to the Bedale Rural District Council, has been appointed a district surveyor under the North Riding County Council.

Mr. Hugh Owen, who has been surveyor to the Flint Corporation during the past forty years, has tendered his resignation on account of ill-health.

Mr. H. E. Basden, assistant superintendent of highways and works at Southend, has been appointed road inspector to the Islington Borough Council.

Mr. H. N. Woodard, assistant in the Paignton surveyor's office, has been appointed assistant to the surveyor to the Stourbridge Urban District Council.

Mr. C. G. Else, a member of the Ilkeston borough surveyor's staff, has been appointed assistant surveyor to the Sutton-in-Ashfield Urban District Council.

Mr. Robert McElroy, assistant surveyor to the Tyrone County Council, met with a serious accident recently while driving, and has been under medical treatment ever since.

Mr. John Murphy, who has been temporarily engaged on county council business, has been appointed assistant surveyor in the Timoleague district, under the Cork County Council.

Mr. W. Fawcett Wilkins, engineer and surveyor to the Barnet Urban District Council, has been appointed surveyor and inspector to the Dunstable Town Council at a salary of £225 per annum.

Mr. G. E. Ashforth, chief assistant surveyor and engineer to the Durham County Council, has been appointed assistant county surveyor and bridge-master to the Cheshire County Council.

Mr. T. H. Bell, surveyor to the Ramsbottom Urban District Council, has been voted £25 for his services in connection with the new destructor works, the tramway shed and the tramway undertaking generally.

Mr. H. Leonard Hinnell, M.INST.C.E., Manchester, has been engaged by the Ulverston Urban District Council to report upon the sewerage and sewage schemes designed by their surveyor, Mr. C. T. Hague, for the relief of the present sewers of the district and the treatment of the sewage.

Mr. E. G. Mawbey, M.INST.C.E., borough engineer and surveyor of Leicester, has asked the Electricity and Tramways Committee of that corporation to recognise in a tangible way the services he has rendered in the design and construction of the tramway track. He has all along contended that this work was outside his duties as borough surveyor, and it has been stated that the corporation were saved about £20,000 by his scheme of track construction.

Mr. C. C. Hutchinson, K.C., who recently passed away in the prime of life, was well known to municipal engineers and surveyors, as his practice was mainly at the Parliamentary Bar and in connection with arbitrations involving engineering evidence. In these matters Mr. Hutchinson had the advantage of having been trained as an engineer, and to the engineering profession he always evidenced a warm side. At one period of his early life he was engaged with the firm of Johnson & Co., of Stratford, E., the well-known makers of sludge presses.

With reference to the appointment of Mr. H. Hamer as chief assistant to the borough surveyor of Stockport, we are now informed that prior to his appointment at Stockport Mr. Hamer acted as deputy to Mr. W. J. Newton, borough engineer of Accrington, with whom he served his articles. Mr. Hamer is an associate member of the Institution of Civil Engineers, and a member of the Institution of Municipal and County Engineers, and while at Accrington

had charge of main roads, highways, sewerage and sewage works, public and private street improvements, tramways, and allotments. Mr. W. J. Heard was appointed deputy on the 2nd inst.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2.

SEWAGE DISPOSAL BY DILUTION.

To the Editor of THE SURVEYOR.

SIR,—After Mr. Kershaw's acknowledgment that he is in complete agreement with Colonel T. W. Harding's statement as to conditions of dilution, I agree that the matter should now rest, as I feel that the correctness of the contention contained in my letters—viz., that quality as well as quantity of diluting water must be taken into account—has been fully confirmed by Colonel Harding's statement with which Mr. Kershaw agrees.

I desire to tender my thanks for the opportunity you have so generously provided in your columns for the discussion of this important point.—Yours, &c.,

HUGH STOWELL, M.INST.C.E.

44 Mosley-street,
Manchester.

March 20, 1914.

HUMUS IN SLATE BEDS.

To the Editor of THE SURVEYOR.

SIR,—Mr. Dibdin calls my attention to an inadvertent error in my paper on sewage disposal, a portion of which you published last week.

I there stated that the residuum in the Dibdin slate bed has to be washed out from time to time. I had in mind the flushing out in situ through specially provided flushing holes, which I had seen in some of the earlier installations. Such an operation is not a very serious one in any event, but Mr. Dibdin now tells me that even this is no longer necessary, as, owing to the sharp fall now provided in the bed bottom, the humus passes away with the effluent, as in the case of an ordinary percolating filter.—Yours, &c.,

GILBERT J. FOWLER.

Manchester.

March 23, 1914.

Manchester Tramways and Street Improvement.

The general manager of the Manchester tramway undertaking, Mr. McElroy, has prepared a report which contains many proposals for the betterment of street traffic. He suggests, among other things, that underground tramways might relieve the traffic in the middle of the city, and that the corporation might create several new streets branching from Albert-square and from Piccadilly to shorten and expedite the journeys of the tramcars.

Slag Wool.—Messrs. F. McNeill & Co., Limited, Lamb Buildings, Bunhill-row, E.C., have issued a new catalogue of their patent "Lion Brand" slag wool. This publication contains a great deal of valuable information to architects and builders as to the best methods of applying this material in buildings for the purposes of fireproofing and sound deadening, and has the additional utility of bearing against each method of application the approximate cost, so that an architect may see at a glance what any particular application of the material as a fireproofing or sound-deadening medium will cost. Messrs. McNeill will be pleased to send to any of our readers a copy of the catalogue, post free, on application.

FOR OTHER ADVERTISEMENTS

See End of Paper.

ENGINEERING ASSISTANT.

The Battersea Borough Council require, temporarily, the services of an experienced Engineering Assistant. Must be an expert surveyor and leveller, a good draughtsman, and have had practical experience of sewer reconstruction. Salary at the rate of £150 per annum. Application must be made (on a form to be obtained from the undersigned) by 9 a.m. on Monday, 6th April.

W. MARCUS WILKINS,

Town Clerk.

PONTEFRACT CORPORATION WATER- WORKS.

ROALL PUMPING STATION.

The Corporation of Pontefract invite Tenders from firms of experienced Well Sinkers for the execution of the works comprised in Deepening the Existing Pump Well at Roall from 124 ft. to 200 ft. below the Engine-house floor, and driving Headings from the sides of the Well, and other incidental works for increasing the yield of water and maintaining the supply to the District.

Drawings and Specifications may be seen at the Pumping Station, or at the Office of the Engineers, Messrs. G. & F. W. Hodson, M.INST.C.E., Bank Chambers, Loughborough, and copy of Schedule of Quantities and Form of Tender may be obtained from them on deposit of cheque for £10 10s., which will be refunded to all persons making a *bonâ-fide* Tender, and on the return of the documents to the Engineers.

Tenders are to be made out on the Form supplied, and sent to the undersigned not later than the 27th April, 1914.

In the event of a Tender being withdrawn the deposit will be forfeited.

The Corporation do not bind themselves to accept the lowest or any Tender.

Dated this 25th March, 1914.

WILLIAM HADDOCK,

Town Clerk.

(1,489)

EAST SUSSEX COUNTY COUNCIL. TO ROAD CONTRACTORS.

Tenders are invited for the widening, improvement and reconstruction of the Lewes-Newhaven road from the boundary of the Borough of Lewes to the boundary of the Urban District of Newhaven, being in length 5½ miles, or thereabouts.

Plans may be seen on application at the County Surveyor's Office, and a copy of the Specification, Conditions of Contract and Bills of Quantities may be obtained from the undersigned upon payment of a deposit of five guineas, which will be returned upon receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Tender for Lewes-Newhaven Road Improvement," and addressed to the Chairman of the Newhaven Road Committee, must be delivered at the County Hall, Lewes, not later than Monday, the 27th of April, 1914.

The County Council does not bind itself to accept the lowest or any Tender, and will not pay any expenses incurred in connection with the preparation thereof.

F. J. WOOD, ASSOC. M. INST. C. E.,
County Surveyor.

County Hall, Lewes.

March 25, 1914.

(1,479)

CUMBERLAND COUNTY COUNCIL. HIGHWAYS AND BRIDGE DEPARTMENT.

REBUILDING "METAL BRIDGE."

The above Council invite Tenders from Contractors licensed to execute Ferro-Concrete Construction on the Hennebique System for the Reconstruction in Ferro-Concrete of "Metal Bridge" across the River Esk, in the Parish of Kirkandrews-on-Esk, about 6½ miles from Carlisle, on the Glasgow main road.

Plans and Specifications, &c., can be inspected, and Forms of Tender obtained at the Office of the undersigned, on payment of £2 (which sum will be returned on receipt of a *bonâ-fide* Tender), on and after the 23rd of March, between the hours of 9.30 a.m. and 4 o'clock p.m.

Sealed Tenders, endorsed "Tenders for Metal Bridge," must be delivered to the undersigned before twelve o'clock noon on the 25th of April, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

WILLIAM FINCH,
County Surveyor and Bridge Master.

The Courts,

Carlisle.

March 17, 1914.

(1,483)

FOR SALE.—"Proceedings" of the Association of Municipal Engineers. Twenty volumes, 1887-88 to 1906-07. Offers invited.—J. H., 18 Ashfield-road, King's Heath, Birmingham. (1,481)

ROAD BOARD GRANTS TO IRELAND.

OFFICIAL FIGURES.

A statement was given in the House of Commons on Tuesday showing the amounts paid under grants and loans by the Road Board to county councils in Ireland in the financial years ended March 31, 1912, March 31, 1913, and the eleven months ended February 28th last.

The figures for the first-mentioned period were as follow: Grants £18,073, loans nil; for the second—grants £25,040, loans £3,721; and for the third—grants £23,909, loans £6,199. Amounts outstanding and not yet requisitioned were: Grants £190,961, loans £39,003.

In reply to a question the Secretary to the Treasury stated that no sums by way of grant or advance had been paid by the board to local authorities in Ireland during the three years for purposes other than road improvement.

THE ADVISORY STAFF.

Questioned as to what officials or staff were employed under the board in Ireland for advisory or inspection purposes, and whether, if any of these officials are in the employment of Irish departments or local authorities, he would state on what terms and conditions the board had obtained their assistance, Mr. Montagu said that at the present time two engineering inspectors on the staff of the Road Board—namely, Messrs. J. P. J. Butler and R. W. Butler—were employed. In addition, Mr. P. C. Cowan, chief engineering inspector of the Local Government Board for Ireland, was a member of the Advisory Engineering Committee of the Road Board, the constitution and duties of which were set forth in the board's first annual report. Mr. Cowan received no payment for his services as a member of that committee. He was the only member of the Local Government Board staff employed on the Road Board staff in Ireland. An Advisory Engineering Committee was appointed last year, and Mr. Cowan was a member of it. Asked who decided as to the grants, Mr. Montagu replied: "I do not know that they actually advise."

Road Improvement Fund.—Asked in the House of Commons on Wednesday as to the method of calculating the shares of England, Scotland and Ireland of the Road Improvement Fund, the Secretary to the Treasury stated that the grants were not allocated in rigid proportions to highway authorities in any prescribed area, but those indicated up to February 28th last worked out in the following proportions: England and Wales, £3,133,271 (84 per cent of total); Scotland, £340,424 (9 per cent); Ireland, £257,986 (7 per cent).

Bayard Cars.—For the motorist of unlimited means the choice of a motor car presents no difficulty, but the man to whom price is a consideration is confronted with a very real problem—to decide which of the many more cars of lesser cost represents his soundest investment. The new twenty-four-page catalogue just issued by Bayard Cars, Limited, presents their 1914 range of six models, from 8-h.p. to 30-h.p., at prices which represent excellent value, bearing in mind the exemplary reputation these cars have earned. This new catalogue synchronises with the company's move to more commodious premises at 155-7 Great Portland-street, W., which is in itself a happy augury for the continued success of the Bayard car.

Lifting Machinery.—We have received from Messrs. Herbert Morris, Limited, Empress Works, Loughborough, copies of their latest catalogues, Nos. 55 and 92, and a pamphlet dealing with their standard electric overhead travelling cranes. Catalogue No. 55 illustrates and describes the firm's latest types of their hoist blocks, electric trolley hoists, and runways for electric operation, also their standard types of cupola hoists, freight elevators, and self-landing and delivering hoists for power operation. These gears are fully priced. All the gears described in the book are built on interchangeable lines, and of the same first-class material and workmanship as Messrs. Morris's electric cranes, which are so well known and widely appreciated. Catalogue 92 deals specially with the company's 90 per cent efficiency spur-gear pulley-block, and further gives some particulars of overhead runways and cranes. The pamphlet illustrates and describes Morris standard electric overhead cranes.

The Calder Vale, Wakefield, Sewage Disposal Works.*

By J. P. WAKEFORD, M.INST.C.E., City Surveyor.

During the past three years these works have undergone considerable extension and remodelling at a cost of £28,000.

They are now practically complete, with the excep-

I anticipate that in two months' time the full quantity will be treated.

The following comparative analyses will indicate the results obtained:—

RESULTS EXPRESSED IN PARTS PER 100,000.

Sample.	Oxygen absorbed in 1 hrs. from $\frac{N}{80}$ KMnO ₄ at laboratory temp.	Chlorides (as Cl)	Ammonia (as N)		Nitrates as N	Nitrites as N	Dissolved oxygen taken up in 5 days at 65° Fahr.	Suspended Solids.		
			Free and saline	Albuminoid				Total	Loss on ignition	Ash
Crude ...	10.80	15.8	2.670	1.250	—	—	—	42.0	25.20	16.80
Tank effluent ...	5.20	16.0	2.470	.780	—	—	—	8.40	3.50	4.90
Final effluent ...	1.70	15.8	1.230	.260	.90	.08	1.85	2.40	1.05	1.35

tion of the coupling up of the sewage from the Sandal area, which is at present treated at a separate disposal works which are shortly to be abandoned and the sewage brought to Calder Vale for treatment.

The original works, put down in 1898, were found to be inadequate owing to the nature of the soil, which, being largely clayey marl, was altogether unsuitable for filtration purposes. This scheme was chemical precipitation, continuous settlement, and filtration on land. The sludge was dried in lagoons, and a small sum given to farmers to get rid of it.

The principal features of the new scheme include:

- (1) Alteration to existing detritus tanks.
- (2) Provision of two electrically driven pumps—capacities 2,000 and 4,000 gallons per minute.
- (3) Lime-mixing house, provided with two mixers (Gabbett's patent) and the necessary electric power and pumping installation for same.
- (4) Ferric-sulphate house, with leaden vats, &c.
- (5) Meter house (2) with Lea recorders.
- (6) An increase in the tank capacity to 18½ hours dry-weather flow, and the provision of baffle and scum boards.
- (7) Percolating filters—3¼ acres, average depth 6 ft., with the necessary conduits, channels, syphons, &c.
- (8) Humus tanks (three), total capacity equal to about three hours' dry-weather flow.
- (9) Storm areas (two).

The works have been designed to deal with a maximum volume during times of storm of 10,000,000 gallons per day. The dry-weather flow has been estimated at 2,000,000 gallons per day. This estimate, however, includes the sewage from the Sandal area, and the sewage from the outlying district of Crigglestone.

In considering the scheme from the outset it was quite apparent that some description of precipitant was necessary. Experiments were undertaken, and the results have been the subject-matter of two papers which I gave before the Royal Sanitary Institute, the first at the annual congress in Belfast in 1911, and the second last year at the congress at Exeter. I must therefore refer you to those papers for full information regarding precipitants.

In actual practice it is found that lime alone, if added in proper proportions, gives excellent results, and therefore for the present, at any rate, the use of ferric sulphate has been abandoned, and an annual saving of £400 thereby effected. The amount of lime necessary is an average of 13.5 grains per gallon of the dry-weather flow, and used in this proportion the alkalinity of the tank liquor is, approximately, equal to 2.8 parts (CaO) per 100,000, experience proving that this alkalinity is reduced in passing through the first foot of the media to 0.8 CaO, and samples taken 2 ft. below the surface give no reaction to phenolphthalein.

The whole of the filter has now been in use four months, and the quantity treated has been gradually increased up to 60 per cent of the dry-weather flow.

* Paper presented at the North-Eastern District meeting of the Institution of Municipal and County Engineers held at Wakefield on Saturday last.

GENERAL DESCRIPTION.

At the termination of the 6-ft. barrel sewer, the sewage enters the detritus tanks through ½-in. screens, which have been completely overhauled with new rakes and an automatic cleansing device. These screens can be operated either by hand or by a motor drive. The amount of screenings per week is about 36 cwt. The detritus tanks are in duplicate, each with a settlement capacity of 32,700 gallons, and a storage capacity of 26,300 gallons, making a total capacity in the two tanks of 118,000 gallons. The sewage passes from the detritus tanks to the pump wells, and is lifted a height of 19 ft. to the inlet channel, along which it passes to the precipitation tanks. The pumping capacity on completion will be:

No. 1	Electrically driven	4,000	galls. per min.
2	" "	2,000	" "
3	Steam	1,600	" "
4	" "	4,000	" "

the object being to instal sufficient pumping power to enable any three pumps to deal with 5 volumes of sewage (6,950 gallons per minute) in case of a breakdown of any one pump.

The Local Government Board requirements as to the quantity of sewage to be dealt with is 6 volumes of the dry-weather flow, but in the present instance representations were made to the board that, as half the flow at Calder Vale is trades waste (which does not increase in wet weather), that the discharge is into a main stream, and that it is proposed to deal fully with more than the quantity ordinarily stipulated by the board in places where a considerable portion of the flow is trades waste, the corporation suggested that anything over 5 volumes should be permitted to go direct to the river, and after some correspondence the board assented to this proposal.

In its passage along the inlet channel the precipitants are added to the sewage, baffle stones being provided for the more effective mixing of the lime, &c., before entering the precipitation tanks.

The lime mixers, which are in duplicate, are known as Gabbett's patent, supplied by Messrs. Young & Co., Nine Elms Ironworks, London. They are electrically driven, and are quite satisfactory in their working. A portion of the filtered effluent from the humus tanks is conveyed to a well in the liming house, whence it is pumped up to a steel tank in the roof of the building, and used for lime-mixing purposes.

At the end of the inlet channel a weir is placed adjacent to its junction with the carriers supplying the precipitation tanks, and is set to discharge at 3 volumes so as to permit the flow up to this amount to pass through the tanks. The flow between 3 and 5 volumes passes forward through the culvert between the tanks into the newly constructed storm-water carrier to two of the disused land filtration areas. Portions of these areas are walled off to arrest solids, and adjustable weirs opening downwards are inserted to permit of the effluent being drawn off to the filtration areas to a depth of 18 in. The effluent, after being so drawn off, is discharged into the existing underdrains through outlet chambers fitted with adjustable weirs.

The maximum flow to be treated on the filter is

6,000,000 gallons per day, and the capacity of the filter is 15,617 sq. yds. = 3.227 acres (average depth, 6 ft.).

The rate of treatment is as follows:—

	Galls. per day per sq. yd.	Galls. per day per cube yd.	Galls. per day per acre.
Average (D.W.F.)	128	63.9	619,000
3 volumes	384	191.7	1,857,000
or average	1 gall. per sq. yd. every 11 mins.		
Maximum	1 " " " 3 1/2 mins.		

The area required to treat this flow (2,000,000 dry-weather flow) at 65 gallons per cube yard (Local Government Board requirement) is 15,385 sq. yds.

Therefore the area laid out is 232 sq. yds. in excess of present requirements, or would deal with an additional flow of 30,150 gallons, representing a population of 737 persons.

The three volumes passed through the precipitation tanks (capacity eighteen hours' dry-weather flow) passed to the tank effluent channel, and thence through the lead culvert to the supply channel by means of four adjustable telescopic feed pipes. This method allows the supply channel to be used in eight separate sections, so that portions of the filter might be thrown out of use as required. In this channel thirty-two syphons have been fixed. These discharge automatically into chambers from which the sewage passes through delivery pipes laid upon the floor of the filters, and communicating by means of vertical pipes with 15-in. half-pipe distributors, cement-jointed, laid upon the surface of the filters. From the half-pipe distributors 3-in. diameter butt-jointed earthenware pipes are laid at intervals of 3 ft., and on the syphons coming into action the liquid escapes from every joint of the pipes, the distribution over the surface of the bed being effected by a top layer of moderately fine material, grading down to larger sizes beneath.

When an efficient state of affairs has been set up this upper fine layer retains the liquid to an extent necessary to provide an equable flow throughout the body of the filter. This method of distribution, which has been adopted owing to the limited fall and the size of the filtering media, and on account of subsidence due to colliery workings, is virtually a compromise between the two methods, type 3 and type 4, referred to on page 92 of the Fifth Report of the Royal Commission. The corporation have been exceptionally fortunate as regards the filtering media, both in respect of its excellent quality and the price paid for it. The gravel has been dredged from the river at Horbury, about 3 miles up the river, and the clinker obtained from the destructor on site. The gravel has been washed, graded and placed in position in the bed for 4s. 6d. per cube yard, while the clinker has cost 2s. 6d. after being crushed and dealt with similarly to the gravel. The sizes of the media, for three-quarters the area of the filter are:—

	Depth.	Grade.	
Bottom layer	1 ft. 0 in.	4 in. to 3 in.	Gravel
	2 ft. 8 in.	3 in. to 1 1/2 in.	Gravel
	1 ft. 0 in.	1 1/2 in. to 1/2 in.	Gravel
Top distributing layer	10 in.	1/2 in. to 1/4 in.	Clinker
	6 in.	1/4 in. to 1/8 in.	Clinker
	6 ft. 0 in.		(free from dust)

The remainder has been graded as follows:—

	Depth.	Grade.	
Bottom layer	1 ft. 0 in.	4 in. to 3 in.	Gravel
	1 ft. 8 in.	3 in. to 1 1/2 in.	Gravel
	1 ft. 0 in.	2 in. to 1 1/2 in.	Clinker
	1 ft. 0 in.	1 1/2 in. to 1/2 in.	Clinker
	10 in.	1/2 in. to 1/4 in.	Clinker
	6 in.	1/4 in. to 1/8 in.	Clinker
	6 ft. 0 in.		

A 6-in. concrete floor, covered with Naylor's tiles, has been laid underneath the gravel media, the floor having a fall towards the filter effluent culvert.

The filtered effluent passes from the bottom of the filter to this culvert, which is situated beneath the supply channel and the feed culvert, and thence to the humus tanks, which are provided with sump boards, and have a capacity of about three hours' dry-weather flow, after which it passes over a weir into the effluent channel, and is conveyed by a 27-in. pipe and a short length of 30-in. brick culvert to the old outlet into the river Calder.

SLUDGE DISPOSAL.

The old method of drying in lagoons was very unsatisfactory. It was expensive, costing about £100 per annum, and was a source of nuisance,

stinking abominably at times. Now a Tangyes' horizontal double-acting sludge pump has been installed in each of the sludge tanks, and each pump is capable of lifting a week's supply of sludge in twelve hours. This sludge is forced through a 6-in. cast-iron main on to portions of the land to be trenched in and finally disposed of. It is estimated that the 21 acres reserved for this purpose will be raised at the rate of 1.87 in. per annum. The cost in this way has been reduced to about £170 per annum, while the nuisance from smell has been reduced to a minimum, no complaints having been raised during the past three years, during which time the sludge trenching has been in vogue.

The top water from the sludge in the sludge tanks is drawn off into the detritus tank by means of a floating arm; in this way the moisture is reduced from 94.5 to 92.7 per cent (approximately). The sludge produced from the precipitation tanks is equal to 60 tons per day, containing 90 per cent water, and from the humus tanks 2.63 tons per 1,000,000 gallons.

RURAL HOUSING.

GOVERNMENT COTTAGE BUILDING.

We understand that the Local Government Board for Scotland have informed a correspondent that, subject to any modifications necessitated by differences in Scottish law practice, the undertaking as expressed in the letter addressed on December 4th last by the President of the English Local Government Board to Mr. Henry Hobbhouse, is intended to apply to Scottish as well as to English rural districts. That letter appeared in the Press on December 5th, but the following extract is sufficient to show the terms of the undertaking:—

"I am in a position to announce, on behalf of the Government, that, in any case in which a rural district council now gets the sanction of the Local Government Board and starts to build cottages in its district under the Housing Acts, the State, when the necessary powers to enable it to provide cottages in rural areas have been obtained, will be willing to take over the council's cottages with the liabilities then properly outstanding in respect of them. This will be subject to the Local Government Board giving a certificate, in each case, that the houses were built to satisfy a real demand, that they are satisfactory in construction, and are reasonable in cost."

School Heating.—The Park Schools new observation block, Hanwell, are being supplied with Shorland's warm air ventilating patent Manchester stoves and grates by Messrs. E. H. Shorland & Brother, Limited, of Failsworth, Manchester.

Metropolitan Asylum Extension.—At the Saturday's meeting, the Metropolitan Asylums Board approved, subject to the sanction of the Local Government Board, of a scheme for the extension of the Tooting Bee Asylum, at an estimated cost of from £151,500 to £165,854.

Institution of Civil Engineers.—The examiners' report on the February examinations for admission to associate-membership of the Institution of Civil Engineers contains notifications that Mr. Geoffrey Alden Stevens, building surveyor to the city engineer, Norwich, has passed in Section A, including scientific knowledge, and that Mr. Frederick Charles Riley, assistant in the electricity department, has passed in the whole of the subjects. Both these gentlemen were articled pupils of the city engineer of Norwich, Mr. A. E. Collins, M.A.S.T.C.E.

Royal Masonic Institution for Boys: April, 1914, Election.—The support of municipal officers is earnestly solicited on behalf of Frederick Charles Lloyd, the eleven-years-old son of the late Bro. Frederick Charles Lloyd, town clerk of Croydon, who died on July 18th last, leaving a widow and six children, five of whom are under twelve years old and dependent upon her. Before going to Croydon Bro. Lloyd was town clerk of Huddersfield, and prior to that deputy town clerk of Cardiff. He was initiated in the Bute Lodge, No. 960, Cardiff, in 1891. The candidate will be twelve years of age in July next, and will not be eligible to contest another election; this is therefore a "last-chance case." Proxies will be thankfully received by W. Bro. T. W. Wood Roberts, F.M. 1556 and 3363, L.R., 59 Park-lane, Croydon (hon. secretary).

RECENT DEVELOPMENTS IN COMMERCIAL MOTOR-VEHICLES.

By THOMAS CLARKSON, M.INST.C.E.

[Abstract of paper read at a meeting of the Institution of Civil Engineers on Tuesday evening.]

The period reviewed in this paper has witnessed the evolution of the motor omnibus as it exists to-day. Greater facilities for the transport of passengers in cities are constantly in demand. Electric rail motors, both on the surface and underground, have met this demand to some extent, but the motor bus has already demonstrated its superiority over the rail car or tram. Complete flexibility is obviously impossible in motors dependent upon an extraneous power station; the vehicles must be self-contained, and the power generated from within. The author regards flexibility as the key to the successful solution of the street-traffic problem in cities.

By reason of the extent of the subject, it is scarcely possible, within the limits of a paper, to do more than select for examination some typical examples of the commercial motors of the present day, and consider the suitability of various types of motor to the diverse conditions of industrial transport. There are at present three methods of generating power for commercial transport—namely, by internal-combustion engines, by steam engines, and by electric motors. Each of these methods has found a fairly clearly defined field of utility. The internal combustion motor far outnumbers the other types of motor for nett loads up to 3 tons. For heavier duty than this, the steam motor continues to hold the field. The rise in the price of petrol has directed attention to other liquid fuels for the internal-combustion motor, and the steam motor using solid fuel is being adapted for loads less than 3 tons, with the object of checking the ever-growing demand for motor-spirit.

The electric vehicle supplied with energy by a storage battery has made remarkably little progress in England.

FUEL.

The petrol motor is confined to the employment of a volatile liquid fuel; the steam motor may use either liquid or solid fuels.

The relative cost of the two systems for fuel per mile is, of course, governed by the ratio between the cost per pound of fuel and the mileage per pound. The fuel cost for a 3-ton petrol commercial vehicle, with petrol at 1s. 4d. per gallon, and at 8 miles per gallon, works out at 2d. per car-mile. The London petrol bus, which may be taken as equivalent to the 3-ton commercial vehicle, costs about 1d. per car-mile for fuel. This lower fuel cost, it should be explained, is not due to superior engine efficiency, but is the result of an exceptionally favourable contract for the purchase of petrol in very large quantities. The present cost of fuel for London petrol buses is, therefore, abnormal from the point of view of the ordinary user of petrol commercial vehicles.

The steam omnibus at present costs, for liquid fuel, 1-875d. per mile, which is a little less than the cost of the ordinary petrol 3-ton vehicle. The steam omnibus, or 3-ton lorry, using coke, costs for fuel 0-4d. per mile with coke at 13s. per ton.

The significance of this economy, and the real value of an apparently small reduction in cost per mile, is indicated by the fact that 4d. per mile represents, approximately, £200,000 per annum on the cost of running London omnibuses.

With regard to the relative reliability of petrol and steam cars, it has been demonstrated conclusively that with either type of motor the mileage lost from mechanical causes is extremely small, even when performing a commercial duty involving an annual mileage of 30,000 miles and more per vehicle.

As regards the cost of mechanical upkeep, there does not appear to be any reason for a material difference between the two systems under this heading when they are run under similar conditions of management. The light steam 3-ton vehicle using coke as fuel may be regarded as combining the speed and handiness of the petrol motor, with a fuel cost equivalent to petrol at 4d. per gallon.

The paper gives details of the construction of present types of both steam and petrol omnibuses, and deals particularly with modern methods of omnibus illumination. The important question of the construction of road wheels most suitable for commercial motors of from 30 cwt. to 3 tons capacity is dealt with. The present position of the electric commercial

vehicle is considered in relation to other types of motor, particularly with reference to the investigations of working costs which have been recently conducted by the Massachusetts Institute of Technology.

The paper concludes with a reference to modern steam motor wagons and tractors.

"Warwick" Sprinklers for Lambeth.—The Lambeth Borough Council have, we understand, decided, after trials, to place an order with Messrs. Glover & Sons, of Warwick, for the supply of forty-eight of their "Warwick" sprinklers to be fitted to existing water vans in place of various other distributors.

Fortrose Water Supply.—A new water supply for the burgh of Fortrose, including the older burgh of Rosemarkie, was formally turned on last week. Up to twenty-one years ago the burgh was supplied by wells in the neighbourhood, which had been in the old days considered ample. The head springs are about 3½ miles from the town.

Excursions in the Eastern Counties.—The Great Eastern Railway Company are drawing attention to the very low rates which they offer for the conveyance of pleasure parties from London and their suburban stations to the seaside, Epping Forest, and Rye House. An illustrated pamphlet, giving full particulars, can be obtained on application to the superintendent of the line, Liverpool-street Station.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

SOUTH-EASTERN DISTRICT.

A South-Eastern District meeting is to be held at the Town Hall, Tunbridge Wells, to-morrow (Saturday).

PROGRAMME

11.30 a.m. Members will assemble at the town hall. Welcome by his Worship the Mayor (Mr. Councillor C. W. Emson, J.P.).

District business.

1 p.m. Members will partake of luncheon at the Royal Mount Ephraim Hotel (tickets 3s. per head).

2 p.m. Members will proceed by motor conveyances (fare 2s. each) to Mount Ephraim, Major Yorke's-road to Forest-road, along Forest-road and thence to Pembury—

(1) To inspect the Tunbridge Wells Corporation waterworks;

(2) To proceed to and inspect the Tunbridge Wells Corporation electricity works.

Tea will be kindly provided by the Mayor.

Other works of interest to surveyors and engineers in Royal Tunbridge Wells: High-street bridge, indoor baths, technical institute, cemetery and sanatorium. Arrangements can be made for any members who desire to do so to inspect any of the above works.

H. W. BOWEN, A.M.I.C.E., A. DRYLAND, M.I.C.E.,
Hon. District Secretary. *District Chairman.*
County Surveyor's Office, County Surveyor,
Horsham. Surrey.

EASTERN DISTRICT.

A meeting of the Eastern District is to be held at Chelmsford on April 18th.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on June 13th.

THE ANNUAL MEETING.

The date for the annual meeting of the Institution of Municipal and County Engineers at Cheltenham has been fixed definitely for June 24th, 25th, 26th and 27th next. It has been decided to make a special feature of town planning and of roads, and, if possible, to arrange for an exhibition of town plans.

THOMAS COLE,
Secretary.

92 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

COUNCIL MEETING.

At a meeting of the council held at Leeds last Saturday the following applicants were recommended for admission:—

To Membership.—Messrs. F. W. Ellis, chief assistant, Colne; and C. B. Barnes, assistant surveyor, Gloucester Rural District Council.

To Associate-Membership.—Mr. F. J. Dean, surveyor's office, Plympton Rural District Council.

Transfer to Membership.—Mr. S. E. Axon, assistant city engineer and surveyor, Adelaide.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

Architects' Registration Bill.—The council, after consideration of the report of the General Purposes Committee, decided that the Bill be opposed unless provision be made either for the registration of all municipal engineers under the Act or for their exemption from its operation.

Town Planning Institute.—It was decided that application be made to the institute asking them to recognise membership of the institution as sufficient qualification for admittance to their body.

Sectional Conferences on Arterial Road Communication in Greater London.—The secretary submitted certain correspondence in this matter, and the council strongly endorsed his action in claiming the right of the institution to be represented at the conferences.

Members are requested to note the following correction: A meeting will be held at Darlington on April 18th, and at Hexham on May 2nd.

The next meeting of the council will be held in London on Wednesday, April 29th.

B. WYAND,
39 Victoria-street, S.W. Secretary.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

TEMPORARY ENGINEERING DRAUGHTSMAN.—March 30th.—Godstone Rural District Council.—Mr. Geo. E. Crowter, engineer and surveyor.

SUPERINTENDENT OF CLEANSING.—March 31st.—Corporation of Glasgow. £550—£700 per annum.—Mr. J. Lindsay, town clerk.

HYDRAULIC ENGINEER.—March 31st.—Nenagh Urban District Council.—Mr. Frank R. Maloney, town clerk.

JUNIOR ASSISTANT.—April 1st.—Wanstead Urban District Council. £70—£100 per annum.—Mr. Bruce Blewitt, clerk.

ENGINEER AND SURVEYOR.—April 2nd.—Barnet Urban District Council. £250 per annum.—Mr. H. W. Poole, clerk.

ASSISTANT SANITARY INSPECTOR.—April 3rd.—Corporation of Middlesbrough. £105—£140 per annum.—Mr. P. Kitchen, town clerk.

ROAD SURVEYOR.—April 4th.—Norfolk County Council. £140—£180.—Mr. T. H. B. Heslop, county surveyor, Shirehouse, Norwich.

TEMPORARY ENGINEERING ASSISTANT.—April 4th.—Finchley Urban District Council. 2½ guineas per week.—Engineer and Surveyor.

ASSISTANT TO COUNTY ROAD SURVEYOR.—April 5th.—Breconshire County Council. £80 per annum.—Mr. W. Lewis Harpur, county roads surveyor, County Hall, Brecon.

TEMPORARY ASSISTANT.—April 6th.—Hiracombe Urban District Council.—Mr. O. M. Prouse, engineer and surveyor.

WATERWORKS MANAGER.—April 6th.—Neath Rural District Council. £300 per annum.—Messrs. Cuthbertson & Powell, clerks.

SURVEYOR'S OFFICE ASSISTANT.—April 6th.—Urnston Urban District Council. £1 per week.—Mr. T. J. Rowland, clerk.

SURVEYING ASSISTANTS.—April 21st.—Shanghai Municipal Council. £335 per annum.—Messrs. John Pook & Co., agents for the Shanghai Municipal Council, 68 Fenchurch-street, London, E.C.

CLERKS OF WORKS.—Rivers Committee of the Manchester Corporation. £3 3s. per week.—Chairman of the Rivers Committee.

ASSISTANT SURVEYOR OF ROADS.—Public Works Department, Gold Coast Government. £300—£350, with £7 10s. per month allowance.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAY WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAY to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

CORNWALL.—March 30th.—For the supply of twenty-four portable shelters, for the Tuberculosis Committee.—Mr. C. L. Cowland, clerk, Bodmin.

BOURNEMOUTH.—March 30th.—For the erection of new schools and alterations to existing schools, for the Education Committee.—Borough Engineer.

OSWESTRY.—March 30th.—For the erection of a lodge in Cae Glas Park, for the corporation.—Mr. G. William Lacey, borough engineer and surveyor.

GLAMORGAN.—March 31st.—For the erection of two cottages, for the county council.—County Hall, Cardiff.

SWANSEA.—March 31st.—For the construction of masonry and concrete approaches and piers, for a steel girder bridge of 111-ft. span, also for the supply of steelwork for the said bridge, for the corporation.—Mr. H. Howard Humphreys, 28 Victoria-street, Westminster.

WATERLOO - WITH - SEAFORTH.—March 31st.—For additions and alterations to fire station, for the urban district council.—Mr. F. Spencer Yates, surveyor.

HUNTS.—March 31st.—For the erection of offices and alterations to a school, for the Education Committee.—The Surveyor, Market-place, Huntingdon.

ABERDEEN.—March 31st.—For the construction of an underground concrete pump chamber and valve-house, for the Electricity Committee.—Mr. J. Alex. Bell, city electrical engineer, Millburn-street.

SHIPLEY.—March 31st.—For the extension of a boiler-house, for the urban district council.—Mr. W. Illingworth, architect and surveyor, 15 Sunbridge-road, Bradford.

FAREHAM.—March 31st.—For the erection of public conveniences, for the rural district council.—Mr. C. W. Hunt, inspector.

ISLE OF WIGHT.—April 1st.—For the extension of a water main, for the rural district council.—Mr. H. B. Cullin, inspector, Brooklands, Wootton, I.W.

BUCKS.—April 2nd.—For partially pulling down and rebuilding a bridge, for the county council.—Mr. R. J. Thomas, county surveyor, County Hall, Aylesbury.

BUCKS.—April 2nd.—For school extension, for the Education Committee.—Mr. C. G. Watkins, secretary, Aylesbury.

LINTHWAIT.—April 3rd.—For the erection of sixteen dwellings, for the urban district council.—Mr. Joe Ainley, architect, Chapel-street, Slinthwaite.

KENT.—April 3rd.—For the erection of new offices, for the Education Committee.—Mr. W. H. Robinson, architect, Sessions House, Maidstone.

BURNLEY.—April 4th.—For the completion of the construction of an impounding reservoir, with catchwaters, aqueducts, and meter-houses, for the corporation.—Messrs. James Diggle & Son, engineers, Hind Hide-street, Heywood, Lanes.

BLACKPOOL.—April 4th.—For work in connection with the laying of cast-iron pipes, sluice valves and hydrants, for the corporation.—Mr. John S. Brodie, borough engineer.

HUDDERSFIELD.—April 4th.—For the construction of a filter-house and reinforced-concrete tanks, for the corporation.—Mr. J. Henry Field, town clerk.

RUTLAND.—April 4th.—For the construction of a culvert over the brook at the foot of Wordley Hill, for the county council.—Mr. James Richardson, county surveyor, 13 Barn-hill, Stamford.

NORTHUMBERLAND.—April 4th.—For the reconstruction or widening of certain bridges, for the county council.—Mr. J. A. Bean, county surveyor, The Moot-hall, Newcastle-on-Tyne.

HUDDERSFIELD.—April 4th.—For the erection of a filter-house, for the corporation.—Waterworks Engineer.

LIVERSEDGE.—April 6th.—For the rubble fencing walling to be constructed around the new circular sewage filters, for the urban district council.—Mr. A. Rothera, engineer and surveyor.

WEST HAM.—April 6th—20th.—For alterations and additions to a school, for the Education Committee.—Mr. W. Jacques, architect, 2 Fen-court, Fenchurch-street, E.C.

BUCKFASTLEIGH.—April 6th.—For sewer and water main extensions, for the urban district council.—Mr. W. J. Goode, surveyor.

STRANORLAR.—April 6th.—For the erection of twenty-nine cottages, for the rural district council.—Mr. G. McLaughlin, clerk.

WITNEY.—April 6th.—For the construction of a concrete lining to a dug well 82 ft. deep, laying about 1,800 yds. of 3-in. service mains, with necessary fittings, and the supply and fixing of a vertical oil engine, three-throw pump, two air compressors, air-lift plant, and necessary piping to connect existing main, for the rural district council.—Mr. H. Howard Humphreys, engineer, 28 Victoria-street, Westminster, S.W.

MONAGHAN.—April 7th.—For the conversion of military barracks into eleven cottages, and the erection of sixteen new cottages, for the urban district council.—Mr. J. J. Inglis, 36 Dawson-street, Dublin.

DEPTFORD.—April 7th.—For repairs and redecoration to mortuary and coroner's court, for the borough council.—Borough Engineer.

BARNES.—April 7th.—For building a sports pavilion, for the urban district council.—Mr. G. Bruce Tomes, surveyor.

NORMANTON.—April 9th.—For the erection of seventy-six workmen's dwellings, for the urban district council.—Mr. A. Hartley, architect and surveyor.

CLONMEL.—April 11th.—For the erection of a re-tort-house and coal store in concrete or, alternatively, in stone, at the gasworks, for the corporation.—Mr. Henry O'Connor, 1 Drummond-place, Edinburgh.

KEIGHLEY.—April 11th.—For the construction of a storage reservoir, filter-beds, clear-water basin, and other appurtenances, for the corporation.—Mr. Ratcliffe Barnett, engineer.

EDMONTON.—April 14th.—For the erection of a public convenience, for the urban district council.—Mr. C. Brown, engineer and surveyor.

HASTINGS.—April 14th.—For the erection of two cottages, for the corporation.—Mr. P. H. Palmer, borough engineer.

HEREFORD.—April 14th.—For the erection of sixty-two cottages, for the corporation.—Mr. J. Parker, city surveyor.

CHESHIRE.—April 18th.—For the erection of certain new buildings and alterations, for the county council.—Mr. W. H. Lancaster, 49 Northgate-street, Chester.

BURNLEY.—April 18th.—For the construction of an impounding reservoir, catchwaters, aqueducts and meter-houses, for the corporation.—Messrs. James Diggle & Son, engineers, Hindhill-street, Heywood, Lanes.

CHELMSFORD.—April 20th.—For sinking a 14-in. borehole, for the corporation.—Borough Surveyor.

MARGATE.—April 20th.—For the erection of a pumping engine house, for the corporation.—Mr. A. E. Borg, borough engineer.

WALLASEY.—April 21st.—For the erection of a town hall, for the corporation.—Messrs. Briggs, Wolstenholme & Thorneley, Royal Liver Buildings, Liverpool.

WEST RIDING.—April 24th.—For alterations at a school, for the Education Committee.—The Clerk, County Hall, Wakefield.

WARWICKSHIRE.—April 24th.—For the enlargement of the police station and the erection of a pair of cottages and works incidental thereto, for the county council.—Mr. John Wilmot, county surveyor, 6 Waterloo-street, Birmingham.

Iron and Steel.

RUISLIP-NORTHWOOD.—March 30th.—For the supply of sixty-seven cast-iron lamp columns, for the urban district council.—The Surveyor.

SHREWSBURY.—March 30th.—For the supply of cast-iron pipes and specials, for the corporation.—Mr. W. Arnold Hewitt, waterworks manager.

BELFAST.—March 31st.—For the supply of 7½ tons of cast-iron specials, for the corporation.—City Surveyor.

TOTNES.—April 2nd.—For the supply of iron pipes, for the rural district council.—Mr. F. K. Windeatt, clerk.

BLACKPOOL.—April 4th.—For the supply of 3,000 lin. yds. of 4-in. cast-iron spigot and socket pipes, sluice valves, hydrants, and surface boxes, for the corporation.—Mr. John S. Brodie, borough engineer.

BRIDGWATER.—April 13th.—For the supply of 124 tons of 3-in. cast-iron pipes and other castings, for the rural district council.—Mr. W. A. Collins, engineer.

TAUNTON.—April 14th.—For the supply of sluice valves, air valves, hydrants, surface boxes, cast-iron mains, carting and laying cast-iron water mains, including fixing valves and hydrants, for the rural district council.—Mr. Sidney S. Orchard, engineer and surveyor.

Roads.

LAUNCESTON.—March 25th.—For main road improvements, for the corporation.—Mr. Arthur W. Grace, borough surveyor.

PENGE.—March 25th.—For resurfacing certain roads with either tarred slag or tarred granite macadam, for the urban district council.—The Surveyor, Town Hall, Anerley, S.E.

WIGTON.—March 25th.—For the maintenance of certain roads, for the rural district council.—Mr. Thomas B. Simmons, surveyor.

HORNSEA.—March 30th.—For making up certain roads, for the urban district council.—Mr. W. E. Warburton, surveyor.

WATH-UPON-DEARNE.—March 30th.—For the supply of macadam, tar-macadam, kerbs, flags, and setts, for the urban district council.—Mr. J. H. Drew, engineer and surveyor.

PONTYPRIDD.—March 30th.—For the execution of private street works, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor.

SOYLAND.—March 30th.—For the supply of granite chippings and local setts, for the urban district council.—Mr. W. Whitehead, surveyor.

KIVETON PARK.—March 30th.—For the supply of broken slag, granite, and tar-macadam, for the rural district council.—Mr. F. Hewitt, surveyor.

WANDSWORTH.—March 30th.—For making up a certain road, for the borough council.—Mr. P. Dodd, borough surveyor.

WEST ASHFORD.—March 30th.—For the supply of gravel, flints, and Kentish ragstone, for the rural district council.—Mr. A. Sims, surveyor.

RUNCORN.—March 30th.—For about 250 lin. yds. of road making and widening (kerbs, channels, and macadam supplied), for the urban district council.—Mr. James Wilding, surveyor.

COCKERMOUTH.—March 30th.—For road widening and building rubble wall, for the rural district council.—Mr. S. K. Gibson, highway surveyor.

BROADSTAIRS.—March 30th.—For the supply of fine gravel or grit, and laying limestone tar-paving, for the urban district council.—Mr. L. A. Skinner, clerk.

PAISLEY.—March 31st.—For laying footways with granolithic and Caithness flagstones, for the corporation. Master of Works.

LOOE.—March 31st.—For concreting a certain street, for the urban district council.—The Surveyor.

WHIFATLEY.—March 31st.—For private street works, for the urban district council. Mr. J. Simons, surveyor, 10 High-street, Doncaster.

KIRKBURTON.—March 31st.—For steam rolling and scarifying, for the urban district council.—Mr. G. W. Smith, clerk, 23 John William-street, Huddersfield.

SWANSEA.—March 31st.—For work of road construction, for the corporation.—Borough Surveyor.

THINGOE.—March 31st.—For the supply of granite, for the urban district council.—Mr. James T. Robinson, surveyor.

MALDON.—March 31st.—For the hire of steam rollers, for the rural district council. Mr. E. J. Ennals, surveyor.

EDINBURGH.—March 31st.—For the conveyance of road material, for the county council. Mr. A. G. G. Asher, county clerk, County Buildings, Edinburgh.

WATERLOO-WITH-SEAFORTH.—March 31st.—For works of sewerage, flagging, kerbing, channelling, and paving, for the urban district council. Mr. F. Spencer Yates, surveyor.

WOODFORD.—March 31st.—For work of road reconstruction, for the urban district council. Mr. W. Farrington, surveyor.

EAST DEREHAM.—March 31st.—For the supply of broken granite and clippings, and hire of steam roller, for the urban district council. Mr. F. L. Burch, engineer and surveyor.

MALDON.—March 31st.—For the supply and delivery of broken granite, basalt, slag, flints, gravel, and picked stone, for the rural district council. Mr. E. J. Ennals, surveyor.

LEWISHAM.—March 31st.—For laying wood paving in various streets, for the borough council.—Borough Surveyor.

MARTLEY.—March 31st.—For the supply of granite and slag, for the rural district council. Mr. L. H. Richardson, surveyor.

HORSHAM.—April 1st.—For the supply of 1,750 cub. yds. of flints, 4,250 yds. of granite, and 1,000 yds. of gravel chippings, for the rural district council.—Mr. W. Dengate, surveyor.

MAGOR AND ST. MELLONS.—April 1st.—For the supply of broken lime-stone and gravel, for the rural district council. Mr. A. H. Rees, clerk.

HOVE.—April 1st.—For paving work, for the corporation. Borough Surveyor.

EAST GRINSTEAD.—April 1st.—For the supply of about 10,000 gallons of tar, prepared in accordance with the Road Board specification for tar No. 1, for the rural district council. Mr. Francis S. White, clerk.

SALE.—April 2nd.—For making good a certain street, for the urban district council.—Mr. W. Holt, engineer and surveyor.

ROWLEY REGIS.—April 3rd.—For tar-spraying certain roads, for the urban district council. Mr. D. Wright, clerk.

PORTHCAWL.—April 3rd.—For work of private street improvement, for the urban district council.—Mr. A. J. Oborn, surveyor.

JARROW.—April 3rd.—For laying tar-macadam in several streets, for the corporation. Mr. J. S. Weir, borough engineer.

ELHAM.—April 4th.—For the supply of flint and Kentish rag, for the rural district council.—Mr. J. Kitney, highway surveyor, Lyminge, Kent.

HOOLE.—April 4th.—For the supply of ordinary macadam and tar-macadam, for the urban district council.—Mr. Chas. Akin, surveyor.

WROTHAM.—April 4th.—For the supply of road stone, for the urban district council.—Mr. F. T. Elliott, surveyor.

COFFORD.—April 4th.—For the supply of granite and local pit stones, for the rural district council.—The Surveyor, Lavenham, Suffolk.

CLEETHORPES.—April 4th.—For the supply of 1,500 tons of granite, broken to 2-in. gauge, for the urban district council.—Mr. C. H. Waithman, engineer and surveyor.

HUNSLET.—April 4th.—For the supply of granite, limestone, dross, tarred limestone, limestone chipping, manufactured flags, kerbs, and setts, for the rural district council.—Mr. W. B. Pindar, clerk, Leek-street, Hunslet, Leeds.

EAST STEYNING.—April 6th.—For the execution of street works, for the rural district council.—Mr. G. W. Warr, surveyor.

RAMSEY.—April 6th.—For the supply of tarred slag, broken granite, granite chips, and Tarvia, for the urban district council. Mr. R. F. Sergeant, clerk.

HENDON.—April 6th.—For making up certain streets, for the urban district council. Mr. S. Slater Grinley, engineer and surveyor.

HAVERHILL.—April 6th.—For the supply of broken granite, slag and tar-macadam, for the urban district council.—Mr. John H. Clarke, surveyor.

BOOTLE.—April 6th.—For the construction of tar-asphalt carriageway and footways, for the corporation. Borough Engineer.

TEDDINGTON.—April 6th.—For making up a certain street, for the urban district council.—Mr. M. Hainsworth, surveyor.

MELTON MOWBRAY.—April 6th.—For asphaltting and repairing footpaths, for the rural district council.—Mr. E. C. Moorhouse, surveyor.

DOVER.—April 6th.—For work of making up, for the corporation. Mr. W. C. Hawke, borough engineer.

BULKINGTON.—April 6th.—For the supply of stone, for the urban district council.—Mr. H. W. Wilson, surveyor.

STANLEY.—April 7th.—For levelling, paving and metalling fifteen streets, for the urban district council.—Mr. A. Routledge, surveyor.

CAERPHILLY.—April 7th.—For road widening and improvement, and bridge construction, for the urban district council. Mr. A. O. Harpur, engineer and surveyor.

DOUGHTON-LE-SPRING.—April 9th.—For the supply of blast-furnace slag, road metal and slag riddlings, for the rural district council.—Mr. D. Balfour, surveyor.

ISLE OF THANET.—April 9th.—For the supply of broken flints and broken granite, for the rural district council. Mr. C. L. Butterworth, surveyor, Birchington.

INVERNESS.—April 11th.—For the upkeep of roads and bridges, for the Badenoch District Committee.—Mr. A. M. Grant, district road surveyor, County Buildings, Kingussie.

KIDDERMINSTER.—April 17th.—For the supply of broken granite, granite screenings, broken slag and slag screenings, for the rural district council.—Mr. G. J. Shepherd, surveyor.

ROTHERHAM.—April 18th.—For the supply of broken granite, broken slag, Portland cement, tarred slag, tarred limestone, concrete flags, gritstone setts and kerbs, for the corporation.—Mr. E. B. Martin, borough engineer.

MADRAS.—May 4th.—For the supply of 400 40-gallon casks of tar, for the corporation. A copy of specification and conditions may be obtained at the office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

CHESTER-LE-STREET.—For the supply of whinstone, limestone, blast-furnace slag, and carting, for the rural district council.—Mr. Geo. W. Ayton, highway surveyor.

Sanitary.

ROTHERHAM.—March 30th.—For the conversion of privies into water-closets, for the rural district council.—Mr. B. Hey, engineer.

HAYFIELD.—March 30th.—For works of sewerage, for the rural district council.—Messrs. John Newton, Son & Bailey, engineers, 19 Cooper-street, Manchester.

WANDSWORTH.—March 30th.—For constructing a sewer, for the borough council.—Mr. P. Dodd, borough surveyor.

ELLAND.—March 31st.—For laying earthenware pipes, for the urban district council.—Mr. J. Clarkson, clerk.

SWANSEA.—March 31st.—For the construction of about 2,350 yds. of roads, sowers, surface-water drains,

manholes, inspection chambers, gullies, and other works, for the corporation.—Borough Surveyor, 13 Somerset-place.

BINGHAM.—April 1st.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. C. W. Kendrick, sanitary surveyor.

CAMBORNE.—April 2nd.—For the provision of and laying about 11 miles of stoneware sewers, the construction of manholes and other works, the construction of about 1,000 yds. of tunnel, the provision and laying of a 24 in. by 16 in. egg-shaped sewer therein, and the provision and laying of about 175 yds. of 18-in. cast-iron outfall sewer, for the urban district council.—Mr. John Chadwick, engineer, Bletchley, Bucks.

WIALLEY.—April 7th.—For the construction of sewage disposal works at the asylum, for the Committee of Visitors.—Mr. J. T. Wood, Bank Chambers, 3 Cook-street, Liverpool.

WHISTON.—April 8th. For the construction of earthenware pipe sewers, manholes, and incidental works, for the rural district council.—Mr. J. T. Wood, engineer, 3 Cook-street, Liverpool.

NANTWICH.—April 11th.—For the construction of pipe sewers, for the urban district council.—Mr. W. F. Newey, surveyor.

KIVETON PARK.—April 15th.—For works of sewerage, for the rural district council.—Mr. P. Hewitt, engineer and surveyor.

BRIGHTON.—April 21st. For the supply of glazed drain pipes, for the corporation.—Borough Surveyor.

Stores.

LIMEHURST.—April 2nd.—For the supply of road, sanitary, and other stores, for the rural district council.—Mr. H. H. Turner, surveyor, Waterloo, near Ashton-under-Lyne.

WOLVERHAMPTON.—April 6th.—For the supply of pitch and tar, Portland cement, macadam, broken slag, brooms, stoneware pipes, sewerage and castings, for the corporation.—Mr. George Green, borough engineer.

COLWYN BAY.—April 18th.—For the supply of drain pipes, kerbs, channels, ironmongery (manhole covers), disinfectants, creosote oil, granite macadam and chippings, and limestone chippings, for the urban district council.—Mr. William Jones, engineer and surveyor.

ROTHERHAM.—April 18th.—For the supply of broken granite, broken slag, tarred slag, tarred limestone, concrete flags, Portland cement, timber, pitch and creosote oil, gritstone setts and kerbs, and granite setts, for the corporation.—Mr. Ernest B. Martin, borough engineer.

TEES VALLEY.—For the supply of road and valve boxes, brass castings, taps, ferrules, and general stores, for the Water Board.—Mr. Hugh Wilson, clerk.

Miscellaneous.

POPLAR.—April 3rd.—For the supply of scavengers' brooms, rotary machine sweeping brushes, and refilling old stocks, for the borough council.—Mr. Harley Hackford, borough surveyor.

ELY.—April 3rd.—For the supply of a horse-drawn tar-painting machine, capacity 240 gallons, for the urban district council.—Mr. G. M. Hall, clerk.

BOURNE.—April 11th.—For the supply of a covered-in refuse removal cart, for the urban district council.—Mr. A. R. Agnew, surveyor.

BRIGITON.—April 21st.—For the supply of Portland cement, for the corporation.—Borough Surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance. ‡ Provisionally accepted.

BASINGSTOKE.—For the erection of a generating station, for the corporation.—Mr. F. Reginald Phipps, borough surveyor and waterworks engineer:—

H. Mundy, Basingstoke	£2,547
Jones & Sons, Southsea	2,396
Franklin & Co., Southampton	2,393
T. Rowbotham, Birmingham	2,336
Wort & Way, Salisbury	2,224
McCarthy E. Fitt, Reading	2,177
H. J. Goodall & Sons, Basingstoke	2,167
Smallbones & Sons, Streatley-on-Thames	1,987

BURNTISLAND.—For laying pipes for drainage, for the corporation.—Mr. J. A. Waddell, burgh surveyor:—

R. C. Brebner & Co., Edinburgh	£1,466
A. Gray & Co., Kirkcaldy	1,243
R. J. Morrison, Kirkcaldy	891
J. Martin, Dumfermline	788

CARLISLE.—Accepted for the erection of an office and convenience at the cattle market, for the corporation.—Mr. H. C. Marks, engineer and surveyor:—
J. & R. Bell, Carlisle, £282.

CARSHALTON.—For treating about 111,000 yds. super. of road with bituminous, dust-preventing material, for the urban district council:

	Special.	Ordinary.
	d.	d.
Du-labaters, Limited, Islington, N. (by hand)	1.37	1.09
H. V. Smith & Co., Victoria-street, S.W. (by machine)	1.56	1.37
Tarroads, Limited, Victoria-street, S.W. (by machine)	1.625	1.25
British Tar Spraying Company, Bristol (by machine)	1.10	.90
Johnston Brothers, Mark-lane, E.C. (by hand)	1.60	1.20
Durable Roads, Limited, Westminster Palace-gardens, S.W. (by machine)	1.20	1.20

COALVILLE.—For laying 1 mile of 9-in. sewers and 490 yds. of 18-in. sewer, and 300 yds. of 4-in. cast-iron and steel main, for the urban district council.—Mr. L. L. Baldwin, surveyor:—

A. Ward & Son, Derby	£1,521
Jakes & Co., Tipton, Staffordshire	3,713
W. Sharp & Sons, Burton-on-Trent	3,361
Martin & Element, Birmingham	3,092
G. P. Trentham, Limited, Birmingham	3,061
Willett & Sons, Birmingham	2,933
Moss & Son, Loughborough	2,859
A. E. Palmer, Glenfield, near Leicester	2,601
Engineer's estimate,	£2,970.

HOVE.—For the construction of underground lavatories, for the corporation.—Mr. H. H. Scott, borough surveyor:—
J. Parsons & Sons, Hove, £1,085.

GLANDILOFAWR. For laying water mains extensions, for the rural district council. Mr. H. Herbert, engineer, Brynmairis, Ammanford:—

W. John, Ammanford	£1,180
P. Davies, Glandilo	1,133
E. Powell, Cardiff	1,097
Hannay Brothers, Swansea	953
R. Clarke, Pontardawe	925

MANSFIELD.—Accepted for making up certain streets, for the corporation.—Mr. T. P. Collinge, borough engineer and surveyor:—

Crown-street.—Lane Brothers, Mansfield, £661.
Bolsover-street.—H. Ashley, Mansfield, £373.
Scarliffe-street.—C. Fulcher, Mansfield, £327.
Linden-street.—C. Fulcher, Mansfield, £151.

MIDDLESEX. For the erection of a courthouse at Ealing, for the county council.—Mr. H. T. Wakelam, county engineer and surveyor.

J. C. Mather, Islington	£9,180
Wells & Son, Whitton	8,986
Jennings & Co., Enfield	8,842
A. Porter, Tottenham	8,650
J. Carmichael, Wandsworth	8,595
Fassnidge & Son, Uxbridge	8,590
G. Neal, Willesden	8,570
W. Lawrence & Son, Finsbury Circus, E.C.	8,492
J. Dorey & Co., Brentford	8,470
W. J. Dickens, Ealing	8,237
A. Monk, Edmonton	8,058

RICHMOND (Surrey).—The following tenders have been accepted by the corporation:—

Portland Cement and Grey Lime, Baxter & Wray, Richmond.
Thames Ballast.—Brown & Mansell; J. Bates; Stevens Brothers.
Ironfounders' Work.—Pontifex & Co.
Road Materials.—London Granite Company; Rowe & Mitchell; Smeed, Dean & Co.; S. West, Limited.
Paving.—Wettern Brothers; Brookes; J. Farrar & Sons.
Artificial Stone Paving.—Adamant Stone and Paving Company; Patent Victoria Stone Company.
Cartage.—J. Bates; Stevens.
Tar.—T. Clayton.
Wood Blocks.—Improved Wood Pavement Company.

RICHMOND (Surrey).—For the construction and fixing of a floor at the first-class swimming bath, for use during the winter, for the corporation:—

Dearing & Co., Limited, Islington	£615
E. J. Saunders, Croydon	440
Galbraith Brothers, Limited, Camberwell-green	409
Dorey & Co., Brentford	315
A. Clayden, Richmond	341
Hughes & Co., Limited, Mortlake	337
Sole & Son, Richmond	335
Speerhley & Smith, Richmond	329
Borough surveyor's estimate,	£285.

SHERBORNE.—For the construction of outfall and intercepting sewers, sewage disposal works, engine-house, cottage, and other works, for the urban district council.—Messrs. Dodd & Dodd, Birmingham.

Wort & Way, Salisbury	£16,841
Jesty & Baker, Portland	16,008
Osman & Co., Southampton	15,988
C. Chamberlain, Leicester	15,791
T. R. Bartlett, Limited, Yeovil	15,113
Grounds & Newton, Bournemouth	15,121
E. Ireland, Bath	14,813

SMALTHORNE.—For scavenging work, for the urban district council:—

J. Bardley, Milton	£150
G. T. Cotterill, Milton	150
J. Ball, Milton	145

SWANSEA.—For private street works, for the corporation.
—Mr. G. Bell, borough surveyor:—
T. Walker, Clydach £4,488
Hill Brothers, Sketty 3,494
Parkinson & Hodgens, Swansea 3,382
Bennett Brothers, Swansea 3,334
W. H. Owen, Seaforth and Swansea * 2,838

TENTERDEN.—Accepted for the supply of granite, Kent ragstone, tar, team labour, mason's work, and fodder, for the corporation.—Mr. W. L. C. Turner, borough surveyor:—

Granite.—J. Mowlem & Co., Limited, Westminster, S.W.
Kent Rag.—E. Hooker, Egerton, Kent.
Chippings.—Padyham & Co., Kennington, Kent.
Tar.—Tenterden Gas Company, Tenterden, Kent; Clare & Co., London.
Team Labour.—Bennett & Co., Tenterden.
Mason's Work.—W. Elliott & Son, Tenterden.
Fodder.—A. Pinyon, Tenterden.

WARE.—For making up two roads, for the urban district council.—Mr. F. W. Hill, surveyor:—
G. T. Crook, Ware £336
G. Porter, Hackney 326
Pilgrims, Limited, Whetstone 303
W. Jackson, Forest Gate * 231

WEALDSTONE.—For the supply of 300 tons of broken slag, for the urban district council.

	Per ton.	
	s.	d.
Johnston Brothers	11	4
Osier Slag Company	10	10
C. L. Stiff & Co.	9	2
Stanton Ironworks	8	7
W. Prestwich & Sons	8	6
J. Smart & Son *	8	3

WILTS.—For alterations and additions to the county police station, Corsham.—Mr. J. George Powell, county surveyor:—

Syms & Son, Calne	£364
A. Skull, Corsham	322
Blackford & Son, Calne *	305

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MARCH.

30.—Surveyors' Institution: Mr. W. W. Jenkinson (fellow) on "London Before the Fire: As Referred to in Sixteenth and Seventeenth Century Literature." 8 p.m.

APRIL.

3.—Royal Sanitary Institute: Meeting at Southampton. Discussion on "The Housing, Town Planning, &c., Act, and its Application to the County Borough of Southampton." 7 p.m.

6.—Society of Engineers: Mr. A. S. E. Ackermann on "The Utilisation of Solar Energy." Institution of Electrical Engineers. 7.30 p.m.

20.—Institute of Sanitary Engineers: Mr. E. A. Lees; A.I.S.T.C.E., on "The Birmingham Waterworks." Caxton Hall, Westminster. 8 p.m.

MAY.

13.—Royal Sanitary Institute: Annual Dinner, Langham Hotel.

23.—Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham; Mr. A. S. Parsons on "Bridge Construction."

JUNE.

17.—Royal Institute of British Architects: Annual Dinner, Hotel Cecil.

TENDERS WANTED.

WARWICKSHIRE COUNTY COUNCIL. ALCESTER POLICE STATION.

The County Council invite Tenders for the enlargement of the Police Station, and the erection of a Pair of Cottages and Works incidental thereto. Particulars, Plans and Forms of Tender may be obtained from John Willmot, County Surveyor, 6 Waterloo-street, Birmingham, by personal application or by letter, on and after the 8th April, 1914.

Intending Contractors will be required to deposit the sum of One Guinea prior to the Particulars being furnished, such sum being returned on receipt of a bona-fide Tender.

Tenders, sealed and endorsed "Tender for Works at Alcester Police Station," are to be delivered at the office of the undersigned by 12 o'clock noon on Friday, the 24th April, 1914.

The County Council do not bind themselves to accept the lowest or any Tender.

E. FIELD.

Clerk of the Council.

Leamington.

March, 1914.

(1,477)

(Continued on p. xxii.)

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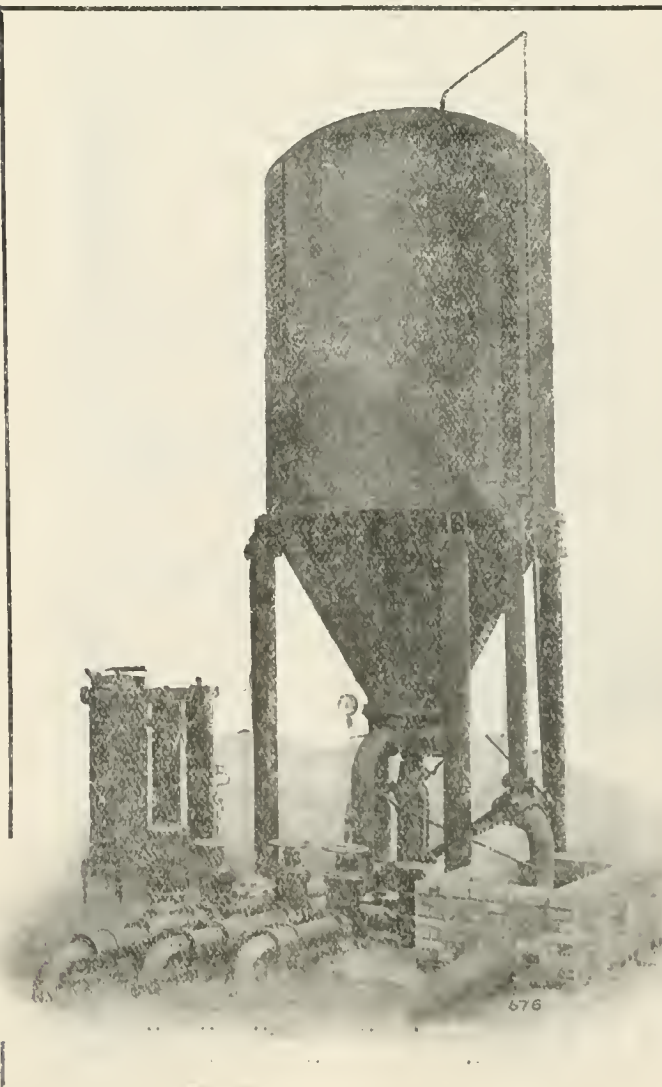
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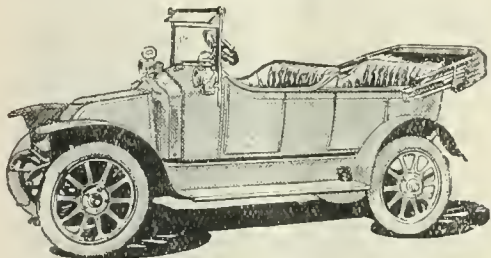
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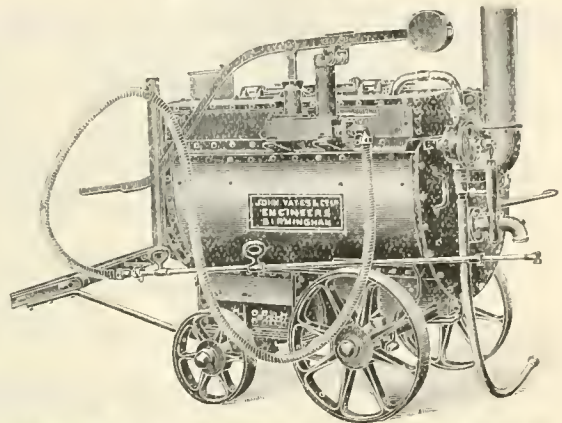
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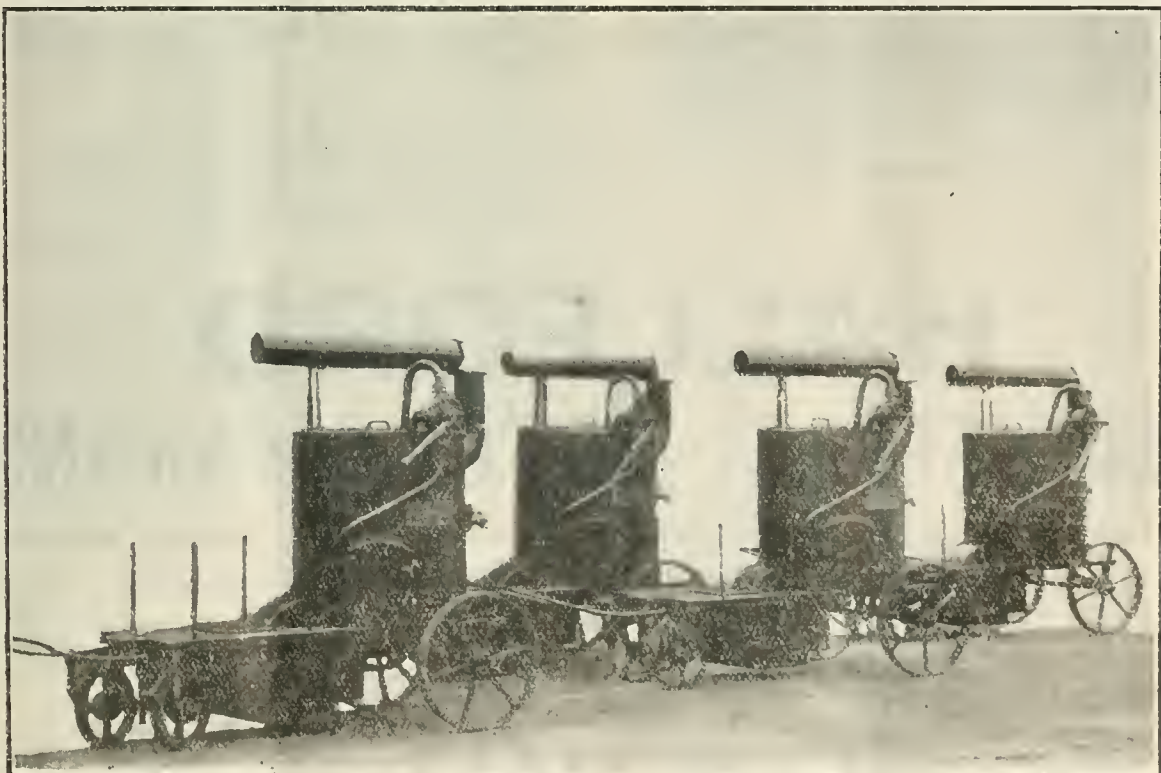
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APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

RURAL DISTRICT COUNCIL OF GODSTONE.

Applications are invited for the appointment of a Temporary Engineering Draughtsman for a period of about six months.

Applicants must have had experience in bridge design and construction.

Applications, stating age, salary required, whether married or single, present occupation, and past experience, together with copies of three testimonials of recent date, must be sent to the undersigned not later than Monday, March 30, 1914.

GEO. E. CROWTER,
Engineer and Surveyor.

High-street,
Godstone,
Surrey.

March 25, 1914.

(1,478)

BARNET URBAN DISTRICT COUNCIL. APPOINTMENT OF ENGINEER AND SURVEYOR.

The Barnet Urban District Council invite applications for the position of Engineer and Surveyor to the Council.

Commencing salary £250 per annum.

Applicants must have had practical experience in the works usually undertaken by an Urban Authority, including Private Street Works, Highways, Sewers, Sewage Works and Sanitary Works of every description, and must be competent to prepare Plans, Drawings, and Quantities for Municipal Works or

Buildings, and perform all the ordinary duties of a Surveyor of Highways.

Applications, in candidate's own handwriting, stating age and experience, and enclosing copies of not more than three testimonials, must be sent to the undersigned not later than the first post on Thursday, the 2nd April, 1914.

Canvassing of any Member of the Council, either directly or indirectly, will be a disqualification.

H. W. POOLE,
Solicitor,
Barnet,
Clerk of the Council.

March 18, 1914.

(1,465)

SHANGHAI MUNICIPAL COUNCIL.

PUBLIC WORKS DEPARTMENT.

FOUR SURVEYING ASSISTANTS.

Four thoroughly qualified Surveying Assistants, with experience in town surveys and cadastral work, are required in the Public Works Department.

Candidates should be about 25 years of age and unmarried.

Salary, taels 250 per mensem, without allowances, under a three years' agreement, with first-class passage from home, half pay on voyage, and medical attendance. There is an excellent superannuation scheme.

The value of the tael at the present rate of exchange is about 2s. 7d., but it is liable to fluctuation. Taels 250 per mensem taken at Exchange 2s. 7d. is equivalent to about £385 per annum. Particulars of the appointment may be obtained of the Council's Agents, and applications, in Candidate's own handwriting, stating qualifications, experience, &c., accompanied by copies of not more than three recent testimonials, and endorsed "Surveying Assistants," should be forwarded on or before April 21st, to Messrs. John Pook & Co., Agents for the Shanghai Municipal Council, 68 Fenchurch-street, London, E.C.

March, 1914.

(1,412)

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The Surveyor

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Vol. XLV.

APRIL 3, 1914.

No. 1,159.

Minutes of Proceedings.

Extraordinary Traffic and Recognised Industries.

A defence not infrequently raised to a claim for "extraordinary traffic" expenses is that the traffic complained of took place in connection with a "recognised industry" of the district. One of the earliest cases in which this defence was successful was *Wallington v. Hoskins* (6 Q.B.D., 206), the traffic consisting of the carriage of stone in a district where quarrying was a recognised business. The magistrates found that the traffic was not extraordinary having regard to the industry of the place and to the mode in which that industry was carried on. Nevertheless, they held that, though the traffic was not extraordinary, the weight was excessive, and on the latter ground they allowed the claim. An appeal to the High Court was allowed for reasons thus stated by Lord Coleridge: "It seems to me that the moment the justices have found this an ordinary and recognised industry of the place, and that it is carried on in the ordinary and recognised mode in which such industry is carried on, the weights are no longer excessive." This decision was followed in *Raglan Highway Board v. Monmouth Steam Company* (46 J.P., 598), which was a case of timber haulage in a district where the woods were periodically cut for sale. The magistrates found that the traffic was connected with a long-established industry, and that the weights of the individual loads were not excessive. They therefore disallowed the claim, and their decision was upheld by the High Court. These decisions, however, were not uniformly followed. Without wearying the reader with references, it will suffice to state that in two cases of stone haulage and in one case of the cartage of agricultural produce, the traffic was held to be extraordinary notwithstanding its connection with a recognised industry. The want of a settled principle was shown by yet another case, in which the carting of peat moss was held not to be extraordinary, although the facts were practically identical with those in one of the stone-hauling cases.

All these decisions were prior in date to the leading case of *Hill v. Thomas* (1893, 2 Q.B., 333), which came before the Court of Appeal, where all the previous cases were reviewed, and a definition of "extraordinary traffic" was given by the Court. That definition is too lengthy for citation here, but it will suffice in this connection to say that its effect was decidedly to weaken the "recognised-industry" doctrine by establishing as the standard of comparison the ordinary traffic on the particular road in question, and not that on other roads in the district. This principle has been applied in

several subsequent cases in which traffic connected with a recognised industry has been held to be extraordinary either by reason of its being conducted on roads not previously used for similar traffic, or by reason of a new method of haulage having been adopted. One of the most recent of these was *Geirionydd Rural District Council v. Green* (72 J.P., 321; THE SURVEYOR, Vol. xxxv., p. 361), which was a case of timber haulage in a district where timber growing was a staple industry. This case is specially striking because timber had been hauled on the particular road some forty years previously. On that occasion, however, the road was not damaged, and this fact was accepted by the Court as evidence that the present traffic must have been extraordinary. This decision was followed in another case of timber haulage—*Llangollen Urban District Council v. Coward & Co.* (noted at p. 484 *ante*)—in which the "recognised industry" defence was set up, but failed for similar reasons.

The Relative Efficiency of Bituminous Road Crusts.

In a short and very practical paper read at the Tunbridge Wells meeting of the Institution of Municipal and County Engineers last Saturday Mr. W. H. Maxwell, the borough engineer of that town, discussed some of the most important of the facts concerning methods of road crust construction with bituminous binders, and indicated what, in his view, is the position held to-day by such crusts in relation to those of other kinds. Mr. Maxwell does not see so wide a gulf between water-bound and bituminous-bound crusts as that which exists in the view of some engineers, and attention may specially be directed to the paragraph in which he sums up certain important features of the former class, and to the remarks made on this point by Mr. A. Dryland and Mr. P. H. Palmer, who spoke in the discussion. Mr. Maxwell's experience is that tar-painting by hand reduces the annual expenditure on road metalling, but his appreciation of the value of tar-painting includes, of course, the consideration that it leads to various indirect economies and advantages beyond those which are apparent in costs accounts. As regards the behaviour of tar-macadam crusts in hot weather, as described in the paper, and with reference also to the efficiency of tar-painting, it may be remarked that the maximum temperature which a road crust attains is very much reduced by suitable shade, which, if the trees are tall enough, or when they have grown tall enough, may, in many cases, be so regulated that it is summer shade only, and

leaves the road exposed to sunshine for six months of the year. Mr. Maxwell's remarks regarding the liability of tar-macadam to creep in summer and to soften under a hot sun, strongly suggest the importance of shade on roads provided with crusts of this kind.

As regards the comparison which Mr. Maxwell has made in his paper between tar-macadam proper and pitch-grouted macadam, it may be suggested that those defects of pitch-grouted macadam to which he refers are traceable to errors in the method of making the crusts. Corrugations may be formed as the result of a too solid construction, lacking the voids which Mr. Francis Wood, in his recently published book, has referred to as playing an important part in providing the necessary resiliency in a road crust or street pavement. It is impossible to indicate in a single sentence the nature of the means which should be taken to avoid the evils referred to, but one important item, perhaps, is the choice of an aggregate with stones which vary considerably, but not too gradually, in size and shape. This, to some extent at least, resists the rocking effect of wheels of small diameter carrying heavy loads. If the corrugation effect is accompanied by the appearance of black, slippery mud during wet weather, this is an indication that the crust has been filled too full of bituminous binder, and one of the precautions against this may be to run in the first portion of the binder at a relatively low temperature, up to, say, 2 in. of the top, in order that the voids in the lower part of the crust may not be quite filled with bituminous binder, though they should be packed tightly with a sufficient proportion of small mineral binder. The crust, as a whole, will then be more resilient, and excess binder in the topmost layer may be to some extent squeezed downwards, or, at least, will not be added to by oozeings from below.

* * *

Other Points in Crust Construction.

Some interesting points were brought forward in the discussion. As regards the strengthening of the edges of the crust, the method described by Mr. H. W. Bowen seems to be a very good one, following, as it does, the principle that the edges should be part and parcel of the crust itself. By the use of large flints, either a flush margin or a raised margin of turf may, if desired, be maintained over this metalling, and so keep the normal incidence of wheel loads well away from the real edge of the crust, so that the spread of the wheel load is within the limits of the strength crust—not beyond it, as in the case of trenched edges. The "abutment" edge, such as that of creosoted deal, described by Mr. W. H. Grieves, may be of value during construction, and may be permanently useful in particular places; but one cannot regard it as typical of practice in crust construction generally. Mr. Dryland supported Mr. Maxwell in his opinion regarding pitch-grouted crusts, as well as in his attitude towards the "panacea" idea, which is one of the most mischievous of the fallacies which road engineers have to combat in carrying out the work of making road crusts suitable for the traffic which they have to carry. Mr. F. Harris's support of Kentish rag deserves attention, and it seems that, in the area in which it can be obtained at a moderate cost, this material provides a really important road metal.

Mr. Grieves' reference to a 1-in. carpet on a water-bound crust is especially interesting. A 1-in. carpet is a carpet proper, and may have important advantages compared with the, at present, much-favoured wearing course of about 3 in. or 3½ in. in thickness. It may be suggested that the bituminous carpet on a crust which is in itself of ample thickness and strength has not yet had a fair trial, and we hope that Mr. Grieves will go further in this direction and give the results of his experience in the matter at some future meeting of the institution. It may be pointed out that

when Mr. Walker Smith, in a paper read before the Institution of Civil Engineers a few years ago, advocated thicknesses such as 4 in. for bituminous road crusts, Mr. Reginald Ryves, speaking in the discussion, pointed out that such a layer, expected to carry some of the load, would not be a carpet proper, and suggested that it would be better to make thicker layers which could be regarded as crusts, or thinner layers which would be carpets proper. As regards asphaltic surfaces for country roads, this advice, and urban precedent, have been followed; but nearly all tar-macadam crusts have been made of just about the thickness which Mr. Ryves said was wrong. As to the use of slag in bituminous crusts, Mr. Maxwell's paper and the discussion, taken together, convey the impression that the decay of slag may be of advantage in the case of tar-bound crusts, attrition and decay proceeding simultaneously having a less disintegrating effect than either would have by itself; this accounting, on the one hand, for the greater difference between tar-bound slag and water-bound slag than that which might otherwise be expected, and, on the other hand, among other reasons, for the superiority of tar-slag to such materials as tarred basalt.

* * *

The Basement House.

It is a commonplace observation that there is no accounting for the passing fancies of popular taste, but when any public dislike reveals any sign of permanence it is usually based upon some solid foundation of good sense. An example of this is to be found in the modern revolt against the basement house, primarily caused, in all probability, by considerations relating to domestic labour and administration. That many other factors are involved, some of them, no doubt, but dimly perceived by those most immediately concerned, was clearly shown by Mrs. Cloudesley Brereton in a paper which she read before the Institute of Sanitary Engineers on Wednesday evening. Her immediate subject was "Problems of Domestic Lighting, Heating and Cooking from the Woman's Point of View." At the outset, however, she narrowed the scope of her paper to these matters as they specially affect the basement house. The problem is fourfold. In the first place, the interests and convenience of the householder must be considered, and this is a most important matter, although it does not very directly affect the sanitary engineer. Then there is an aspect of the question which does directly concern the sanitarian, for modern sanitary science and legislation alike condemn the basement as a place for sleeping or even living. In this connection we would point out that it is by no means only in the case of small property that basement rooms are used as sleeping places. In many of the most fashionable quarters servants in expensive houses of the basement type are relegated to underground "rooms" which, as regards the access of light and air, are little better than cupboards. By the Housing, Town Planning, &c., Act, 1909, such rooms, when used for sleeping purposes, are liable to be closed as being unfit for human habitation unless they are 7 ft. high and comply with regulations made by the local authority, or, in default, by the Local Government Board—a most salutary provision. The third point from which the problem of the basement house may be viewed is that of the property owner. There can be no doubt that at the present time property owners on every hand are suffering much loss by the continued unpopularity of this type of house. As a remedy for this depression, Mrs. Cloudesley Brereton suggests that the remodeling of the basement house either for service purposes, as in the case of more expensive town houses, or as cellars, and so forth, as in the smaller houses, is a sanitary work worthy of the consideration of the progressive landlord as a strictly business and paying proposition, and a large part of her very interesting paper is devoted to an elaboration of this

them. Finally, the question must be looked at from the point of view of the legislator, whose business it is to examine with a view to more effective prohibition the case of houses which are rapidly becoming unwholesome tenement dwellings. There can be no doubt that the paper draws attention to one of the less appreciated living problems of modern sanitation.

* * *

Weight and Speed Regulations for Heavy Motor Vehicles. Regulations restricting the weights and speeds of heavy motor vehicles are in force in Massachusetts, New Jersey, and Philadelphia, as the result of laws passed in the spring of 1913; and a set of regulations based on the Massachusetts law was recently issued by the Commissioner of Highways for New York State. During the winter sessions of the legislatures efforts were to be made to introduce similar legislation in Maryland, and probably in New York and several other States, the regulations at present in force in New York State being, presumably, applicable only on State roads. A plea for uniformity is put forward by the *Scientific American*, and it is pointed out that eleven Eastern States are attempting to harmonise the different laws relating to motor vehicles. Our contemporary remarks that the manufacturers of heavy motor vehicles object to discriminating legislation in this matter, and point out that highway commissioners themselves admit that heavy team haulage is one of the most injurious forms of highway traffic. The speed limits of 15 miles an hour for vehicles of a gross weight of more than 4 tons, and 6 miles an hour for hard-tyred, and 12 miles an hour for soft-tyred vehicles of over 6 tons gross weight, are not objected to by leading manufacturers, and it is remarked that out of 80,000 commercial vehicles now registered in the United States, fewer than 400 weigh as much as 14 tons with full load. Those exceeding 5 tons rated capacity do not number much more than 1,200. It is interesting to note, in this connection, that the association of automobile manufacturers known as the Automobile Chamber of Commerce has adopted standard speed ratings slightly below those fixed by the State regulations, and the standard form of warranty issued with each truck provides that overspeeding and overloading will render the warranty void. Leading tyre manufacturers recommend loads considerably less than 800 lb. per inch of width, and seek to discourage loadings in excess of those specified.

It seems, then, that the regulations are regarded as reasonable; and since different regulations are needed for the smaller loads carried by horsed vehicles, the only just cause of complaint seems to be that suitable regulations are not framed for the latter class. Since these vehicles, when the tyres are narrower than they ought to be, inflict much damage on roads in the United Kingdom, and doubtless in the United States also, it is not unreasonable that persons who are taxed to provide funds for the upkeep of roads should desire that other classes should be made to provide tyres of width suitable for the loads carried. When this is done the taxes on vehicles may be regarded mainly as general taxes, and not be considered to entitle those who pay them to a voice in the management of roads and traffic.

* * *

New York Sewerage Commission and Chlorine Treatment.

Four further reports of the Metropolitan Sewerage Commission of New York have been issued, and one of these, which is concerned with a report of Dr. Samuel Rideal on oxidation processes applicable to New York conditions, is reproduced in part elsewhere in this issue. Briefly, it is Dr. Rideal's opinion that all the sewage produced now and in the next genera-

tion in the metropolitan district of New York and New Jersey could be sufficiently purified on properly selected sites near where it is produced to permit of its discharge locally into the waters of the inner harbour without violating any of the provisions of the commission's standard of cleanliness. The purification works, he thinks, should be able to remove the unsightly and offensive floating suspended matters of the sewage, and ensure that the effluent becomes invisible and inodorous when mixed with the harbour waters. So far as oxidation is concerned, Dr. Rideal considers that sufficient oxidising treatment should, and could, be given to the sewage to keep the effluent from absorbing more than one-half of the oxygen in the harbour water. In order completely to oxidise the 1,500 million gallons per day of sewage included in the estimates, Dr. Rideal finds that 1,280 tons of available chlorine would be required daily. The chlorine could be added, in Dr. Rideal's opinion, in the form of chlorine gas, bleaching powder, or as sodium hypochlorite produced from an electrolysed solution of sodium chloride. A considerable part of Dr. Rideal's report is devoted to the question of forced aeration as a method of sewage disposal and the results of various calculations are given to show that it would be impracticable to oxidise New York sewage by this means. At the conclusion, the report recommends that chlorine treatment should be given serious consideration along certain lines. As will be seen, however, the commission do not regard the proposition as affording a practical solution of the problem before them on the ground that the amount of chlorine which it would be necessary to apply to settled sewage in order to produce a material reduction in the dissolved oxygen would be so great, its sterilising effects so powerful, and its odour so penetrating, as to make it probable that the entire harbour would become sterilised, and smell disagreeably of the disinfectant.

* * *

Engineers-in-Charge.

In our last issue there appeared a report of the proceedings at the nineteenth annual dinner of the Association of Engineers-in-Charge, but considerations of space precluded us from offering any observations on the speeches which were delivered on that occasion. In the first place, it should be mentioned that in proposing the toast of "The Association," Sir Boverton Redwood was able to record another year of steady and satisfactory progress. In reply, Dr. Glazebrook, the distinguished president of the association, threw out a hint that there was a real demand for its extension by forming branches in the provinces and in the Colonies. There can be no doubt that the vitality of an organisation of this character depends to a large extent upon the provision of facilities for local meetings of its widely scattered members. It is satisfactory to observe, therefore, that the development of the association on these lines is receiving the most earnest consideration of the council. One other point is worthy of special note. In replying to the toast of "Science, Practice, and Technology," Sir Alfred Keogh spoke of the relationship between engineering colleges and industry. It has been alleged—with what degree of truth we express no opinion—that hitherto the colleges have been lacking in their recognition of the practical requirements of modern industries. But, as Sir Alfred Keogh pointed out, the Imperial College of Science and Technology has been established to alter this, and in taking the advice of the great leaders of industry, there can be no doubt that those responsible for the education of the students at that college are proceeding on sound lines. The association, which fulfils a very useful function, is to be congratulated upon its present healthy condition.

Chemical Oxidation as a Process of Sewage Treatment.

NEW YORK COMMISSION AND DR. RIDEAL'S PROPOSALS.

Among the latest reports of the Metropolitan Sewage Commission of New York is one which deals with the proposals of Dr. Samuel Rideal for the adoption of chemical oxidation as a method of treatment of the sewage of that city. The commissioners point out that the object of oxidising New York's sewage, partly or completely, by chemicals would be to remove the excessive demand which the sewage makes on the dissolved oxygen in the harbour water, and so permit the sewage to be discharged into the inner harbour with little or no other treatment.

AERATION AND CHEMICAL OXIDATION COMPARED.

Forced aëration has been suggested for this purpose by various investigators, as it has previously been proposed for other situations, and as it has subsequently been recommended in connection with various biological processes; but aëration (the commissioners observe) is not a process in itself. Its function is not to oxidise sewage, but to supply the oxygen with which the ordinary purifying forces of Nature can carry the oxidising processes forward. Its benefits are slow, for they depend not only upon the rate at which sewage will absorb oxygen, but upon the rate at which the natural purifying agencies will appropriate it.

Aëration is especially useful where the oxygen supply is deficient, for then the rate at which the water will absorb it is relatively high. Water and sewage absorb oxygen at the same rate and to the same extent, and, as has been shown elsewhere, when there is a considerable amount of dissolved oxygen present, it is difficult to add more by aëration or by any other means. Where large quantities of oxygen have to be supplied by aëration, it is necessary to continue the process over a long period of time, or to repeat it at frequent intervals. Either of these alternatives is likely to prove expensive, for the reason that they make it necessary to provide means for keeping the sewage on hand for a considerable period.

Chemical oxidation seeks to eliminate the slowness and inconvenience of the aëration process, and, by aiming directly at the desired re-aëration, to effect a material gain. Unlike aëration, chemical oxidation is a radical form of treatment which involves abrupt interruption in the natural course of self-purification which sewage ordinarily undergoes from the moment it is produced until its harmful properties are rendered inert, and in which living organisms play an important part. Chemical oxidation, by whatever method it is carried on, means a sudden arresting of the natural purifying agencies, a rapid and intense chemical re-aëration between the oxidising agent and the oxidisable ingredients of the sewage and the final discharge of the effluent in a state which is not inimical to the fauna and flora of the natural body of water into which it is emptied. Incidentally, the oxidation produces disinfection, and the disinfecting properties of the oxidising matter in some cases prove to be advantageous. Under other and more usual circumstances, it may prove embarrassing, as, for example, where a large amount of sewage effluent possessing antiseptic properties is discharged into water which is inhabited by fishes.

The use of chemicals to purify sewage is by no means a new idea, although there are apparently no existing large sewage works where chemical oxidation is practiced to serve as an example of the size and arrangement of apparatus needed, and the cost, efficiency and reliability of the process. Nevertheless, considerable help in forming an opinion on the leading difficulties to be overcome can be obtained from the experience gained with certain standard processes of water and sewage treatment, notably the application of basic sulphate of alumina, lime and iron, copper sulphate and hypochlorite.

INTENDED SCOPE OF DR. RIDEAL'S REPORT.

Experiments on the purification of New York's sewage through the electrolytic decomposition of sea water by the application of bleach and by chlorine led the commission, in 1912, to seek the opinion of an eminent expert on chemical questions relating to the purification of sewage and disinfection, and Dr.

Samuel Rideal, of London, was requested to make a report on the possibilities of direct chemical oxidation. . . .

In preparation for his report, Dr. Rideal made a personal inspection of the conditions of sewage disposal in New York Harbour, and visited the commission's office to become familiar through conferences and study with the results of the commission's work. His report is a discussion of the questions assigned to him from a chemical and theoretical standpoint, and makes no claim either to finality or practicability, which he rightly says would not be warranted in "so short a report nor without a prolonged study of the main details, chiefly of an engineering character."

In a letter dated October 3, 1912, the commission requested Dr. Rideal to report on "other ways of oxidising sewage than by biological means—that is, through the use of chemicals. Absence of odour, restricted areas of land, and freedom in the effluent from substances poisonous to fishes should be features of such procedures. It should be remembered also that the process must be applicable to large volumes of sewage—not less than 25,000,000 or 30,000,000 gallons per twenty-four hours, for example. The cost of the treatment, including the purchase of materials, should not be excessive, nor should the process involve expense for pumping. Inasmuch as processes for the chemical oxidation of sewage are not in general use, it will be desirable to give such assurance as is possible that any process suggested can actually be carried out."

In addition to his opinion on chemical oxidation, Dr. Rideal was asked if, in his view, the commission was right in placing importance on the presence of sludge on the harbour bottom as an element making for the exhaustion of oxygen from the water, whether he considered it possible to purify the sewage sufficiently near its points of origin to permit the effluent to be discharged into the inner harbour, and to give his impression of the condition of the harbour as he saw it on his trip from the Battery to Hell Gate on October 2, 1912.

SYNOPSIS OF THE REPORT.

It is Dr. Rideal's opinion that all the sewage produced now and in the next generation in the metropolitan district of New York and New Jersey can be sufficiently purified on properly selected sites near where it is produced to permit of its discharge locally into the waters of the inner harbour without violating any of the provisions of the commission's standard of cleanness. The purification works, he thinks, should be able to remove the unsightly and offensive floating suspended matters of the sewage, and insure that the effluent becomes invisible and inodorous when mixed with the harbour waters. So far as oxidation is concerned, Dr. Rideal thinks that sufficient oxidising treatment should, and can, be given to the sewage to keep the effluent from absorbing more than one-half of the oxygen in the harbour water.

The reagents which are considered available for the oxidation of the sewage are few in number. They include manganates and permanganates, and oxidised compounds of chlorine. The first two would be prohibitively costly. Even the cost of hypochlorite, the cheapest oxidising agent, would be too expensive for use with crude sewage, according to Dr. Rideal's report. It would be necessary to use it as a finisher to the mechanical or bacterial process, which would remove much of the floating suspended matters. Sedimentation basins having from four to twenty hours' flow are suggested to accomplish the removal of the solids, the basins to operate on the principle of septic tanks or sludge-digesting tanks.

In addition to their main function of retaining and digesting the solids so as to reduce the cost of the chemicals, the basins would prevent sludge from forming on the harbour bottom. In Dr. Rideal's opinion, the advantage to be gained in this respect would be of small value, for he does not think that the sludge deposits in New York harbour are as responsible as the liquid part of the sewage in exhausting the dissolved oxygen from the water.

If it was not possible to secure space for septic or

sludge-digesting tanks on land, Dr. Rideal thinks the tanks could be erected in the water along Manhattan Island and elsewhere with the necessary chemical equipments by their side. He suggests that the basins be covered to prevent nuisance. The sludge having attained its main decomposition without oxygen could, in Dr. Rideal's opinion, be discharged into the harbour with no fear of absorbing much oxygen afterward. The effluent should be treated at the outlet by a small quantity of the oxidiser. By the use of such tanks as he proposes, Dr. Rideal thinks that hardly any pumping would be required.

The report contains calculations on the amount of chlorine necessary; and in these due account is taken of the oxygen required by the sewage, the quantity of oxygen which is brought by tidal action into the harbour from the ocean, that which is contributed by the land water from the rivers, and that which is absorbed from the atmosphere. The object of the chemical process would be to supply only enough oxidation to supplement the natural process which proceeds in the harbour.

To completely oxidise the 1,500 million gallons per day of sewage included in the estimates, Dr. Rideal finds that 1,280 tons of chlorine would be required per day. Basing his opinion on experiments made with Philadelphia sewage, the report indicates that New York harbour sewage could be disinfected with a good quality of chloride of lime in the proportion of 27.9 tons for screened sewage and 19.5 tons for screened and settled sewage. In another way, it is calculated that 6 parts per 1,000,000 is the proper dose which is likely to prove effectual.

The chlorine could be added, in Dr. Rideal's opinion, in the form of chlorine gas, bleaching powder, or as sodium hypochlorite produced from an electrolysed solution of sodium chloride. The supply of sodium chloride could be obtained from the harbour water or from a solution of rock salt. Sea water might not be strong enough for practical purposes, its weakness possibly requiring works of too large size. Electric bleach works usually operate with 5 to 15 per cent sodium chloride solutions.

A considerable part of Dr. Rideal's report is devoted to the question of forced aeration as a method of sewage disposal, and the results of various calculations are given to show that it would be impracticable to oxidise New York sewage by this means. At the conclusion, the report recommends that chlorine treatment be given serious consideration along the two following lines: (1) Preliminary screening and sedimentation to produce a non-fermenting sludge which can be discharged into the harbour waters separately without robbing them of any dissolved oxygen, and (2) a chlorine treatment of the clarified effluent to such an extent as will insure the proposed minimum standard of 3 c.c. of dissolved oxygen per litre being maintained throughout the whole of the harbour waters.

THE COMMISSION'S OPINION.

The commission has given careful consideration to Dr. Rideal's recommendation, and as a result does not regard his proposition as affording a practical solution of New York's sewage problem.

Experiments have shown that the amount of chlorine which it would be necessary to apply to settled sewage in order to produce a material reduction in the dissolved oxygen required would be so great, its sterilising effects so powerful, and its odour so penetrating, as to make it probable that the entire harbour would become sterilised, and smell disagreeably of the disinfectant.

Theoretically a powerful oxidising agent, chlorine appears to be capable of producing an appreciable oxidising effect upon sewage only in concentrations which it is impracticable to employ. In moderate concentration it is a poisonous gas easily soluble in water, from which it can be completely driven only with difficulty.

Hitherto chlorine and hypochlorite have been used in water and sewage treatment only as disinfectants, minute doses being usually sufficient to accomplish the desired end. In the arts, chlorine compounds are used extensively for bleaching purposes. There are no works for the chemical oxidation of sewage now operating upon this principle, and it appears impossible to give reasonable assurance that the process suggested can actually be carried out. Used as a disinfectant, the commission is of opinion that chlorine, perhaps, prepared from electrolysed sea water may be found to be of considerable service in dealing with certain parts of New York's sewage.

The cost of oxidising the sewage by means of

chlorine would be excessive, especially in view of the ample provision which would have to be made for the preliminary septic tanks or basins capable of producing a non-fermenting sludge. It is not clear why the fermentation of sludge appears to the author of the report to be a necessary step in the process. If thorough sedimentation could be provided for all the sewage entering the harbour, it would seem, from the commission's researches, to be permissible to dispense with the oxidising process.

The idea of discharging fermented sludge into the harbour is, apparently, contrary to the federal laws which have been enacted for the protection of the navigable channels against shoaling.

CHEAPER HOUSES.

URBAN SURVEYOR'S SUGGESTIONS.

In a paper which he read at a recent meeting of the South-Western Centre of the Sanitary Inspectors' Association at Radstock, Somerset, Mr. G. H. Gibson, surveyor to the urban district council of that town, put forward the following suggestions for the cheapening of houses:—

(1) I think the speculative builder must go for good, so far as working-class property is concerned. He cannot get his money so cheaply by a considerable amount as the local authorities. He cannot afford to leave his money in the property to earn as small a percentage as the local authority, and therefore cannot afford to accept as low a rent.

(2) Local authorities should build their houses by direct labour. Smart managers of large commercial undertakings, such as factories and collieries, keep their own staff of workmen to put up their buildings, and it goes without saying that they have found out that it pays to do so. No builder can possibly live and pay his way without a profit of from 10 to 15 per cent, and nobody can deny that this is anything but a reasonable and legitimate sum. If rents, however, are to be kept down to what the workman can pay, these profits cannot be allowed.

(3) If properly built, eighty years is not too long a period for a housing loan to be extended to. This would ameliorate the unfairness of the man who is living in the house not only having to pay his rent, but also having to pay for the house, a single brick of which will never belong to him.

(4) The rate of interest charged should be lowered. For this purpose the money deposited in the National Savings Bank should be used. In 1912 the total amount in the Savings Bank was £181,699,122, belonging to nearly 9,000,000 people, and averaged about £20 per head. I am not a national financier enough to know just exactly where this money is, but, wherever it may be, I can well believe it is wanted. Well, leave it there, but every year this fund increases. In 1912 it increased by nearly £1,500,000. Why not, in future, until there is a sufficiency of houses, allow this annual surplus to be lent to local authorities for the erection of working-class houses for the people who have mainly deposited the money? This would allow for 7,500 houses to be erected annually at a cost of £200 each. I do not know what it costs to administer the Savings Bank, but I should think not more than 5s. per cent. Make the rate of interest, therefore, £2 15s. per cent.

(5) Exempt local authorities from paying income-tax upon working-class dwellings. Co-operative societies pay no tax, because, I think, it cannot be proved that their members, as a whole, have an income that exceeds £160 each year. It could, I think, easily be established in the case of the ratepayers, as a whole, to whom the houses built by all local authorities belong, that their income is much short of £160.

(6) Make the rating easier. In 1869 the Poor-rate Assessment and Collection Act was passed, allowing the owner of a dwelling-house situate in the provinces to obtain a 30 per cent reduction on rates upon a house not exceeding £8 in rateable value, where let to a *bona-fide* tenant. Within my own recollection and experience, many houses in country towns which were formerly let at £8 a year will now command £10 and £12, and it would only be fair, having regard to the increased cost of building, that the minimum for compounding should now be raised to cover a rateable value of £12.

Royal Sanitary Institute.—The Housing and Town Planning Act and its application to Southampton will be discussed at a meeting of this body to-day at Southampton.

New Public Offices, Harrow-on-the-Hill.

The building illustrated herewith, the architect of which is Mr. Henry Prince, A.R.I.B.A., 19 Old-square, Lincoln's-inn, W.C., is an extension of the old public offices, and is built on a strip of ground next to the latter, necessitating the pulling down of some cottages standing on the site. The old building, which has been retained, includes the fire station on the ground

round the window opening, and the plinth, cornice, &c., in Portland stone. A feature of the front elevation is the cast-lead rain-water pipes and heads.

The roofs are covered with red tiles, the roof to the front elevation being surmounted by a small fleche of oak with copper dome. A yard for fire drill has been formed off Byron Hill-road.



HARROW-ON-THE-HILL PUBLIC OFFICES: BACK ELEVATION.

floor. The rooms on the first floor and in the basement have been altered to suit the needs of the new scheme.

The main front faces the High-street, while the back and side elevations face Byron-hill. The walls are built with purple bricks, with lighter-coloured bricks

riched plaster ceiling. Other rooms on the first floor are the clerk's private and general offices. The rooms on this floor in the old building have been reconstructed, and now form the surveyor's private, general and drawing offices. The building cost £5,400 to erect.

BASEMENT FLOOR.

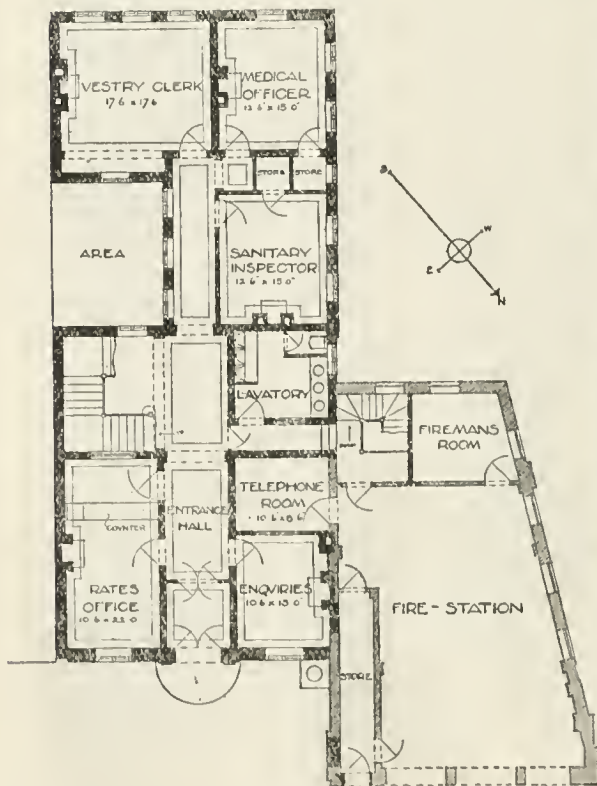
On the basement floor are the caretaker's rooms and two strong-rooms. The basement to the old building has been reconstructed, and includes a new pay-room, heating chamber and bicycle store. A new staircase has been formed in the old building, giving access to the basement from the fire station and the new offices.

GROUND FLOOR.

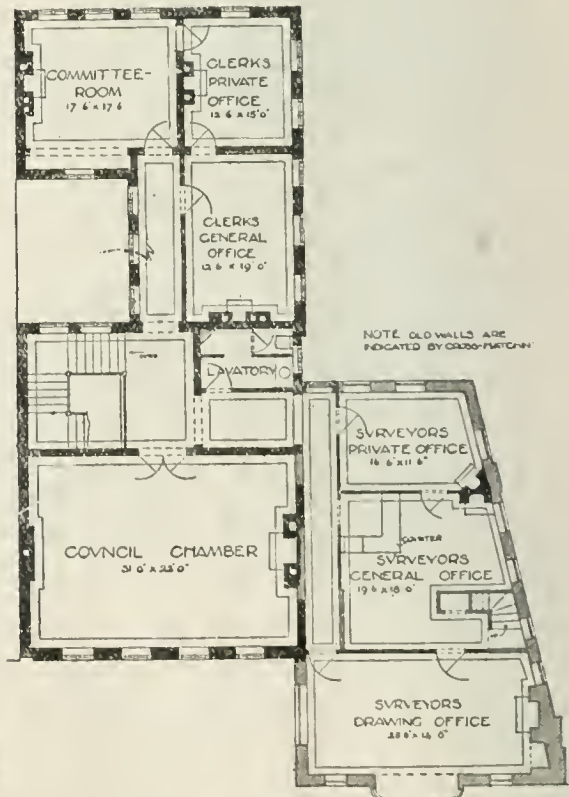
The main entrance to the new offices is from the High-street. On the ground floor are situated offices for the rate-collector, vestry clerk, medical officer and sanitary inspector, also a room next the entrance for inquiries, and a new telephone room for the use of the fire brigade. The main staircase, leading to the first floor, is placed in the centre of the building.

FIRST FLOOR.

The whole of the front of the building is occupied by the council chamber. The windows of the room overlook the High-street. It is panelled in Austrian oak, and has a coved ceiling enriched with ornamental plaster work. This room, which measures 31 ft. by 22 ft., is ventilated by means of an electric fan fixed above the circular grille in the ceiling. The committee room is panelled in American white wood, and has an enriched plaster ceiling.



GROUND FLOOR



FIRST FLOOR

SCALE OF FEET

HARROW-ON-THE-HILL PUBLIC OFFICES.

CANALS DEVELOPMENT.

PROPOSED WATERWAYS BOARD.

On Tuesday, at the Board of Trade offices, Mr. J. M. Robertson received a deputation from the Waterways Association to urge the Government to give effect to the recommendations of the Royal Commission by appointing a Waterways Board to consider the question of the acquisition by the State of the canals on what is known as the "cross" route.

Mr. Neville Chamberlain, the chairman of the association, stated that their proposals comprised three distinct and separate stages, but it would be a mistake to suppose that, having got through the first stage, it was absolutely necessary to go on to the second or third stage. Each stage was independent of the others, and it would be possible to stop at the first or the second without necessarily completing the scheme in all its stages. The first stage was the appointment of a Waterways Board; the second the acquisition of the canal system of the country by the State through the medium of the board; and the third was the improvement of the

Government intervention it would justify action. The State was the only body that could unify the existing ownerships. The proposed Waterways Board would not consist of more than five members, but they should be men who had special knowledge of the subject, and who could act as a board of technical advisers to those by whom the canals could be controlled. The board might be responsible to the Development Commissioners and to the Board of Trade, but that was a point on which they did not presume to offer an opinion. The acquisition would be a simple matter, and might be carried through in somewhat the same sort of manner as the Port of London Authority was constituted. He did not see why there should be any difficulty in getting the various companies to agree to the purchase, but if an agreement could not be arrived at, then there would be

COMPULSORY ARBITRATION

As to the price, he took it that that would be fixed in a certain number of years' purchase of the nett earnings of each company. He thought it would be safe to assume that the capital that would have to be invested by the State would not exceed £6,000,000. Waterways stock could be issued to the existing holders, whose stock would be cancelled, and the interest in the new waterways stock could be guaranteed by the State. The earnings through tolls would go to pay the interest. They did not desire to see the third stage commenced until the first two had been carried out. They had received sufficient information to say that there was likely to be very generous support on the part of local authorities to any demand for assistance. Traders in this country suffered very considerably from Continental competition. Their competition had specially benefited by the money spent by their respective Governments on the improvement of waterways; but in this country the canals were left just as they were 100 years ago, and traders had been handed over to the tender mercies of the railway companies, who were totally unable to deal with the mass of traffic, who had continually tightened up their restrictions and raised their rates. They thought the time had come when the Government should do something to assist the waterways in taking their proper place in the transport system.

Mr. Robertson having promised to lay before the President of the Board of Trade, Mr. John Burns, the views which had been expressed, the deputation withdrew.



HARROW-ON-THE-HILL PUBLIC OFFICES: FRONT ELEVATION.

system so acquired to a reasonable standard of efficiency. Seventeen and a-half millions was the capital sum which it was estimated would be required for the improvement of the waterways to what was known as the 100-ton standard—they did not suggest that so large a sum should be spent before suitable experience had been acquired. What they were asking for was only that a Waterways Board should be appointed, and that from that point they should proceed step by step, and not that the whole scheme should be carried out at once. He pointed out the difference in the carrying capacity of the canals in the North of the country as compared with those in the South, and said that in the report of the Royal Commission there was a large amount of evidence as to the difficulty of obtaining through tolls. That was to a considerable extent due to the fact that so many canals or portions of canals were owned or controlled by railway companies. The

MULTIPLICATION OF AUTHORITIES,

and especially the ownership by railways of certain sections of canals, was one of the principal causes why our canals had remained in their present stagnant and ineffective condition. Unification was so important that if that alone were the result of

houses, with scullery and bathroom; ten two-room and kitchen houses, with scullery and bathroom; and the remainder of a larger class of house. The estimated cost is £13,000.

Adjustment of Public Works.—Answering a question in the House of Commons on Tuesday, Mr. Herbert Lewis stated that, although the Local Government Board had in times of exceptional distress from want of employment issued circulars to local authorities to urge the putting in hand of public works, and had on various occasions emphasised the desirability of regularising employment as far as possible, they had not taken direct and formal action so to adjust such works as to regularise the demand for labour in recurring periods of good and bad trade. The practicability of doing this would, however, be examined by the committee which the Government were appointing.

EASTER HOLIDAYS.

Owing to the necessity of going to press earlier than usual, news and advertisement matter intended for insertion in next week's issue of "The Surveyor" must reach us not later than Wednesday morning, April 8th.

Institution of Municipal and County Engineers.

SOUTH-EASTERN DISTRICT MEETING AT TUNBRIDGE WELLS.

A successful meeting of the South-Eastern District of the Institution of Municipal and County Engineers took place at Tunbridge Wells on Saturday last, those present including Messrs. W. Banks (Rochester), H. W. Bowen (West Sussex), hon. district secretary, J. H. Brierley (Richmond, Surrey), T. A. Busbridge (Maidstone), E. R. Capon (Epsom), R. Chart, junr. (Croydon), A. Dryland (Surrey), W. H. Grieves (Sutton, Surrey), P. Harris (Tunbridge Wells), P. E. Harvey (Worthing), W. Hosken (West Sussex), W. H. Maxwell (Tunbridge Wells), B. A. Miller (Seaford), P. H. Palmer (Hastings), T. A. P. Phillips (West Sussex), J. L. Redfern (Gillingham), F. W. Ruck (Maidstone), H. H. Scott (Hove), G. M. Seels (New Malden), H. S. Wood (Brighton), and W. E. Woollam (East Grinstead).

Assembling at the town hall shortly before mid-day, the members were received by the Mayor (Councillor C. W. Emson, J.P.), who, in an allusion to the duties and responsibilities of municipal engineers, said they thoroughly justified their existence by the work which they undertook. Mr. Maxwell, the borough surveyor of that town, was a man whom they all very highly appreciated, and the short statement as to the engineering features of the district which he (Mr. Maxwell) had prepared for their information would, he thought, be of interest to them. His Worship added that he did not think there was another town in the kingdom that had a purer water supply than Tunbridge Wells, while in the matter of drainage they had arrived as near perfection as possible.

Mr. A. DRYLAND, district chairman, moved the accordancy of a vote of thanks to his Worship for his kindly welcome and the appreciative remarks he had made with regard to their profession. It was a profession which they thought did great work for the public, and they were always delighted when they found their activities were appreciated by those who presided over public bodies. They were very glad to have an opportunity of visiting such an interesting town as Tunbridge Wells, and they were greatly obliged to Mr. Maxwell for the trouble he had taken in arranging the gathering and enabling them to inspect the works he had carried out and had in hand.

The vote of thanks was passed with acclamation.

THE DOVER MEETING.

Reference was made to the arrangements for the meeting of the institution which, as announced elsewhere in this issue, is to be held at Dover on Saturday, May 9th, and the hope was expressed by the chairman that the gathering would be well attended by members, not only of the South-Eastern, but other districts. It was intimated by the hon. district secretary that Mr. A. T. Walmisley, of the Dover Harbour Board, Mr. W. C. Hawke, the borough engineer, and Mr. P. C. Tempest, of the South-Eastern Railway, were doing all that was possible to make the meeting a success.

The chairman next stated that, in addition to preparing a statement regarding the various municipal works of the borough, Mr. Maxwell had consented to read the following short paper on the question of roads.

HAVE BITUMINOUS METHODS OF CONSTRUCTION SOLVED THE MODERN ROAD PROBLEM?

By W. H. MAXWELL, ASSOC. M. INST. C. E.,
Borough Engineer of Tunbridge Wells.

For a decade past the doctrine of bituminous methods of construction has been both preached and practised almost universally throughout the country, and applied, antidotally, against certain well known evils alleged to have arisen owing to the use of high-speed mechanically propelled traffic on highways. It can therefore scarcely be said to be in any way premature to expect that some general and yet fairly definite conclusions should now be formulated with reference to the advantages or otherwise of these methods of road making and maintenance.

In the great majority of cases, where the traffic is insufficient to justify the expense of granite, wood, or asphalt paving laid on a concrete foundation,

apart from special proprietary and more or less improved processes, little choice remains except as between a granite macadam surface and one formed of one or other of the various bituminous methods in which the presence of coal-tar and pitch is the distinguishing feature.

The bituminous methods include tar-macadam as used in some parts of the country for probably half a century or more, pitch-grouting of recent experimental notoriety, tar-binders, and various other forms, all having for their main object the exclusion of water from the crust of the road. Tar-painting, although not a process of construction, is an important factor in the matter of maintenance, and may be looked upon as a useful step towards the waterproofing of road surfaces. Its adoption has introduced what is practically a new department in the administration of the work of highway maintenance.

Tar-macadam has long proved to be a very serviceable material when laid in suitable situations and under favourable conditions, but its successful application requires careful discrimination. Its cost is generally fairly high, owing largely to the difficulty of obtaining a cheap and suitable aggregate from which it can be prepared. Almost every class of stone has been experimented with in this connection, but among the most largely used materials are slag, Kent ragstone, and Quenast stone, all broken to the required gauge. If the aggregate selected is too soft much wear and dust is naturally formed. If too hard the tar does not satisfactorily combine with the stone to produce a good, well-bound surface when laid.

Slag varies considerably, and much care is needed in the selection of suitable material, but the point is one of some difficulty, as large demands upon the available supplies have been made of recent years. Tar-macadam made from unsuitable slag is very liable to disintegrate, and thus involve frequent resurfacing.

Kent rag tar-macadam may be employed as a bottom layer supporting a wearing coat of slag tar-macadam, or an armouring of asphalt.

The writer has also experienced good results from Quenast stone, but very few of the harder classes of stone are suitable for the purpose.

In all cases, and especially in the case of slag, it is advisable, where facilities exist, to buy the aggregate unmixed in order that its quality can be more readily detected, and subsequently to carry out the drying and mixing process at the local public works depot.

Some disadvantages commonly experienced in the use of tar-macadam are:—

(1) That it cannot be satisfactorily laid and repaired during wet and cold weather.

(2) It will not withstand heavy traction engine traffic for a considerable period after it has been laid.

(3) At all times it is liable to soften slightly under hot sun to an extent sufficient to admit of damage by heavy traffic.

(4) It is liable to creep during a hot summer towards the sides of the roadways, especially on country roads, where the lateral support of a kerb and footpath is not available. Some provision to meet this tendency must usually be made.

(5) Its cost is, as a rule, considerably beyond that of a granite macadam tar-painted surface, and its useful life cannot always be so accurately predicted.

But notwithstanding all the difficulties which may be enumerated, much successful work of this description has been carried out, and every case must be carefully considered on its merits, with special reference to local traffic situation and conditions of the site.

The official figures of cost given in the Road Board interim report (January, 1913) for different classes of tar-macadam and for pitch-grouted macadam are as follows:—

Kent rag tar-macadam, $3\frac{1}{2}$ in. finished thickness, 2s. 8d. per square yard.

Selected blast-furnace slag tar-macadam, 3 in. thick, 3s. 3d. per square yard.

Selected blast-furnace slag tar-macadam, 4 in. thick, 3s. 8½d. to 4s. per square yard.

Blue Guernsey stone tar-macadam, 4 in. thick, 4s. 1d. per square yard.

Single pitch-grouted macadam, 3 in. thick, 4s. 1d. per square yard.

Double pitch-grouted macadam, 4½ in. thick, 5s. 7½d. per square yard.

So far as the writer's observations have gone, pitch-grouting has not yet manifested any superiority over good-class tar-macadam, well laid, and it has been frequently noted that its serviceable life is not great, also that deep corrugations quickly appear in the newly formed surface, making motoring, even at the most moderate speeds, an unpleasant experience. The surface, too, during wet weather, often carries much slippery black mud.

The work involves the use of a considerable amount of rather cumbersome and highly depreciative plant, which not infrequently causes inconvenient obstruction on narrow highways.

An absolutely sound and uniform foundation is indispensable for all well-made roadways, and this is particularly true in the case of bituminous road crusts, which are necessarily of a yielding and more or less plastic nature.

Where the old macadam road surface is used as a foundation for the bituminous coating, the surface should be first lightly scarified all over and consolidated by rolling to a uniform face before the tar-macadam or other material is laid. If this precaution is neglected, the old inequalities and potholes in the road crust will soon reappear on the surface of the new bituminous coat.

Amidst the present popularity of bituminous methods, as the writer has often previously pointed out, the fact should not be lost sight of that a thoroughly well-made first-class granite macadam road surface subsequently coated with refined tar and granite chippings is free from many of the drawbacks appertaining to most of the bituminous methods. When laid on a good foundation, and tar-painted annually, a good, rigid contour is usually maintained free from the fatal defects of deep, wavy corrugations, so characteristic of some bituminous processes. Tar-painting by hand is more satisfactory, from many points of view, than machine work, and, in the writer's experience, this treatment reduces the annual expenditure on road metalling, and certainly minimises the amount of road dust.

Although bituminous methods have contributed more largely towards the waterproofing of road crusts than almost any other process, and form very serviceable surfaces in many situations, it cannot be claimed, in the writer's opinion, that this mode of construction solves the road problem, as has been so often advocated. On the contrary, it is eminently unlikely there can ever be any universal solution to such a problem, inasmuch as local conditions and requirements, character and extent of traffic, local facilities of obtaining suitable materials, considerations of cost and the like, must always constitute deciding factors in arriving at the most satisfactory mode of treatment in each particular case.

Fast travelling motor omnibus and char-à-banc traffic, motor vehicles and tractors for the delivery of goods have unquestionably a very destructive action on road surfaces, and, in view of the rapid growth of this class of traffic, the problem of maintaining public roadway surfaces within reasonable limits of expenditure, is one of ever-increasing difficulty to highway authorities.

DISCUSSION OF MR. MAXWELL'S PAPER.

The CHAIRMAN (Mr. A. Dryland), in moving a vote of thanks to Mr. Maxwell, said the subject dealt with in the paper was one in which they were all interested in a greater or less degree. A great deal had been said and written upon it for a long time past, but he thought they would agree with the assertion of the author that there was no absolute panacea for all the evils with which they were confronted; as had been said, each particular problem had to be dealt with by itself. There was no special system suitable for all situations and all kinds of traffic. He thought Mr. Maxwell's experience with pitch-grouting was very much the same as that of most of them. While undoubtedly it did make a crust of considerable strength, it had some disadvantages, greater in some respects than was the case with other methods—one being corrugation. That might not matter much on roads with slow traffic, but it did on roads with fast traffic, for, besides

restricting the speed of vehicles passing over it, it tended to its own destruction. So it could not be an economical proposition. There was no doubt that to-day in certain situations and under certain conditions a good water-bound macadam road, tar-painted, was the most satisfactory method. He had roads of that character on the open downs—almost perfect roads of their kind—but now that he had motor buses running over them he "had doubts," for after traffic exceeded a certain limit there came a time when a method ceased to be economical. In the summer-time there was no difficulty, but continuous heavy traffic passing over a road during a long spell of wet weather resulted in the surface beginning to chum up. One did not get out of the road quite the results one wanted, and it became necessary to coat the tarred macadam, and adopt even more expensive forms of reconstruction than that. After all, the great secret of success with all roads carrying fast traffic was waterproofing, and unless one could get a surface that would exclude the water, even in the winter time, it was not possible to get a perfect road. That was one of the advantages of slag as compared with ordinary tar-macadam—it did preserve a waterproof surface during the winter. He had had a very favourable experience of slag tar-macadam. He was sorry, for many reasons, that they had not had more success with granite tar-macadam, but his experience with it had been very limited. A few years ago he laid a number of lengths of it between lengths of slag tar-macadam, and the latter was very much better to-day than the other, largely perhaps owing to the fact that the slag kept so much more waterproof.

Mr. H. W. BOWEN (West Sussex), seconding the vote of thanks, pointed out that while Road Board returns gave them the cost of different forms of construction, they said nothing as to where the particulars were obtained. He thought it was somewhat misleading that the localities should not be specified. For instance, in the Midlands, where one was close to the quarries, and works from which the slag was obtained, the cost of materials must be very much lower than in the Southern counties. On one occasion when his chairman heard a county surveyor speak of having constructed roads at so much per mile, he wanted to know how it was they were so extravagant in West Sussex. But in the county in which the work in question was done, stone was delivered direct on to the roads at from 7s. to 11s. per ton, as against from 16s. to 17s. per ton in his own county. The chairman had observed that a water-bound road, tar-painted, was one of the best roads that one could put down under some conditions. The conditions had, of course, changed in recent years. On nearly every road in his county they had a large amount of motor traffic, and their greatest difficulty was to keep the roads together before they were tar-painted. Another trouble was the lack of abutments on country roads, and the method he had adopted to overcome that was to excavate the roads on each side and put in boulder flints, which acted as part and parcel of the roads, and did duty as a sort of kerb. When engaged in carrying out road works and having no possible means of diverting the traffic they had found with these abutments that there was not so much trouble with lateral movement.

Mr. P. H. PALMER (Hastings) stated that he had obtained from macadam roads twice tar-painted far more satisfactory results than with tar-macadam roads.

Mr. W. H. GRIEVES (Sutton, Surrey) said there was no doubt that everything depended on the position and the traffic the roads had to carry. He had tried several of these special kinds of road construction, and he, too, had yet to obtain any very satisfactory results from granite tar-macadam. The best material he had so far found was Rocmac. That could be laid in almost any weather, even frosty weather, though it was not wise to put it down during very wet periods. He had laid it on the main road from London to Brighton, and he knew of no material that gave a better result on a hill. It was not absolutely free from dust. One got dust from it in a dry time, more in the second than in the first year, but it was absolutely free from mud, when on the ordinary water-bound roads they had the sweepers and scrapers at work. Another material from which he had obtained good results was Mexphalte, a half mile of which he had laid some fourteen or fifteen months ago on the main road of which he had spoken. That was made on the site, and put down at a temperature of over 200 degrees, and up to the present time it had stood most excellently. On that section

of road they had put in abutments of creosoted deal 3 by 2, and he had found that these answered very well. Still another method which he had tried in his district was putting on a carpet of Roadant, 1 in. in thickness, on an ordinary water-bound road. The effect of that was wonderful, for several business-people with premises on the road on which the work was carried out had told him that whereas vibration from traffic had previously been very bad it had now entirely ceased.

Mr. T. A. BUSBRIDGE (Maidstone) said he assumed from the suggestion of Mr. Maxwell as to the employment of Kent rag bottoming with a topping of slag, that the slag was superior in wearing qualities to the Kent rag. He had, however, had considerable experience of both materials in an untarred condition, and he had found that the Kent rag was by no means inferior to the other. He would like to know whether it was Mr. Maxwell's personal experience that slag was better.

Mr. F. HARRIS (Tunbridge Wells Rural) said he could recommend everyone to experiment with ragstone, for they would find it satisfactory. He was quite certain it was good enough to carry any traffic.

Mr. E. R. CAPON (Epsom) said he had a good deal of experience with both slag and limestone tar-macadam in his district. The cost was practically the same, but he much preferred the slag. He thought they were inclined to make a mistake when they spoke about a stone absorbing tar. When it did that to any considerable extent it was proof that it was too soft. It would seem that slag had an affinity for tar that other materials did not possess, and his belief was that it was the finest material for roads they had.

The vote of thanks was carried.

Mr. MAXWELL, in the course of his reply, said his view was that Kent ragstone was a very suitable material under many conditions. He had used it under different conditions, but so far as roads bearing very much traffic were concerned, he had to admit that he was not very much impressed with it. For a side road with light traffic it made a good wearing surface, but it had been his experience that slag made a very much more durable road. If one broke up a slag tar-macadam surface one would notice that the slag and tar seemed to have consolidated in one crust, but he did not think quite the same thing would be observable in a Kent rag tar road.

Before the close of the proceedings Mr. J. H. BRIERLEY (Richmond, Surrey) pointed out that the discussion had shown how everything depended on the nature of the traffic, and so forth. When they had presented to them various details as to cost they did not convey much, and he desired therefore to know whether it would not be possible to make arrangements for a collection of statistics which might be mutually helpful to all engaged in the construction of bituminous roads.

The CHAIRMAN said he agreed that the tabulation of such information would serve a useful purpose, for it was important if any comparisons of cost were to be made that all the circumstances should be known if they wished to avoid falling into error. He suggested that Mr. Brierley should bring up the question at the next meeting of the executive in order that steps might be taken to obtain figures.

THE MUNICIPAL WORKS OF TUNBRIDGE WELLS.

In his description of the various municipal works of Tunbridge Wells, Mr. Maxwell, after mentioning that the area of the borough was 3,991 acres, the population 36,000, or including the "water area," about 40,000, the rateable value £309,928, and the rates, including district, borough, education and poor rates, 6s. 1d. in the £, went on to refer to the

WATER SUPPLY.

The area of supply consists of a circle of 6 miles in diameter. The sources of water consist of twelve springs, and deep borings into the Ashdown sand rock, which is overlaid by about 185 ft. of Wadhurst clay. The daily supply varies from about 1,000,000 to 1,500,000 gallons per day according to the season. The character of the water is soft, and of the highest purity.

Filtration consists of open sand beds and Candy oxidising mechanical pressure filters, the latter, it was pointed out, being specially adapted for the removal of iron from the deep well supplies.

There is an open storage reservoir of 42,000,000 gallons capacity, and a clear-water reservoir of 200,000

gallons at the waterworks; also a high service reservoir of 900,000 gallons at Blackhurst, near the eastern boundary of the borough.

From one bore well water is raised by an air lift capable of discharging from 25,000 to 30,000 gallons per hour from a depth of about 90 ft. to 120 ft. The pumping machinery consists of steam-driven deep-well pumps, centrifugal pumps to filter-beds, compressor engines for the air lift, an 80-h.p. oil engine for deep well pumping, two compound rotative beam engines jet condensing, and two triple-cylinder compound inverted direct-acting rotative surface-condensing engines for pumping to the high-service reservoir.

There are four Lancashire boilers, 30 ft. by 7 ft. 6 in., with Sugden superheater.

Electric light has been installed throughout the works.

Bore wells recently sunk are 336 ft. deep by 3 ft. 6 in. overall diameter at the top, lined with cast-iron tubes in 12-ft. lengths, through 185 ft. Wadhurst clay and 151 ft. Ashdown sand.

SEWERAGE AND SEWAGE DISPOSAL.

The borough is divided into three watersheds, or drainage areas, two being drained by gravitation outfall sewers of 5 ft. and 5 ft. 6 in. diameter respectively, and one to a sewage pumping station. The depths of the sewers vary up to a maximum of about 66 ft., the district being of a hilly character.

Sewage disposal is by means of broad irrigation on two sewage farms of 386 acres in area, with the assistance of percolating bacteria beds at one farm. About thirty-five horses are kept at one farm for town work.

The sewage pumping station is provided with four gas engines, and sets of three-throw plunger pumps capable of raising 60,000 gallons per hour through 135-ft. lift. The rising mains are 9 in. and 12 in. diameter.

ROADWAYS.

The total mileage of roads is about 50, of which 8½ miles are main roads. The gradients, in some cases, reach a maximum of about 1 in 10. Tar-painting has been carried out for many years past, and a length of slag tar-macadam was laid in the St. John's-road seven years ago, when a considerable widening of this thoroughfare took place at a cost of about £7,000.

The public works depot adjoins the S.E. & C.R. goods station, and is accommodated with sidings for delivery of materials. Here also are stabling for about twenty horses, stores offices, three weighbridges, stone-breaking machinery, tar-macadam mixing plant, storage for steam rollers, fitters', blacksmiths', carpenters' and painters' workshops, waterworks fitting and testing shop, and other municipal services.

ELECTRICITY WORKS.

These adjoin the public works depot, and were opened in 1895. The system adopted is high-tension, single-phase, alternating current, periodicity 67.5, with transformer sub-stations and distributing low-tension mains. The voltage is 220. The charge for lighting is 4½d. per unit, and for heating, power and cooking 1d. per unit.

GENERAL.

A quarry at Sevenoaks is worked by the corporation for the purpose of providing stone for roadways of medium and light traffic, and gravel for paths, and so forth.

There are three recreation grounds having a total area of 18 acres.

Both open-air and indoor baths are provided by the corporation. The indoor baths have one large swimming bath, 90 ft. by 35 ft., fifty dressing boxes, and sixteen slipper baths.

A technical institute in Monson-road, which was erected by the corporation, was opened in 1902. The cost, including equipment, was about £19,944.

A sanatorium, accommodating about sixty-five patients, is situated on high ground at Frant Forest, 1½ miles from the town, and is surrounded by about 7 acres of land.

The Grosvenor Bridge, crossing the S.E. & C.R. goods sidings and main line, was built by the corporation, and opened in 1883. It is a steel-girder bridge, with a wood-paved carriageway. The High-street bridge, over the S.E. & C.R. main line and passenger platforms, was rebuilt in 1906-7 jointly by the corporation and the S.E. & C.R. Company at a total cost of £15,000. A substantial street improvement and widening was at the same time secured. Owing to the very limited headroom available, considerable difficulty was experienced in suitably arranging the levels of the various approach roadways, and with relation

to the floor levels of adjoining properties. The carriageway is paved with "Acme" Jarrah blocks on concrete.

The borough cemetery consists of 28 acres, and is situated at Frant Forest, $1\frac{1}{2}$ miles from the town. A new portion is now about to be laid out, drained, and a new waiting-room, offices, &c., provided.

The Calverley-parade property was acquired by the corporation in 1895, at a cost of £20,600, for the purpose of new municipal buildings, and for the widening of Mount Pleasant-road, this latter work having been completed in 1901.

The public health offices are situated at the Calverley-parade, and a well-equipped municipal laboratory is also provided.

The Tunbridge Wells and Rusthall Commons are under the management of a body of conservators, and comprise an open space of great natural beauty of 249 acres in area.

Mr. P. H. PALMER asked, with reference to the statement that the daily supply of water varied from about 1,000,000 to 1,500,000 gallons per day, whether that was the daily supply from the various springs and boreholes or the consumption. [Mr. MAXWELL: The consumption.] Was that due to the fact that they could not get more? He was in a similar district, and he knew that the summer yield was very much less than that of the spring and autumn.

Mr. MAXWELL said they had no difficulties in that connection. There was no fluctuation in consumption. So far as the underground sources of supply were concerned, there was a fluctuation of water within a range of 50 ft. of depth, but they always obtained as much as they required, with a very large margin over. From one borehole, 15 in. in diameter, they were able to draw at a rate of 40,000 gallons per hour.

The CHAIRMAN (Mr. Dryland) said he saw that Mr. Maxwell had a tar-macadam plant, and some figures regarding the cost of working that would be of interest to the members.

Mr. MAXWELL said he had not the figures available at the moment.

Mr. W. H. GRIEVES (Sutton, Surrey) asked what was the consumption of water per head per day. He supposed that in a place like Tunbridge Wells it was rather high.

Mr. MAXWELL said the figure was 21 gallons. That could not be regarded as a high figure, considering that a large quantity was used for gardens and so forth, and included all municipal purposes. A close lookout, however, was kept on leakages in mains and elsewhere. Answering other questions, Mr. Maxwell said the upkeep of the baths involved something between a 1d. and $1\frac{1}{2}$ d. rate. The sanatorium was built about eighteen years ago, but he could not supply off-hand any figures as to cost. A 1d. rate produced about £1,150.

During the afternoon the members made an inspection of the corporation waterworks, electricity works and depot, being subsequently entertained to tea by the mayor.

Public Authorities and Tarco.—Tenders for the supply of Tarco for surface spraying, and Bi-Tarco for the construction of improved tar-macadam, have been accepted by the corporations of Ossett, Bexhill, Birkenhead, and Tenterden, and the Kendal Urban District Council.

Road Tarring in St. Austell.—During last year a large proportion of the roads in the St. Austell Urban District were sprayed with tar, and generally speaking, says the surveyor to the council, Mr. E. D. Groves, in his annual report, the treatment was very effectual in keeping down the dust and preventing the road surface from breaking up during the dry season. Where, however, the traffic was especially heavy, the face of the tar was soon broken, causing an objectionable mud to form on the surface. Mr. Groves adds that where tar-spraying has been done on slight gradients it has been found to be slippery for horse traffic at certain periods. Referring to ordinary tar-macadam, the surveyor says: "I am very doubtful of its success under heavy traffic. Tar is sensitive to weather conditions, and, having a low melting point, flows in hot weather, or becomes very soft, and the traffic moves the metalling. When the road surface is fractured and broken by the traffic the tar loses its nature, and becomes hard and brittle in cold weather; and the wet gets into the road and causes it to break and churn up."

ELECTRIC LIGHTING FOR COTTAGES.

THE WEDNESBURY EXPERIMENT.

The scheme of the Wednesbury Corporation for the supply of electricity to small houses and cottages was the subject of an address given last week by Mr. W. Fennell, engineer and manager of the Wednesbury electricity department, to the Birmingham members of the Institution of Electrical Engineers at the Birmingham University.

Mr. Fennell said electricity had for so many years been looked upon by the public—and even by electrical engineers themselves—as a very convenient but rather expensive form of lighting, that it required considerable imagination, even to-day, to contemplate the installation of electric light in hundreds of cottages inhabited by the poorest people, and rented at, say, 3s. to 4s. a week. It might be said that while electric lighting would confer great benefits upon the tenants of cottages by supplying a healthy light which would not vitiate the air in already overcrowded rooms, it was not reasonable to suppose this could be done profitably at a cost within the means of the consumer, and that any such proposal was doomed to failure, if only on the ground that such tenants were unreliable as well as careless, and would not properly use or appreciate the supply.

It might be well to set out the reasons that led to the consideration of the question. Wednesbury, like many Midland towns, was not an attractive residential area. The richer people, for the most part, lived outside, and the workers formed nine-tenths of the population. In developing the demand for electricity on the usual lines most of the larger houses and shops were soon connected. Reduced rates for licensed premises brought almost all those houses on the mains, and the smaller shops followed when a free wiring scheme was introduced. But not even free wiring coupled with the rateable value system of charge, or slot meters, induced the £8 to £18 householder generally to take a supply of electricity. With those small consumers, the convenience of gas for cooking and the cheapness of the apparatus was greatly in its favour. That class of consumer would not, as a rule, use both electricity and gas, and had no money to spare for the purchase of expensive cooking stoves. It was therefore useless to expect to make much headway until cheap electric cooking apparatus could be offered. It appeared that the limit of the lighting demand was being reached.

ENGINEERS AND COMPETITIONS.

IRISH INSTITUTION'S ACTION.

The following letter from the Institution of Civil Engineers (Ireland) was read at the meeting of the Belfast Rural District Council held recently:—

"The council of the above engineering society have had their attention drawn for some time past to a practice which exists among local authorities of inviting by advertisement engineers to submit in competition with others their terms of preparing plans and proposals of certain engineering schemes, accompanied, then or perhaps at a later stage, by estimates of the cost of the works proposed. In the opinion of the council such a proceeding is very undesirable in the best interests of the public authorities themselves, and is derogatory to the engineering profession. The council desire to express emphatically the repugnance with which they regard the practice in question. They have every confidence that the members of the institution will support them by declining to respond in any way to such advertisements as those. The council have informed the Local Government Board of their action in making this communication."

Cost of Leeds Strike.—At the Leeds City Council on Wednesday it was reported that the recent municipal strike had cost the city £112,000.

Housing and Town Planning Conference.—A conference of local authorities of Greater London was held at the Westminster Palace Hotel on Wednesday under the auspices of the National Housing and Town Planning Council, to consider practical town planning administration. Forty councils were represented, and of these about thirty already have town planning schemes under contemplation or in various stages of progress.

The Road Board General Directions and Specifications Relating to the Tar Treatment of Roads.

THEIR BEARING ON ROAD CONSTRUCTION AND MAINTENANCE.

By JOHN HUTCHINSON.

It will doubtless be quite satisfactory to the Advisory Engineering Committee who prepared for the Road Board the specifications three years ago, to know that the president of the Southern District Association of Gas Engineers and Managers, in his inaugural address at the meeting on March 12th (*The Surveyor*, March 20th), declared that the specifications had "been of some assistance." To appreciate fully the weight to be now attached to such an expression of opinion, coming as it did from one of the leading men in the gas and tar world (Mr. Thomas Glover, Norwich), we must go back to the time when those same specifications were regarded with a not too friendly eye. The editor of *The Journal of Gas Lighting*, issue of February 27, 1912, wrote as follows: "These specifications have been the subject of a good deal of criticism on the part of gas managers and tar distillers; but the criticism has been to some extent mutually destructive, because gas managers and tar distillers seldom hold identical views on such matters."

Gas managers and tar distillers had hitherto worked with a free hand, and it is not to be wondered at that they felt at first disposed to resent any restraint or control being imposed upon the products of their works.

I gather from that part of the president's address which dealt with tar and the treatment of roads that at the time the address was prepared Mr. Glover had not seen the second (and revised) edition of the specification, otherwise he would hardly have suggested that "Adherence to the Road Board Specifications would appear to mean the exclusion of many such tars, so reducing the source of supplies, with a consequent rise in prices." Whatever limitations were imposed (as a fact they were only suggested) in the first edition, it would now appear that the revised edition, as regards tars Nos. 1 and 2 and pitch, has been prepared with a view to be as broad and liberal as possible. One instance of this may be given, the amount of free carbon formerly with maximums of 16 and 18 per cent in tars Nos. 1 and 2 are now given a range of 12 to 21 and 12 to 22 per cent.

To refer once more to that portion of Mr. Glover's remarks which has reference to the title of this paper, it must be noted that the president gives evidence of "research" in his investigation of the properties which he deemed essential in tar-binders. His views on the necessity for a "standard of viscosity and adhering to that standard," which coincided with those of the engineering department of the Road Board, will be endorsed by all concerned with bituminous road making, who will also gladly acknowledge that gas engineers and tar distillers can be of much assistance to road authorities, and will agree with Mr. Glover that the best results will follow co-operation of the supplier and user of road tar. Both parties are interested, the one in preparing a material which will fairly meet the specified requirements of the engineer, the other in seeing that the material supplied is that which he has ordered, and that it is of that quality, as regards certain properties which he has specified as essential.

It is here that the Road Board Specifications will act as a valuable guide to the tar producer as well as the road maker. Coal-tar in its adaptation to road making is only in its infancy. It is only within quite recent years that the properties which render it so valuable for road treatment have become the subject of laboratory research and service experiment. Many of the secrets, and certainly most of the records, of the success, or, on the other hand, the failure, of tars in their application to roads are in the possession of the Road Board. It is that invaluable knowledge which gives weight and authority to the suggestions and directions which have been prepared by the engineering department.

The first edition of the Road Board Specifications, having been superseded by the second (revised) edition, I will make no further reference to it beyond saying that its publication had unquestionably the result of calling the attention of local authorities,

including works committees and their surveyors and engineers, to the fact that the time had come when road construction and maintenance would have to be conducted on scientific lines in the interests of all concerned, while at the same time it woke up gas managers and tar distillers to the necessity for more attention to be given to the preparation of tar for roads.

It is perhaps to be regretted that this new edition did not bear on its title page an announcement that the specifications had been revised and brought up to date. The result of this omission will probably be that those who have in their possession the first edition will regard the second as merely a reprint and will think it hardly necessary to buy it. The second edition is, however, far from being a reprint of the first. The careful reader will observe that the directions for surface tarring refers only to the water-bound road. He will perhaps find in practice that "boiling," par. 9, will not be reached at the temperatures given for tar No. 1 (220-240 Fahr.). If the tar froths and wallops to any considerable extent within those ranges of temperature it is evidence that it does not comply with the specification for tar No. 1.

The engineer will now use his own discretion as to the amount of gritting material to be spread on the tarred surface, and he will doubtless be careful to direct that such material must be free from dust. Should he keep samples of the tar he has used on any particular piece of work, which he will be sure to do, as a guide for future operations, he will direct that the vessels containing the samples—which might be half gallons in preference to quarts—are well stoppered so as to exclude air.

Though the surveyor will not now be invited to send his records of bituminous work to London, he will no doubt have them kept as carefully as before.

The *Value of Specification No. 2* (directions for surfacing with tar-macadam) cannot be over-estimated. There are a few road makers in England who regard themselves as wanting in knowledge of either how to prepare tar-macadam or in what manner to lay it, yet either of these operations can only be successful if carried out on scientific and approved lines.

Paragraph 6 defines the grading of the stone. It is of first importance to note that the grading is now based on the standard gauge, and that the term "gauge" is used to describe the standard group of sizes into which broken stone is divided. Were it not for this proviso the amount of air spaces in the aggregate would be so great as to make it impossible to produce an impermeable surface.

It is assumed that all those engaged in the preparation of tar-macadam have provided themselves with a copy of the "British Standard Specification for Sizes of Broken Stones and Chippings,"* which was published last August. If not, I might mention here that it would be found invaluable to engineers and quarry owners.

When thoroughly drying the stone (par. 7), which all makers of tar-macadam agree is essential, it will be remembered there is always present the risk of overheating. If the stone is too hot the film or coating of tar will be "burnt" and rendered useless as a binding medium.

In *Specification No. 3* the directions for surfacing with pitch-grouted macadam will be found of great value. The importance of waiting for fine weather until the stone is dry before carrying out the operation (par. 8) will be observed by those who have witnessed the result of pouring pitch on wet stone. Coal tar has no affinity for moisture is a well-known saying, and is applicable to the tar treatment of roads in greater force than probably to any other work in which tar may be used.

The rules for mixing the heated sand with the pitch, the proportions of both to be used, the method of pouring and the necessity for keeping the matrix well stirred throughout the operation of mixing and pouring are essential, and it is only by careful adherence

* Crosby Lockwood & Son. Price 3s. nett.

to these rules that this important method of road construction will have a fair trial. The instructions for melting the pitch (par. 18) and adding the oils, with the observations made as to how temperatures can be raised or lowered, cannot fail to prove a valuable guide to those directing this part of the work.

Specification 4, Tar No. 1. Suppliers as well as users of road tars will examine this specification carefully to learn what, if any, alterations have been made since 1911. They will find a strong recommendation to use heaters specially designed to prevent "frothing, which will otherwise inevitably occur if the tar contains even a small percentage of water." This is very sound advice, and should be taken note of, especially by those who from various circumstances are compelled to use crude or raw tars.

It is noticeable that the discrimination between "tar from gasworks" and tar from distilleries is not now made.

A very proper and, indeed, requisite addition to the specification is now made in defining the method which should be adopted in determining freedom from water and ammonia. The method of testing for crude tar acids (phenols) is also given.

The distillates at given temperatures are now usefully described as "light," "middle" and "heavy" oils. The wide range now given for free carbon—12 to 21 per cent—should satisfy those distillers who were disposed to criticise the limitation of that constituent to 16 per cent.

Specification 5 for Tar No. 2 will also be closely looked into, and it may come as a surprise to some that carburetted water-gas tar may now be admitted to an amount not exceeding 25 per cent of the volume of the tar. (In tar No. 1 it is limited to 10 per cent.) This liberal extension of the former limit in carburetted water-gas tar may be attributed to the desire of the Road Board to avoid the exclusion of any source of supply, so long as the tar complies with the specification in other respects.

Free carbon is given a range of from 12 to 22 per cent—that is 1 per cent more than is admissible in No. 1 tar.

In direct connection with these important specifications for road tar are the directions for their being tested. The necessity for such directions is obvious.

Specifications, no matter how well drawn up, would effect nothing unless the material supplied was to be examined for compliance or otherwise. It is now plainly stated that "compliance of a sample of tar with the Road Board Specifications" can be ascertained only in a chemical laboratory. This, of course, implies that the necessary analysis is to be made by a properly qualified chemist.

Immediately following the above directions comes a suggestion as to how it can be promptly and simply ascertained whether or no the consignments "differ fundamentally from an approved sample."

Herein lies one of the greatest risks for which the surveyor has to bear the responsibility under present conditions. He may have ordered, on the strength of an approved sample, tar No. 2, with which he intends to prepare tar-macadam. The consignment arrives; it is tar No. 1, and the work proceeds. It is only when the final tribunal of actual experience on the road—to use Mr. Glover's words—has given its decision that the mistake will have come to light.

The specifications provide against the occurrence of such a disaster.

A chemical test, it goes without saying, could not conveniently be carried out either at the municipal depot or on the roadside. Fortunately, however, what is known as a physical test can. Now, the quickest and simplest physical test is that for specific gravity. Be it noted that one of the most valuable features in the specific gravity test is that it provides very reliable means for identification; in a word, by having this test applied to a consignment the foreman can report whether it is what was ordered for the job or not. The specification describes—pp. 23 and 21—the kind of instrument to be used and the method of using it, the time occupied being some two or three minutes.

Immediately following the above test for checking consignments, it is laid down that "the specific gravity of a tar is not by itself a sufficient indication of the utility of the tar." That brief statement of a scientific fact should be carefully noted by every supplier and user of tar.

The gas engineer and the tar distiller with their staffs may be, as Mr. Glover declares, better equipped for experimental work and standardising than the

road surveyor; but, nevertheless, the only guide they have hitherto used for determining the suitability of tar for road treatment of various kinds has been that of specific gravity. There are some few exceptions to the above, among which may be mentioned Mr. Glover.

Specific gravity not being a sufficient indication of utility, the specification proposes a test for viscosity, and sets forth in a concise and simple form the conditions under which such a test should be made. The surveyor's attention to the directions under head of viscosity will be well repaid.

A simple and, so far as I know, an original test for the presence of water and naphthalene completes these new directions for the testing of tar.

Specification for Pitch, No. 6.—Here we are told how a "straight-run" pitch suitable for pitch-grouting is obtained, also how a harder pitch may be softened or cut "back." A test by a standard penetrometer using a weighted needle, with the sample at a fixed temperature, is proposed, and an excellent test it is for ascertaining the comparative hardness or softness of the sample.

The proportions of distillates at given temperatures of prepared pitch and commercial soft pitch, and the permissible range of free carbon as set forth in the specifications, give evidence of much chemical research supplemented by the experience of the chemical engineer in both experimental and service work.

The directions for tar oil to be used in softening the pitch will, no doubt, be accepted as a guide to what has been found by careful experiment to give the best results.

The bearing that the Road Board Specifications, especially the new and revised edition, will have on road construction and maintenance cannot be made manifest to the lay mind at once. The professional mind will not be slow to grasp the fact that powerful influences are at work, suggesting now—later on, perhaps, insisting—that work must be conducted on scientific and approved principles.

In the road-making world of to-day everything points to the desire of the British surveyors and engineers to keep abreast with their colleagues in other countries. That they will succeed is certain, and to such an end the Road Board Specifications will have contributed much.

The note at foot of specifications Nos. 1, 2 and 3, that the directions are not intended to displace or discourage the use of proprietary articles should be noted, also that the engineering department find themselves able to endorse the opinion of the Advisory Committee as to those articles being of proved value.

QUERIES AND REPLIES.

We cannot undertake to reply to any queries which are not accompanied by the writer's name and address. These are required as a guarantee of good faith, and not for publication. Sketches accompanying queries should be made separate, on white paper, in plain black ink lines. Lettering or figures should be bold and plain.

904. Water Supply.—Mr. H. Fox Hill, surveyor to the Ware Urban District Council, writes: I shall be glad if any of your readers can give me any information as to where loaded equilibrium valves are used for the purpose of keeping a head on the pumping main for pumping to high districts.

Roads Improvement Association.—The Hon. Arthur Stanley, M.V.O., M.P. (president of the branch), occupied the chair at the annual general meeting of the Lancashire and Cheshire Branch of the Roads Improvement Association held at Manchester on the 24th ult. The president was supported by a full attendance of the committee, a large number of local subscribers and general road users being also present. In his opening remarks the president emphasised the representative nature of the Roads Improvement Association, and its wide field of usefulness. He congratulated the branch upon their very busy year, and the large measure of success that had attended their activities. The annual report was adopted on the motion of Mr. A. Lyle Rathbone, J.V., C.C. (Liverpool), seconded by Mr. E. J. Chambers (Manchester), and general discussion ensued upon road topics, and especially in relation to the provision of roads in town planning proposals, and the need for a central highway department with more power than the Road Board. In the evening the committee dined together at the Midland Hotel, Manchester.

Passenger Transportation Problems in Large Cities.

MANCHESTER TRAMWAY MANAGER'S REPORT.

In November, 1911, the Manchester Tramways Committee decided upon an investigation of the problem of street congestion within that city, and a sub-committee was appointed to consider and report upon—(1) The probable increase of tramway traffic during the next twenty years, (2) The provision necessary to diminish the increasing congestion in the central streets, and for facilitating tram traffic, by the following or other means: (a) Widening of existing streets or the construction of new streets; (b) the acquisition of an arterial centre for the marshalling of tram traffic; (c) The construction of subways for tram traffic. (3) The extent to which the financial resources of the tramway undertaking can be applied to this purpose. In the following January the sub-committee presented an interim report showing the magnitude and importance of the problem, and recommending that the general manager and the permanent way engineer be instructed to visit certain cities in the United Kingdom and abroad, carefully study the passenger transportation facilities of those cities, and present a full report upon the subject. This recommendation was approved by the committee, and subsequently by the city council, and Mr. McElroy, the general manager, and Mr. Mattinson, the permanent way engineer, proceeded to visit in turn, New York, Philadelphia, Boston, Chicago, Pittsburg, Newark, Montreal, Toronto, Paris, Berlin, Vienna, Hamburg, London and Glasgow.

The general manager's report has now been issued, and, as mentioned in our last issue, contains many proposals for the betterment of street traffic in the city of Manchester. It includes numerous illustrations in the shape of photographs, maps and diagrams, and the information generally which it furnishes is of an extremely valuable character.

GENERAL OBSERVATIONS.

Mr. McElroy points out that in all the larger cities in various parts of the world the municipalities have found that the provision of adequate facilities for local passenger transportation has been one of the most complex problems they have had to deal with. "As cities have grown, due to the gradual increase in population, and as the riding habits of the people have developed, especially in the last few decades, it has become more and more difficult," he observes, "to make the channels of passenger transport equal to the ever-growing demands. In every city the main factors affecting the problem are much the same. There is a constant migration of the population from the inner to the outer zones, and this is greatly accelerated by every extension and improvement in the means of transit. Suburban districts rapidly become urban, and new suburban districts in the outlying areas are always in progress of formation. Smaller towns and districts on the outskirts are being drawn into closer touch with the cities, and a greater community of interests is being established over a gradually widening area.

"Every extension of the means of transit into the outer zones adds to the difficulties of handling the traffic in the central zone, and in time the congestion becomes so acute that the city authorities realise they are face to face with the inevitable traffic problem. This condition of things arises sooner or later in all large cities, but some cities have been confronted with the problem at an earlier date than others owing to the narrowness and bad lay-out of the streets in the older parts of the city, to the absence of suitable arterial roads, and to the presence in the central zones of a large amount of ordinary vehicular traffic, which, if it is slow-moving, tends to retard the general flow of the traffic."

NEW YORK.

Some interesting features presented by the transit facilities now in operation, and those which are under construction in New York, are noted in the report. Greater New York, with a population of about 5,000,000, and an area of 324 square miles, embraces Manhattan Island and the boroughs of Brooklyn, Queen's, Richmond, and Bronx. Manhattan Island, the original city prior to the inclusion of the adjoining boroughs within the city area, is the most densely populated piece of territory in the world, and the crowding of huge buildings for business purposes

into its limited area has created a transportation problem of the most complex kind.

Comparing the Manhattan subways with the deep level "tubes" of London, Mr. McElroy says:—

"The most interesting feature of the existing transportation facilities is the underground railway—the subway as they call it—in Manhattan. This subway is owned by the city authorities, and is leased to the Interborough Company. It is constructed under the streets of the city, and as near the surface as possible. The usual depth of the station platforms from the street levels is about 25 ft., and the approaches are by short flights of steps. The nearness of this subway to the street surface, and its easy accessibility as compared with the deep-level "tubes" in London, with their lifts and long subterranean passages, at once illustrates the advantages from the passengers' point of view of shallow underground railways as against deep-level "tubes." The subway has four tracks—two for express services and two for local services. It was originally built to carry 400,000 passengers per day, but it is now carrying over 1,000,000 per day, and the traffic is still increasing."

The problem as to the best method of meeting the present demands and making provision for the future occupied the attention of the Public Service Commissioners for several years. Ultimately they prepared a scheme which, as regards breadth of conception and thoroughness in all its details, is unsurpassed. The entire scheme, when completed, will add 333 miles of rapid-transit lines to the existing 296 miles, making a total of 629 track miles. The total cost of the new scheme when completed will be about £68,000,000—a figure about equal to the amount invested in the existing rapid-transit lines in New York. Thus the total investment on these undertakings, as outlined, will reach £137,000,000.

In his reference to the Manhattan tramways, Mr. McElroy states that experiments are being made for the first time with a double-deck car, which has several special features. Tramways are not regarded as means of rapid transit, however, for we read that "the conditions of traffic and the strong desire of the inhabitants for rapid transit lead one to think that a great deal of attention is not given to tramway development—although the Public Service Commissioners have in recent years caused many improvements to be effected in the tramway equipment and the service generally—but everywhere we became impressed with the idea that the authorities do not regard tramways as an important factor in any schemes for meeting the future transportation requirements in New York."

The motor omnibus has not, so far, made much headway in New York. There are a few running in one or two of the main avenues in Manhattan—avenues in which tramways have not been permitted.

Mr. McElroy quotes from a report recently made to the municipality, following an inquiry in London and Paris, as to the motor bus question. In this report the effect of the competition of these vehicles with the tramways in London is dealt with. It is admitted that, to a certain extent, the increase in facilities will result in increased riding, but it is added: "Motor buses operated by more than one company should not be permitted on the same route. The experience of London shows that if it is allowed the number of accidents will be increased by the racing of rival buses. Further, if more companies than one were to receive a franchise to operate buses in New York, it would only be a short time before one company would control the entire operation. Motor buses should not be operated in the same street with street surface railways (tramways), except for short distances where such duplication of route is necessary, because there are no other existing highways available for that portion of the omnibus route. This is undesirable, not only on account of competition, but because of such deliberate interference as has occurred in London, where in some cases buses run so close to surface cars that people cannot use the latter in safety. Motor buses should be excluded from streets having macadam pavements, and permitted only on pavements having a heavy foundation; the weight of the vehicle should not

exceed that permitted by police regulation of London."

PHILADELPHIA.

When Mr. McElroy and his colleague visited Philadelphia there was no evidence of traffic congestion such as they are familiar with in Manchester, nor as great as what they saw in other cities in America. The most striking traffic feature in this city, they remark, is the small mileage of rapid-transit lines as compared with what exists in other large cities in the United States. "The rapid-transit lines run between the business district on the east side of the city and the suburban district on the west, and they cater only for the flow of traffic in these directions. The lines in the business area are of the shallow subway type. In the outer area they are elevated. A special feature of the underground facilities is that, at the sides of the tracks laid for the rapid-transit trains, tracks are laid for tramcars, which enter the subway at certain convenient places and handle the local traffic. The system is designed so that the tramways shall act as tributaries to the rapid-transit lines."

BOSTON.

The chief feature which characterises the methods employed in Boston to meet the passenger transportation requirements is the excellent way the various means of transit have been devised to supplement one another. "The authorities," the report says, "have endeavoured to eliminate waste of facilities by not creating the unnecessary competition which accompanies the paralleling of different means of transit. The tramway lines, both on the surface and underground, and the rapid-transit lines are all operated by one company—the Boston Elevated Railway Company. This method of having only one operating authority for all the means of transit in a city has much to commend it. Under proper conditions and safeguards it leads to the best results."

CHICAGO.

In this, the second largest city in the United States, the population is widely spread, and every endeavour has been made to insure that the transit facilities should keep pace with the public demands. Developments are now being proposed in the direction of further rapid-transit lines to relieve the congestion of the surface lines which, in certain streets in the heart of the city, is becoming very acute.

PITTSBURG.

As regards the question of the provision of rapid transit in this city, this, it is observed in the report, will have to remain in abeyance for some years until the tramways have been modernised and brought nearer to their maximum efficiency for dealing with the passenger transportation requirements of the city. Ultimately, rapid-transit lines will have to be provided.

NEWARK, TORONTO, AND MONTREAL.

In each of these cities there were many points connected with the construction and management of the tramways systems which were interesting and instructive, but there was nothing of importance from which lessons might be drawn in relation to the special investigation Mr. McElroy and his colleague were making. In each of the cities there are troubles with a certain amount of traffic congestion, and suggestions have been made in the Canadian cities that relief might be provided by the introduction of rapid-transit facilities, but the subject has not yet taken any practical shape.

PARIS.

The City of Paris is the only place where practically the whole of the surface transit facilities—tramways and motor omnibuses—are operated by one authority on a large scale, and it was thought, therefore, that an unbiased opinion might be obtained as to the merits and demerits of the two systems from the point of view of the management. On this question being put to the officials there was a strong pronouncement in favour of the tramways, mainly on the ground of less cost in operation.

BERLIN.

In addition to rapid transit lines, there are the State railways within the city of Berlin. One line runs through the city, and the other is a circular line—the ringbahn.

The large network of tramways in Greater Berlin is operated by a company—the Grosse Berliner Strassenbahn. There are a number of important streets in the heart of the city from which tramways

are excluded, and surface transit in these streets is provided for by motor omnibuses.

VIENNA.

Vienna is the only large city on the Continent where the tramway system is owned and operated by the municipality, and this, added to the fact that the city has just had a thorough investigation made with the object of introducing a number of new rapid-transit lines to meet the city's growing transportation needs, makes the Vienna problem very interesting.

At the present time there is a rapid-transit line—the Stadtbahn or State Railway, partly elevated and partly underground—which was originally constructed for State purposes, and is therefore not well laid out for dealing with local passenger transportation. It is a steam-driven line, but is just about to be electrified. It forms a connection between a number of main line railway stations.

The proposed new rapid-transit lines closely follow the line of the flow of traffic, and it is intended to construct them on the shallow subway plan. With a view of obtaining the fullest information on the subject of rapid-transit lines, exhaustive inquiries have been made on behalf of the city into the methods of construction and operation of the American rapid-transit lines.

The motor bus services have not, so far, made much headway. The municipality, however, is gradually introducing them, and "we may," Mr. McElroy observes, "expect considerable development." Experiments are now being conducted with a view to the adoption of covered tops for the upper decks of the buses.

A proposal has been made to the city that shallow subways for tramways should be constructed in order that the tramcars now excluded from the central area might be brought underground within that area, and thus provide the through services which are much needed. This proposal, however, has not found favour with the city authorities, they being of opinion that if subways are to be constructed they must be operated as rapid-transit lines by high-speed trains, otherwise the cost of their construction is prohibitive.

HAMBURG.

The city of Hamburg has a large network of tramways, and, in common with other cities, the traffic congestion along certain arterial lines became so acute that in recent years steps had to be taken to meet the difficulties. The tramways company suggested the construction of tramway subways, but after a full investigation the city authorities negatived this proposal, and determined to construct lines for high-speed trains—rapid-transit lines; these are partly in shallow subways and partly elevated. The lines form a circular route, but the flow of traffic along the northern portion of the route is comparatively small, and scarcely justifies its existence.

The city provided the necessary capital for the construction of the lines, and the operating company provided the capital for their equipment. The company have to pay to the city a certain percentage of the gross receipts, but otherwise is not responsible for meeting the fixed charges on the construction costs.

LONDON.

The defect of London's rapid-transit system, Mr. McElroy remarks, is that it has not been laid out in accordance with a comprehensive plan so as to meet the requirements of London as a whole. "It has been laid out piecemeal in accordance with the plans of different private companies, and there has been no permanent authority which has exercised control over the planning and development of the system. This method of handling one of the most difficult problems a city is faced with can only end in failure to secure the most satisfactory results.

"Individual companies and authorities promoting and operating the various means of transit, without the controlling and regulating influence of a central authority acting in the public interests, is a condition of things which everyone who has studied the question should not have permitted to grow up, because it produces anything but the best results."

It is shown in the report that the full development of the London tramways system has been much retarded owing to local causes and influences; "hence the county council tramway system can only be said to supply imperfectly the surface transit facilities within the administrative county generally, and there are practically no tramway facilities at all in the heart of London.

From the passengers' point of view, the main ad-

advantages of the motor bus over the tramcar in London are:

(a) That its mobility enables it to run practically anywhere. Narrow and congested streets are not shut against it, and it gives the through service, which the tramcar is unable to do.

(b) It can maintain a slightly higher average speed than the tramcar, and this appeals to the increasing desire on the part of the public for more rapid transit.

(c) It can set down and pick up passengers at the footpaths, thus avoiding the danger which is experienced in boarding and alighting from tramcars.

When the financial aspect of the two means of transit is compared, the following points, says Mr. McElroy, should be borne in mind:

"In the first place, the tramways are weighted with a very heavy expenditure on their track construction; secondly, the tramway authorities have to repair and maintain the tramway portion of the roadway; and, thirdly, they have to pay large sums in local rates in respect of the rails laid in the streets.

"These two latter obligations the motor bus is entirely free from. It is true, however, that the bus has to pay the petrol tax, but this is small in comparison with the cost of the obligations placed upon the tramways.

"The irony of the situation is that the tramway owners are called upon to repair and maintain the tramway portion of the roadway which their competitors—the motor-bus companies—are helping to wear out rapidly.

"There is little doubt, however, that these anomalies will in time be removed. In the meantime, the facts should not be lost sight of when drawing inferences from operating results of the rival systems of transit."

Mr. McElroy adds: "There is no other city in any part of the world so favourably circumstanced for the working of motor buses as London. It has the best paved streets in the world. It has an immense population, which is growing at an estimated rate of 100,000 per annum. The riding habits of the people are increasing rapidly. They are still a long way below those of New York, so there is ample scope for increased traffic—new traffic—and not traffic necessarily drawn from other channels. And, as has already been pointed out, motor buses supply what the tramways are not permitted to do—they give through services to all parts of the Metropolis. The rapid-transit facilities of London are not all that could be desired from the passengers' point of view. This, again, is favourable to motor-bus operation. The motor bus competes fairly well with the rapid transit of the "tubes." The time occupied from point to point at the street level is not much less by "tube" than by motor bus, except for long-distance traffic."

At the same time, the report points to the fact that tramways cause not nearly so many fatal accidents as the motor buses, while they also offer cheaper travelling facilities.

GLASGOW.

Mr. McElroy remarks that in Glasgow the corporation are faced with a traffic problem very similar to that they are attempting to solve in Manchester, and, like them, they sent a deputation to America last year to study the traffic conditions over there.

LESSONS FOR THE FUTURE.

Some of the more important lessons drawn from the wide investigations made by Mr. McElroy and Mr. Mattinson are summarised in the report as follows:—

(1) That in all cities and towns there is an immense potentiality in the riding habits of the people. Everywhere there is a continual growth in the number of journeys per head of population, and the provision of new or improved transit facilities accelerates this growth in a very marked degree.

(2) That in planning city transit facilities a wide outlook is all important; any schemes carried out on narrow or confined lines ultimately result in serious losses to the community from every point of view.

(3) It is essential that every city should have a permanent authority directing the initiation and carrying out of all schemes for new transit facilities, in order that there may be continuity of policy, and that future needs of the city and the surrounding districts over a wide area are properly looked after. It is also desirable that all the means of passenger transportation—both surface and rapid-transit—should be centralised under one management. If the management is not that of the city itself, then it should be subject to control and regulation by a permanent authority appointed by the city.

(4) That, in planning underground lines for rapid transit, the aim should be to supplement the surface-transit facilities; that the rapid transit lines should be laid so as to follow as closely as possible the direction of the flow of the greatest volumes of traffic, and the surface lines should be adapted so as to act as feeders to the rapid-transit lines at all convenient points.

(5) That, on account of the great initial cost, the construction of underground rapid-transit lines cannot be justified unless there is a very large volume of traffic to be dealt with; that, speaking generally, underground subways for tramcars are an unjustifiable expense owing to the comparatively small number of passengers it is possible to pass through them by single or double deck cars. Underground lines, if they are to be placed upon a paying basis, must be worked by the high-speed trains operated at a very close headway. This demands a great density of traffic.

(6) The motor buses have proved themselves to be an exceedingly valuable means of surface transit, especially under conditions such as exist in London and Paris; but the question of their general adaptability for conditions which exist in other cities, and the part they will play in the future, either in supplanting or supplementing the existing tramway facilities, calls for a careful analysis of their advantages and disadvantages from the local point of view.

Among the few special points which Mr. McElroy recommends should guide future tramway development are the following:—

Tramcar design requires further study; improvements should be directed (a) to more rapid loading and unloading, and (b) to the prevention of boarding and alighting accidents.

The number of stopping-places should be reduced so as to increase the average speed of the cars.

Island refuges for the safety of tramcar passengers should be constructed wherever possible; also shelters should be provided at all suitable places.

No doubt is felt by the author of the report that the time is rapidly drawing near when Manchester will have to be provided with rapid-transit facilities, with the lines so laid out that they can be worked in conjunction with the surface lines by providing suitable transfer points from surface to rapid transit, and *vice-versa*. The surface lines must gather the local traffic, and "feed" the rapid-transit lines, which, in order to pay their way, must be provided with an immense volume of traffic. A general all-round figure of, say, £500,000 to £700,000 per mile of double track is suggested as roughly representing the cost, which will, of course, largely depend upon the engineering difficulties to be encountered.

With regard to motor buses, Mr. McElroy says that in Manchester and the surrounding districts these will in future form an important part of the surface-transit facilities; they will supplement the tramway services in many directions, and particularly in the outlying and thinly populated districts.

While lacking the great elasticity as to routes which the motor bus provides, there are circumstances, he adds, which may warrant the introduction of trackless trolley cars in outlying areas, especially if the operating costs continue to be lower than those of the bus, "which seems likely to be the case."

The statement was frequently made that in ten years hence the tramways would be "scrapped," and motor buses substituted. From the facts before us at the present time, it was almost unnecessary to deal with this suggestion, but in these days of rapid developments of mechanical traction it was unwise to make dogmatic predictions as to the future one way or the other. "One fact, however, must be borne in mind: Ten years hence—even if we do not in the meantime borrow any further capital for our tramway system—we shall still owe nearly a million of money, and it would surely not be good business to throw away assets representing a large part of that sum unless we were assured that the newer form of traction would so cheapen the expenses of operation as to leave sufficient net revenue to meet the fixed charges on the new capital as well as on that of the discarded plant. This does not seem likely to occur."

Institution of Civil Engineers' Examinations.—At the examinations of February, 1914, Mr. Knowles' pupils were conspicuously successful, there being but one failure, and one pupil obtained the highest marks in the associate-membership examination, being awarded the Bayliss prize.

The Surveyor

And Municipal and County Engineer.

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CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2.

THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

To the Editor of THE SURVEYOR.

SIR,—I would like to be allowed a little more of your space to remind Mr. L. J. Small that, while it may be advisable to scrutinise carefully the experience of any person applying for membership, it would, in my opinion, be quite inadvisable to reject his application solely for the reason that he has not passed the institution's examination. If Mr. Small will look through the roll of membership he will find the names of a large number of our best engineers who have not passed, but who, he will have to admit, are more fitted to be members than some of those who have passed.

I think it would be more to our benefit if we endeavoured to concentrate our powers as a professional body by, as I stated before, influencing public authorities to give preference to our members—a most vital point to us all.—Yours, &c.,

ROAD SURVEYOR.

March 27, 1914.

Swinton's New Waterworks.—The new waterworks constructed by the Swinton Urban District Council were opened on Tuesday. The works represent the completion of a thirty years' search for an abundant water supply, and the cost to the township has been about £30,000. The parish is now in the position of being able to command two watersheds within its boundaries, and, although the population is less than 15,000, there are now two good supplies.

Smoke Abatement: A Departmental Committee. The President of the Local Government Board was asked last week whether he proposed to appoint a departmental committee to inquire into the question of smoke abatement, and, if so, whether he would state the names of its members and the terms of the reference to them. Mr. Samuel said the reply to the first part of the question was in the affirmative. He was not yet in a position to state the terms of reference and the names of the members, but he hoped to be able to do so very shortly.

STATE AID TO LOCAL AUTHORITIES.

THE QUESTIONS OF ROADS AND PUBLIC HEALTH.

Considerable changes, involving an augmentation of grants to local authorities in respect of semi-national services, are proposed in the recently issued report of the Departmental Committee, of which Sir John Kempe was chairman. They recommend, in the first place, the abolition of the assigned revenue-system, and the substitution of direct payments to local authorities from the Exchequer.

These grants, they suggest, should be made only in respect of local services of a national character, of which the more important are education, poor relief, police, main roads, public health, criminal prosecutions, and mental deficiency.

Changes are proposed in the financing of these services which will entail a nett estimated increase in Government subventions of £4,700,000 per annum, £2,385,000 being in respect of elementary education and £2,315,000 on account of other services.

As to highways, they recommend that these should be classified by the Road Board into main roads, county roads, and district roads, and half the maintenance of main roads and a quarter of that of county roads be met by the Exchequer grants; that the balance of the cost of main roads and a quarter of that of county roads should be borne on county funds, the remaining half of the cost of the latter roads being charged to the highway district responsible for them, and that the necessary Parliamentary authority should be obtained as soon as possible to enable the Road Board to commence a provisional classification of highways.

The total grant for main roads is estimated at £1,800,000, and that for county roads at £600,000.

Under the head of public health, it is proposed that the present grant for the salaries of sanitary officers should be withdrawn, and that a subvention should be given in aid of public health administration generally at the rate of 9d. per head of population in rural, and 6d. per head in urban districts. Here the total grant is estimated at £1,000,000.

SOME RECENT PUBLICATIONS.

We have received a copy of this year's edition of Messrs. Waterlow Bros. & Layton's Diary, and find it as excellent as ever. There is one matter for regret, however, and that is the omission of the names and addresses of the members of the various professional societies. We think we are voicing the views of many subscribers to this useful publication in drawing attention to the absence of this useful feature of the book.

"Laxton's Price-book" is again with us, and although it is the oldest price-book it is as vigorous as ever; its bulk seems to expand yearly, and its usefulness certainly increases. What would a modern surveyor's office be without its copy of Laxton's?

Local Government Board and Rural Council.—The Local Government Board have informed the Beverley Rural District Council that, unless within two months a satisfactory reply is received with regard to the order of the board for the council to undertake the drainage of Elloughton and Brantingham, the board will apply in June for a mandamus to enforce the order. The cost of the drainage scheme referred to is estimated at £10,000, and the parishes concerned have opposed it. The rural council on Saturday resolved simply to acknowledge the receipt of the letter.

The Supply of Building Materials.—The Prime Minister was asked in the House of Commons on Tuesday if, in view of the fact that builders and housing reformers complained that the supply of building materials was controlled by a trust which raised prices last year by 20 per cent, which was equal to the price of the land on which houses were built, he would make provision in the Government's Housing Bill enabling public authorities to manufacture building materials and to supply them to private builders. It was stated in reply that consideration would be given to the matter, but that so far no request to be furnished with such powers had been received from any public authority.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

The premium for March is awarded to

Mr. H. BONE,
Municipal Offices,
Palmouth.

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

385. Chimney Design.—Design a brick chimney shaft 130 ft. in height from ground level, the internal diameter at the base being 10 ft. (F. S., *Plumstead*.)

387. Boring.—Describe, with sketches, the appliances necessary in carrying out borings to a depth of 100 ft. for the purpose of ascertaining the character of the soil. (W. N. B., *Cambridge, N.Z.*)

388. Reactions on Beams.—Show how to find (graphically or otherwise) the pressures on the two supports of a horizontal beam which is loaded at any given point. If the distance between the supports be 20 ft., and if one of the loads be 12 cwt., find the changes in the pressures produced by shifting this load through a space of 5 ft. along the beam. (A.M.I.C.E.)

389. Design of Floors.—What loads should be allowed for in designing a floor (a) in a general warehouse, and (b) in a platform to which the public are to be admitted? What factor of safety would you adopt in each case?

390. Removal of House Refuse.—A new urban district has just been formed in the neighbourhood of London of which the following are particulars: Area, 3,500 acres; population, 9,000, increasing at rate of 700 per annum; number of houses, about 2,300; length of district, north to south 3 miles, east to west 1½ miles; mileage of roads, 17; character of district, flat in northern part, hills up to 1 in 16 in southern part; distribution of population, 2,000 at north end in £40 villas, shops, &c., 500 in north-east in large houses with long approach drives, 1,000 in south and south-west in small villas and workmen's cottages. The refuse for the present will be utilised at brickfields on the southern boundary of the district. It is desired to organise the removal of house refuse on the most up-to-date methods compatible with economy. Describe fully the methods of collection and transit, the organisation of the staff, the plant required, and give an estimate of the capital and annual charges for this work. Trade refuse is negligible, and no plant has been taken over from the rural authority who formerly had control of the area. (Togun.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

386. Storm Overflow Weir.—A 9-in. diameter stone-ware pipe, laid on a gradient of 1 in 281, carries a mean dry-weather flow of 33,300 gallons per day. It is required to construct a storm overflow weir, in a manhole, to pass all above six times the dry-weather flow. At what height above the invert of the pipe should the lip of the weir be set? (H. V. O., *West Bromwich*.)

The mean dry-weather flow is 33,300 gallons per day. It must not be assumed from this that the mean flow per hour is $\frac{1}{24}$ of this value, for it is obvious that the flow in the middle of the day is very different from the flow at night. It is usual

to assume that one-half of the mean dry-weather flow passes off in six hours, and we must design the overflow on this assumption.

Hence $\frac{33300}{2}$, i.e., 16,650 galls. flow in 6 hrs.

∴ Flow per hour = $\frac{16650}{6}$ galls.

And the discharge of the sewer $\frac{16650}{6 \times 60}$ galls. per min.

Now the overflow is to be set so that it passes all above six times this flow—i.e., it must be set above the invert at such a height that if the flow exceeds $\frac{16650}{6 \times 60} \times 6$ gallons per minute, the excess will pass over the lip of the overflow.

It is given that the gradient of the 9-in. sewer is to be 1 in 281. It is therefore correct to assume a velocity of flow of 3 ft. per second, as such velocity will render the sewer self-cleansing.

The discharge of a sewer is obtained from the formula—

$$Q = A V$$

wherein Q = Discharge of sewer in cub. ft. per min.

$$= \frac{16650}{60} \div 6\frac{1}{4} = \frac{16650 \times 4}{60 \times 25} \text{ cub. ft. per min.}$$

A = Area of cross section of flow in sq. ft.

and V = Velocity of flow in feet per min.

$$= 3 \times 60 = 180 \text{ ft. per min.}$$

Substituting known values in this equation gives

$$\frac{16650 \times 4}{60 \times 25} = 180 A$$

$$\therefore A = \frac{1665 \times 4}{180 \times 6 \times 25} \text{ sq. ft.}$$

$$= \frac{6660 \times 144}{180 \times 150} \text{ sq. in.}$$

∴ Area of flow = 35.5 sq. in.

Now, the cross-sectional area of the pipe is $\frac{\pi}{4} \times d^2$, wherein d = internal diameter of pipe.

Hence area of cross-section = $\frac{81\pi}{4} = 63.5$ sq. in.

It is thus clear that the pipe is running just a little more than half full, for, if it were flowing half full, the area of flow would be $\frac{63.5}{2} = 31.8$ sq. in.

The depth of water in the pipe would then be 4½ in.

Let us suppose that the depth of water is 5 in. If this were so, we should be adding nearly (½ × 9) square inches to the cross-sectional area of the flow, thus bringing the total area of flow up to (31.8 + 4.5) square inches = 36.3 sq. in.

But, as the added area is not exactly 4½ in. (it is not a true rectangle), it will be advisable to allow another ½ in. in depth to be added to the total depth of flow.

Thus the depth of flow, and hence the height at which the storm overflow weir should be set above the invert of the sewer, is (4½ + ½ + ½) inches = 5½ in.

The construction of the sill requires most careful attention. It must be set dead level throughout its length, and should be constructed of dressed granite worked to a rounded or bull-nosed face, or it may be made of bull-nosed Staffordshire blue bricks carefully pointed in cement. The overflow should be of a suitable slope to allow the water to fall gradually, and thus prevent undue splashing and the wearing away of the slope. Care must also be exercised in making the weir of sufficient length to prevent the water rising too high in the sewer. (T. W. P., *Berkhilton-Sca.*)

Blotter.—We have received from Messrs. Kerner-Greenwood & Co. a handsome blotter, which contains useful information regarding Pudlo, "the powder which makes cement waterproof." Messrs. Kerner-Greenwood & Co. will be pleased to send one to any architect who has not received a copy.

INSTITUTION OF MUNICIPAL ENGINEERS.

MEETING OF NORTHERN AND NORTH-WESTERN DISTRICTS.

A joint meeting of the Northern and North-Western Districts of the Institution of Municipal Engineers was held at Leeds on the 21st ult. Among the members present were Messrs. Horace Boot, president of the institution, Wm. Finch, chairman Northern District, A. R. Bleazard, chairman North-Western District, J. H. Halstead (Harrogate), H. G. Firth (Leeds), John Davison (Morpeeth), B. Hinchliffe (Gomersal), P. Morris (Doncaster), R. Laycock (Farsley), G. L. Bowron (Darlington), J. W. Plewes (Ripon), Geo. Symon (Blaydon-on-Tyne), A. G. Kilner (Wetherby), G. H. Hopkinson (Chorley), W. Wilby (Gildersome), H. P. Coeks (Horbury), John Robinson, hon. secretary Northern District, R. J. McKenn, hon. secretary North-Western District, and B. Wyand, secretary of the institution. There was a number of visitors, including Messrs. J. Battye (Guisley), T. A. Prince (Leeds), W. M. Stephenson (Darlington), D. Wood (Leeds), W. Whitaker (Donholme), J. Slater (Horbury), F. Horsepool (Leeds), J. C. B. Smith (Leeds), H. J. Ward (Doncaster), J. H. Hardacre (Leeds), W. Miller (Leeds), H. Richardson (Horsforth), and E. C. Tomkins (Darlington).

The members met on the North-Eastern Station, Leeds, and were received by Mr. David Wood, representative of Messrs. J. Fowler & Sons, Limited, Hunslet. A visit was then paid to Messrs. Fowler's works, and under the guidance of the managing director and Mr. Wood an inspection of the various and extensive departments was made. Afterwards the party were entertained to lunch at the Griffin Hotel as Messrs. Fowler's guests.

Mr. Horace Boot, the president of the institution, in proposing the success and prosperity of the firm, and thanking them for their kind hospitality, said that all the members were struck by the various classes of machinery seen, especially the oil or petrol driven tractors and huge engines built for foreign work where coal and other fuel was difficult and costly to obtain. Messrs. Fowler & Sons were well up to date in all their departments, and the works were under excellent management. The president, in thanking the two local secretaries, Mr. McKenn, North-Western District, and Mr. John Robinson, Northern District, alluded to the enthusiasm for the institution shown in the North, and referred to the great success of the annual meeting of the Northern Division held in Newcastle.

Both local secretaries replied, thanking the president for his kind remarks, and stated that it was their intention to further the interests of the institution in the Northern and North-Western Districts so far as lay in their power.

Mr. A. R. Bleazard, chairman of the North-Western District, endorsed all that the president had said, and said he felt sure that everyone present had had a most enjoyable and instructive visit.

Mr. W. Finch, chairman of the Northern District, on behalf of his members expressed his thanks to Messrs. J. Fowler & Sons and to Mr. Wood for their kindness for making arrangements for the visit.

Mr. David Wood, on behalf of his firm, said it had been a pleasure to entertain the members, adding that they would be very pleased to do so again at any time.

Mr. Bleazard, in proposing a vote of thanks to Mr. Boot for attending the meeting, said that the prosperity of the institution depended greatly upon the president, and he felt sure that Mr. Boot had the interests of the institution thoroughly at heart.

Mr. Boot, in reply, said he hoped that the Institution of Municipal Engineers would eventually become one of the strongest institutions in this country, and he was prepared to give all members every assistance in his power, and should be only too pleased to give his advice in any case of difficulty on receipt of a personal letter.

SUGGESTED FUND FOR NORTHERN DISTRICT.

It was decided that Mr. John Davison's motion be left over until the next meeting of the Northern District.

PROPOSED BADGE.

It was suggested that some small badge should be obtained, so that when attending meetings members who were strangers would be able to approach each other, and on the motion of Mr. Finch, seconded by Mr. Symon, it was resolved: "That the council of

the institution be asked to take into consideration the question of providing a small suitable button badge for members to wear at the District and other meetings of the institution."

PAST-PRESIDENT'S MARRIAGE.

The secretary was asked to write to Mr. J. T. Pegge, the first president of the institution, and convey to him the congratulations of the institution, and the hope that he and Mrs. Pegge would have a long, prosperous, and happy life.

LEEDS MEETING.

The secretary was asked to write thanking Mr. G. A. Hart, Mr. F. Horsepool, and Mr. J. B. Hamilton for their kindness in assisting in the day's entertainment.

VISIT TO SEWAGE DISPOSAL WORKS AT RODLEY.

After lunch the members visited the Leeds Corporation sewage disposal works at Rodley, where the system adopted was fully explained by Mr. F. Horsepool, who also handed to each member a pamphlet giving a full description of the undertaking.

ROAD BOARD APPOINTMENTS.

FURTHER QUESTIONS IN THE HOUSE.

In the House of Commons on Tuesday Mr. Lardner asked the Secretary to the Treasury whether any county surveyor in Ireland, at the request of the Road Board or the Advisory Committee, or any of the inspectors of the board, inspected or reported on any road improvement work in Ireland in any county other than that of which he is surveyor; and, if so, in how many cases.

The Financial Secretary to the Treasury (Mr. Montagu) said the answer was in the negative, except in so far as county surveyors were members of the Advisory Engineering Committee.

Mr. Lardner asked when Messrs. J. P. J. Butler and R. W. Butler were appointed as inspectors by the Road Board; what the terms of their appointment and salaries are; and at what they were engaged prior to their appointment by the Road Board.

Mr. Montagu stated that Mr. J. P. J. Butler was appointed engineering inspector to the Road Board on December 12, 1911, at a salary of £6 a week and travelling expenses. Prior to his appointment by the Road Board he was engaged as an engineering assistant upon the staff of a consulting engineer. Mr. R. W. Butler was appointed engineering inspector of the Road Board on April 28, 1913, at an initial salary of £250 per annum and travelling expenses. Prior to his appointment he was the chief assistant to the engineer and surveyor of the county borough of Newport.

Mr. Lardner asked the names of the persons comprising the Advisory Engineering Committee appointed by the Road Board last year, showing the representation for England, Ireland, and Scotland; and for how long the committee was appointed.

Mr. Montagu said the Road Board appointed in February, 1913, a temporary Advisory Engineering Committee for the purpose of inspecting a considerable mileage of roads in Ireland. The committee, which was dissolved in February, 1914, consisted of Mr. P. C. Cowan, chief engineering inspector, Local Government Board for Ireland; Mr. W. Cohen, county surveyor of county Dublin; Mr. W. E. Duffin, county surveyor of county Waterford; and Mr. R. H. Dorman, county surveyor of county Armagh. This temporary committee was distinct from the Advisory Engineering Committee constituted by the Road Board in August, 1910, in accordance with the scheme printed in Appendix No. 10 of the first annual report of the Road Board.

Mr. Lardner asked on whose advice, recommendation, or report were the grants and loans made by the Road Board in Ireland; whether all work in process or actually completed was inspected by an officer of the Road Board; and, if so, who these inspection officers were.

Mr. Montagu said the details of each application for grants or loans were examined and reported upon by the engineering staff of the Road Board. The answer to the second part of the question was in the affirmative, and as regarded the third part, he would refer the hon. Member to the reply which he gave him on March 24th. [THE SURVEYOR, March 27th, p. 562.]

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

HIGHWAY: ACCIDENT: DANGEROUS BUILDING LIABILITY.—The decision of Mr. Justice Scrutton in *Hurlstone v. London Electric Railway Company and Another* (noted at p. 232 *ante*) has been reversed by the Court of Appeal (March 13th). By an agreement between the company and one other defendant (a builder), the latter agreed to erect a super-structure over the company's tube station at Cranbourn-street and to take a ninety-nine years' lease thereof. The necessary scaffolding and hoardings were to be erected in such a way as should be reasonably approved by the company, and a gantry for raising building materials was to be erected in a particular manner specified in the agreement. During the progress of the work the plaintiff (a lady), while walking on the pavement adjoining the building, was injured by a piece of wood falling on her head. The jury found that there had been negligence on the part of the builder, and awarded the plaintiff £75 damages, and Mr. Justice Scrutton gave judgment against both defendants. He held that there was a duty on the company to safeguard the public during building operations on their property adjoining the street, and that they did not fulfil that duty by delegating it to an independent contractor. In the Court of Appeal the Lord Chief Justice said that the Court were of opinion that the appeal must be allowed. The circumstances revealed the fact that the railway company were merely the reversioners of the building, having given the builder the sole occupation by virtue of a lease, and no authority had been cited in which a reversioner had been held liable for the negligence of a lessee. It was argued that, as the railway company "caused" the dangerous work to be done, they could not shelve their responsibility merely because the work had been delegated to an independent contractor. It was also argued that the company had a duty imposed upon them to protect the public. The Court, however, saw no ground for these contentions, having regard to the position of the company. In fact, they could not see that the company could not free themselves from all responsibility in connection with the erection of the building. Lord Justice Swinfen Eady, who concurred, said that this was not a case of principal and agent or employer and employed, but of lessor and lessee. Lord Justice Phillimore also concurred, and the appeal was allowed.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as *noms de plume*. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

BUILDING BY-LAWS: FOOTINGS.—"Quest" writes: A builder in this district is erecting a small villa. His attention has been called to by-law No. 18 of this council's by-laws (a copy of which I enclose), which requires the wall to rest upon proper footings, &c. The builder contends that he has provided a depth of 3 ft. 9 in. of concrete for foundations, and has then provided 9 in. of concrete for footings, which 9 in. has been continued over the whole site, and that he has caused the diminution of the footings to be in one offset at the top of the footings. I should be glad of your opinion as to whether the builder has reasonably complied with the by-law, or whether the council would have reasonable grounds for taking proceedings for an infringement of the by-law. The following is a copy of the by-law referred to:

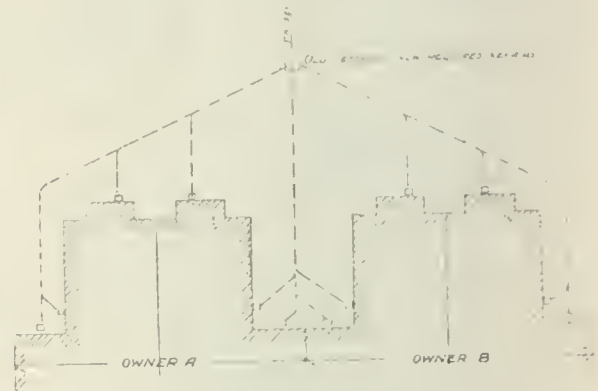
18. Every person who shall erect a new building shall construct every wall of such building so as to rest upon proper footings, or upon a sufficient bressummer. He shall cause the projection at the widest part of the footings (if any) of every wall, on each side of such wall, to be at least equal to one-half of the thickness of such wall at its base, unless an adjoining wall interferes, in which case the projection may be omitted where that wall adjoins. He shall also cause the diminution of the footings to be in regular offsets, or in one offset at the top of the footings, and he shall cause the height from the bottom of the footings to the base of the wall to be at least equal to two-thirds of the thickness of the wall at its base.

19. Every person who shall erect a new building shall

cause the footings (if any) of every wall of such building to rest on the solid ground, or where necessary upon a sufficient thickness of good concrete, or upon some solid and sufficient sub-structure, as a foundation.

A footing is defined in Lloyd's Encyclopaedic Dictionary as "the base, foundation, or first courses of brick or stone in a wall, broad at the bottom and gradually narrowing to the width of the wall above ground." This appears to imply that a footing is an integral part of the wall, and constructed of similar material. In this sense the wall shown on the sketch has no footings. It may be, however, that in practice the term has a wider interpretation, and that such an arrangement as shown constitutes a footing. I think really it is a question for an architect to decide.

COMBINED DRAINAGE: CESSPOOL.—"H. R." writes: I shall be glad if you will kindly inform me for which portions of the drain and cesspool (the cesspool was



connected to the sewer some time after the former was constructed) shown on the accompanying plan the owners (A and B) and the council are respectively responsible.

Each of the three drains connected with the cesspool is a "sewer" from the point at which it receives the drainage of more than one house, and (assuming that Part III. of the Public Health Acts Amendment Act, 1890, has not been adopted in the district) is repairable by the council from that point. So much of each drain as drains one house only is repairable by the owner. If the cesspool is a mere catchpit it is part of the "sewer," and repairable by the council. See *Pakenham v. Ticehurst Rural District Council* (67 J.P. 448). Otherwise, in the event of its being a nuisance or injurious to health, it can be repaired at the cost of the owner or occupier, under sec. 41 of the Public Health Act, 1875; or if the contents overflow or soak therefrom the council can abate the nuisance at the expense of the occupier under sec. 47 of that Act. See *Meador v. West Cowes Local Board* (1892, 3 Ch., 18).

EXTRAORDINARY TRAFFIC: STEAM TRACTOR ON HIGHWAYS.—"Dony" writes: A steam wagon with a truck is being used in this district to convey bricks, &c., from a brickyard to a new colliery village, and is damaging the roads. The roads are good and strong, and well adapted to the ordinary traffic. Can I successfully claim for damage?

If the surveyor gives a certificate that having regard to the average expense of repairing the highways in the neighbourhood extraordinary expenses have been incurred in repairing the highways in question by reason of the damage caused by excessive weight or extraordinary traffic, the authority can recover from the person by or in consequence of whose order the traffic was conducted, the amount of such expenses as may be proved to the satisfaction of the Court to have been incurred by reason of the damage. The question of whether the weight was excessive, or the traffic extraordinary, would be determined by reference to the ordinary traffic on the roads and to their character, and the authority would have to prove that the user of the roads by the defendant was out of the common orders of traffic, either in itself or in the way in which it was conducted, and substantially increased the burden imposed by the ordinary traffic.

We have to draw the attention of querists to the directions laid down for their guidance in regard to the preparation of diagrams. Rough sketches obviously cannot be made use of, and we should be obliged if correspondents would therefore send only carefully-prepared drawings, preferably about 6 in. in width, and without colouring or wash of any description. Failure to observe these rules will involve the risk of queries remaining unanswered.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Durham C.C. (March 31st. Mr. Edgar Dudley).—£1,800 for the purchase of land in Newgate, as a site for a public elementary school.—Mr. A. J. Dawson, representing the Education Committee of the county council, said the site was the only one which had in all respects commended itself to the county education authority. It had been approved by the Board of Education.

Hoyland U.D.C. (March 20th. Mr. A. W. Brightmore).—£1,344 for enlarging and improving the sewage disposal works at Elsecar. The surveyor, Mr. F. Thackray, stated that it was proposed to add additional septic tanks and sludge lagoons to the existing works. This work was, he said, proposed to meet the requirements of the West Riding Rivers Board, from whom repeated complaints, though Dr. Maclean Wilson, their chief inspector, had been received with respect to the final effluent, which found its way into the South Yorkshire Canal at Elsecar. The last analysis of the effluent which had been submitted to Dr. Wilson showed the solids in suspension to be about an average of 10 parts per 100,000 gallons, and that, he submitted, left no room for doubt as to the necessity for the improvement scheme.

Paignton U.D.C. (March 25th. Mr. P. M. Crosthwaite).—£105 for the purchase of foreshore in Goodrington Bay, and £5,600 for laying out land between Preston Sands and Redcliffe-road, including the provision of public shelters and a convenience.—The clerk, Mr. J. R. Mill, stated that the council asked for a thirty years' repayment for Goodrington and sixty years for Preston. The surveyor, Mr. E. O. Baines, said the proposed works embraced the filling up of the low-lying portions of Preston land, the construction of a promenade at the back of the sea wall, laying drains for the conveyance of spring and subsoil waters, and the erection of conveniences, shelters, seats, rockeries, and sloping embankments. The whole had to be completed within two years from the date of completing the purchase in July, 1913. The promenade was to be 25 ft. wide by 1,000 ft. long, with approaches from Manor-road and Redcliffe-road. The western edge of the promenade would be formed with rough dry walling in limestone, set as a rockery. At the back of this wall embankments would be formed right along the west of the promenade. Four shelters, similar in design to those on the Paignton front, would be erected.

Preston R.D.C. (March 18th. Mr. W. M. Cross).—£12,075 for purposes of sewerage and sewage disposal for the townships of Little Hoole and Longton.—The borough engineer of Blackburn, Mr. W. Stubbs, said he had carefully inspected the districts, and had considered the proposed schemes. The population of both districts was so scattered and the land so flat that a satisfactory scheme of sewerage by gravitation methods was almost impossible, and to employ pumping in any form would add not only to the capital outlay, but would enormously increase the yearly upkeep. Mr. H. Heaton's scheme of gravitation, assisted by flushing chambers, should be quite satisfactory. He calculated that the 9-in. sewer would deliver 413,000 gallons per day, and the 12-in. 890,000 gallons. He considered the detritus and settling tanks, as designed, to be capable of dealing with the sewage, but it was a question whether it would not be advisable for the overflow from the tanks to be carried by means of an 18-in. outfall sewer into the river below the floodgate. That would entail an extra expenditure of £1,000.

Rhyl U.D.C. (March 31st. Mr. P. M. Crosthwaite).—A further sum of £4,259 for dredging.—The council, it was explained, had undertaken dredging to drain the river in connection with the sewerage scheme. A dredging fleet had been purchased, and the sum already borrowed had been swallowed up in the plant and dredging. It was now necessary to cut off a bend in the river and to carry out other works. Mr. Baldwin Latham said he could not say what the total cost of the dredging would be, as delays meant silting up.

Wakefield T.C. (March 26th. Mr. M. K. North).—£17,813 for sewerage extension works.—Mr. A. C.

Allibone, town clerk, stated that the loan is required for the provision of sewers for the undrained part of Sandal, and, by arrangement, for dealing with the sewage of Crigglestone within the area of the Wakefield Rural District Council.

APPLICATIONS FOR LOANS.

Aberdare U.D.C.—£15,350 for the purposes of water supply.

Bowland R.D.C.—£2,180 for sewerage works.

Brighouse T.C.—£563 for sewerage works.

Bromley T.C.—£13,234 for wood paving.

Cheimsford T.C.—£1,000 for the erection of an engine-house and the provision of pumping machinery.

Harrogate T.C.—£7,300 for a water supply scheme.

Haslingden T.C.—£220 for surface-water drainage.

Listowel R.D.C.—£2,600 for the purposes of the waterworks, and £430 for sewerage works.

Llandudno U.D.C.—£4,855 for workmen's dwellings.

Newton Abbot R.D.C.—£600 for the purchase of land for the erection of twelve houses at Chudleigh and £2,400 for the erection of the houses.

Romford R.D.C.—£2,095 for making up certain streets, and £470 for surface water drainage.

Skiffelagh R.D.C.—£1,155 for the erection of cottages.

Stoke-on-Trent T.C.—£5,875 for conversions to the water-carriage system.

Sunderland R.D.C.—£4,360 for sewerage works.

Sutton (Surrey) U.D.C.—£1,600 for main road improvement.

Walthamstow U.D.C.—£674 for road widening.

LOANS SANCTIONED.

Barking U.D.C.—£930 for road widening.

Belper R.D.C.—£655 for a water supply for Kilburn and district.

Cheshunt U.D.C.—£255 for street improvement.

Essex C.C.—£1,728 for a school at Messing, and £506 for the provision of an engineering school at Colchester.

Gloucester T.C.—£5,250 for water supply extensions.

Haverfordwest T.C.—£5,000 for the gasworks.

Hfracombe U.D.C.—£1,050 for the purchase of property for a public improvement.

Newbury T.C.—£2,545 in respect of sewerage works.

Southend T.C.—£4,250 for the provision of a public pleasure ground.

Stoke-on-Trent T.C.—£2,500 for a new police station at Fenton.

Wellingborough U.D.C.—£360 for road widening.

FORTHCOMING INQUIRIES.

	APRIL.	£
6.— Wilton-upon-Thames. For works of sewerage (Mr. R. H. Bicknell) ...		1,600
7.— Altrincham. For street works and the provision of a public convenience (Mr. F. H. Tulloch) ...		1,265
7.— Gravesend. For electricity extension (Mr. P. M. Crosthwaite) ...		13,600
7.— Great Harwood. For works of sewage disposal (Mr. F. O. Stanford) ...		15,000
7.— Lincoln. For burial ground purposes (Mr. M. K. North) ...		1,100
8.— Dartford. For tar-paving works and public park extension (Mr. Edgar Dudley) ...		1,991
8.— Disley. For sewage disposal works (Mr. F. O. Stanford) ...		2,239
8.— Eccles. For the erection of offices (Mr. F. H. Tulloch) ...		1,110
8.— Sheffield. For the purposes of telephonic fire alarms and street works (Mr. M. K. North) ...		12,059
9.— Loigh. For gas supply purposes and street improvement (Mr. F. O. Stanford) ...		17,672
9.— Mansfield. For sewerage and street works (Mr. M. K. North) ...		6,350
9.— Stockport. For the purposes of street improvement and public pleasure grounds (Mr. F. H. Tulloch) ...		11,987

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Cambridge £4,500, Derby £6,000, Redruth; housing and town planning—Coventry, Leicester; roads and materials—Penistone, Romsey, Scarborough £25,000; sewerage and sewage disposal—Branston £21,600, Folkestone £29,000, Redruth £25,000; water, gas and electricity—Atherstone £15,000, Coventry, Withernsea.—Particulars of other works projected will be found on our "Local Government Board Inquiries" page.

BUILDINGS.

Bourne R.D.C.—An isolation hospital is to be built at an estimated cost of £1,000.

Brighton T.C.—Plans have been approved for the construction of a new bandstand and concert hall on the West Pier.

Cambridge T.C.—The Guildhall buildings are to be enlarged, at an estimated cost of £4,500, and premises are to be purchased for conversion into lodging-houses and baths for women.

Derby T.C.—A proposal has been made for the enlargement of the public library and art gallery, at an estimated cost of £6,000.

Inverness T.C.—It has been agreed to purchase, at a cost of £3,000, a house and grounds for the purposes of an infectious diseases hospital and sanatorium.

Lowestoft T.C.—The tender of Mr. James Wales, Lowestoft, at £1,632, has been accepted for additions to the hospital.

Redruth U.D.C.—The Sanitary Committee has been asked to consider the question of constructing an underground public convenience.

St. Helens T.C.—The Watch Committee has decided to build branch police stations to serve the outlying districts of Clock Face and Derbyshire Hill.

Sunderland T.C.—The borough engineer, Mr. J. W. Moncur, has received instructions to proceed with the alterations at the Diamond Hall school, the cost of which is estimated at £387.

Torquay T.C.—The tender of the Stanton Iron Company, Nottingham, at £3,353, has been accepted for the cast-iron pipes for the first section of the new water main, and the tender of Mr. Duke, Plymouth, at £1,079, for laying the main.

HOUSING AND TOWN PLANNING.

Bungay U.D.C.—It has been decided to purchase land for the erection of twenty houses.

Coventry T.C.—The council have adopted a recommendation from the Housing Committee that a housing scheme be prepared in connection with Leicester-street improvements, and that 101 houses already sanctioned be allocated for the purpose of the scheme.

Leicester T.C.—It was announced at the council meeting on Tuesday that the borough surveyor, Mr. E. G. Mawbey, had for the past three years been at work upon a town plan, which would in a short time come before the council for discussion.

Midhurst R.D.C.—The council have adopted the scheme of the surveyor, Mr. A. G. Gibbs, for the erection of two pairs of cottages at Milland, at an estimated cost of £775.

Pembroke (Co. Dublin) U.D.C.—The council last week affixed the seal to the necessary deeds for borrowing £81,418 for the provision of working-class dwellings.

Petworth R.D.C.—A start is to be made with the housing scheme by the erection of four cottages at Fittleworth.

PARKS AND OPEN SPACES.

Salford T.C.—The council have accepted, with thanks, the offer of Sir Arthur Percival Heywood to convey to them a portion of the Light Oaks estate, Pendleton, for the purposes of a park. The area is some 11½ acres, and the gift includes a mansion.

West Ham T.C.—At a cost of £10,000 the council have decided to purchase the freehold of the sports ground and a portion of the Memorial estate at

Manor-road, West Ham, for the purpose of a public recreation ground.

REFUSE COLLECTION AND DISPOSAL.

Glasgow T.C.—The tender of the Patent Lightning Crusher Company, Limited, 14A Rosebery-avenue, Gray's Inn-road, E.C., has been accepted for the supply of two patent lightning dust manipulators, to be erected at the Partick destructor works.

ROADS AND MATERIALS.

Arbroath T.C.—Consideration is being given to an improvement scheme from Rosemount-road to Dundee-road, the estimated cost of which is £900.

Dulverton R.D.C.—At a meeting of the council last week Mr. D. J. Tapp (Dulverton's representative on Somerset County Council) attended and gave the council particulars regarding the County Works Committee's opinion as to the Exmoor road improvement and widening scheme. The scheme was started five or six years ago, when a tender was accepted at about £3,317. The firm was allowed to relinquish the work some time ago, and it transpired that the scheme had already cost £5,774, which with £1,736 estimated expenditure for the year amounted to a total of £7,510. A short time ago the county surveyor, in company with Mr. Berryman (chairman of the County Works Committee), motored over the Brendon road. The day was wet, and the road in a bad condition owing to incessant rain. Consequently the county surveyor's report on the road to the County Works Committee was very unfavourable. The grant of £500 promised by the county council on condition that the Brendon road work was completed by Lady-day to the county surveyor's satisfaction would not now be forthcoming. After some discussion the council resolved to complete the work as soon as possible.

Langholm T.C.—The road surveyor, Mr. R. Milligan, has prepared a report on the improvement of the High-street, which forms part of the trunk road from Carlisle to Edinburgh, and it is expected that the street, which is an old macadam roadway, will soon be put into a good condition. The Road Board are expected to spend a large sum in improving the trunk road, and it is anticipated they will help in putting High-street into a satisfactory state.

Middlesex C.C.—Messrs. W. Griffiths & Co., contractors, Bishopsgate-street, E.C., have secured the contract for laying 56,248 super. yds. of paving on some of the county main roads, with 38,387 ft. run of 12 in. by 8 in. granite kerbing.

Penistone R.D.C.—The council have referred to the county authority the scheme for repairing a portion of the Sheffield Wadsley, and Manchester turnpike road, from Flouch to Fiddler's Green, about 3 miles in length. The surveyor, Mr. W. Howard, estimates the cost of the work at £4,669.

Rickmansworth U.D.C.—A widening scheme is to be carried out in High-street, at an estimated cost of £3,000.

Rotherham T.C.—The council on Wednesday passed a series of resolutions which will result in the corporation purchasing the West Riding Court House and St. George's Hall for the widening of College-square and Eflingham-street. The scheme involves the removal of the cattle market to the new site in Millgate.

Romsey R.D.C.—The surveyor, Mr. C. Dyson, having submitted a report on the subject, the Roads and Finance Committee have been instructed to consider the purchase of a steam roller.

St. Ives (Cornwall) T.C.—The council have adopted the scheme of the borough surveyor, Mr. S. Palmer, for making good Wharf-road and erecting a sea wall from the Custom House to the public latrine, at an estimated cost of £950.

Scarborough T.C.—Approval has been given to a scheme for the construction of a new road from the centre of the town through the east ward, at an estimated cost of £25,000. The Road Board will be asked to make a grant in aid of the project.

Swansea T.C.—A scheme for a larger widening having fallen through, an alternative proposal for

setting back the corner of Temple-street and Castle-street is to be carried out.

Tavistock R.D.C.—The clerk, Mr. A. K. Johnstone, reported recently that the auditor held that the council ought to pay for the new steam roller outright, and that by paying by instalments they were incurring a loan without permission. If they paid outright they would have to make provision for £360. The council resolved to ask for the sanction of the Local Government Board to pay for the roller by instalments.

Westminster B.C.—The council have decided to repave a number of streets, and have issued a memorandum containing the dates fixed for the work in each thoroughfare concerned.

SEWERAGE AND SEWAGE DISPOSAL.

Brampton R.D.C.—The Local Government Board have returned the scheme of sewerage and sewage disposal for Castle Carrock for amendment in certain details. The estimate of cost is £1,240, but the council are advised to submit a revised estimate if the suggested alterations involve an increase in the amount of the proposed loan.

Branston R.D.C.—It has been agreed to ask the Local Government Board for sanction to a scheme prepared by the sanitary surveyor, Mr. T. R. Howitt, for sewage disposal in Boultham, part of the parish of Skellingthorpe, and the parish of North Hykeham. The estimated cost is £21,600.

Chester-le-Street R.D.C.—The surveyor, Mr. J. H. Mole, has been authorised to prepare a scheme of sewage disposal for Black House.

East Westmorland R.D.C.—The Pollution of Rivers Committee of the county council inquired what progress was being made with the abatement of the river pollution. They thought the time had now arrived when the district council should be in a position to submit to them a scheme for dealing with the sewage. It was stated by a councillor that "the thing had been going on for years," and eventually a committee was appointed to go into the matter.

Folkestone T.C.—The scheme for the construction of relief sewers is estimated to cost £29,000, and Messrs. James Mansergh & Sons, Victoria-street, London, have been appointed engineers.

Redruth R.D.C.—A drainage scheme for the Hlogan-Portreath district is engaging attention, and Major Tulloch has prepared a report on the subject. The estimated cost is approximately £25,000.

Romford R.D.C.—The tender of Messrs. Petters, at £66, has been accepted for a 3-in. pump and 5-b.h.p. oil engine, for lifting the sewage from the low level sewer.

Wallington U.D.C.—The cost of the sewage disposal scheme, for which a loan of £4,700 has been sanctioned, will now be supplemented by a further charge of £8,200 for 56 acres of land at £135 per acre, the construction of a culvert on the land, and the erection and maintenance of fences.

WATER, GAS, AND ELECTRICITY.

Atherstone R.D.C.—A scheme for supplying the Atherstone district with water from the new borehole is now being prepared for the Local Government Board. Dr. H. Lapworth, M.INST.C.E., who recommended the boring, and has acted as consulting engineer during its sinking, will continue to act as joint engineer with Mr. H. J. Coleby, engineer and surveyor to the council, in preparing and carrying out the new scheme, which is estimated to cost about £15,000.

Battle U.D.C.—With the object of purifying the water and increasing the supply, it has been decided to proceed with the work of deepening the new well at the waterworks and connecting it with the borehole.

Coventry T.C.—The Waterworks and Fire Brigade Committee recommend the council to adopt a scheme for the treatment of water from the Whitley Well so as to safeguard it for drinking purposes. The cost of the scheme will be £3,500.

Dunoon T.C.—The tender of Mr. Ewan Cameron, Dunoon, at £5,819, has been accepted for the construction of a new reservoir to give an additional 17,000,000 gallons.

Hackney B.C.—The council have decided upon a further extension of electricity generating plant at an estimated cost of £15,750. The proposed plant includes a 5,000-kw. turbo alternator, with condensing plant and accessories, and an extension of the switch gear.

Hammersmith B.C.—The nett surplus on the accounts of the electricity undertaking for the current year is estimated at £6,328.

Hampstead B.C.—The council have adopted a recommendation of the Lighting Committee to reorganise the staff of the electric supply department, and, in order to give the officials and permanent workmen some distinct personal interest in the success of the undertaking, have decided to allow them in future to participate in a proportion of the profits. The staff and workmen total 139.

Llanelly R.D.C.—An agreement has been signed with the Swansea Rural District Council for the supply of water to Hendy at 1s. per 1,000 gallons.

Llangollen R.D.C.—It has been agreed to obtain a supply of water for Garth from the Cefn Water Company.

Manchester T.C.—The Electricity Committee have completed arrangements for an improvement in the lighting of the central parts of the city. It is intended to proceed with a further installation of metallic filament lamps in Oxford-road from Whitworth-street to All Saints'. In Oxford-road the lamps will be suspended from the arms of the existing tramway poles. From Whitworth-street to Deansgate the thoroughfare will be lighted by arc lamps suspended in the centre.

Marylebone B.C.—It has been agreed to ask for sanction to a loan of £5,521 for a third rotary converter, and a duplication of the canal condensing equipment.

Newmill U.D.C.—The question of the construction of a reservoir, as advised by Messrs. Marriott, Son & Shaw, engineers, has been referred to a committee for consideration.

Salford T.C.—Authority has been given to the Gas Committee to borrow £70,000 for various purposes, including cooking stoves, fires, and meters.—The tender has been accepted of West's Gas Improvement Committee, Limited, Manchester, for the supply and erection at the Regent-road gasworks of an installation of Glover-West vertical retorts, with all necessary machinery and apparatus, for the sum of £25,720.

Saxmundham U.D.C.—The Local Government Board have sanctioned a scheme of water supply for the urban district.

Withernsea U.D.C.—Proposals with respect to a new water supply scheme are to be submitted to the Local Government Board.

PERSONAL.

Mr. Joseph Hackett, an assistant surveyor of Tyrone, has resigned.

Mr. A. A. Peccaver, surveyor to the Long Sutton Urban District Council, has been granted an increase of salary.

Mr. W. W. H. Musselwhite, surveyor to the Wilton Town Council, has resigned after twenty-five years' service.

Mr. W. Dengate, surveyor to the Horsham Rural District Council, has been voted an increase of salary of £25 per annum.

Mr. John Bennett, L.R.I.B.A., Bolton, has been appointed architect to the Exeter City Council, out of 209 applications.

Mr. F. P. Cook, surveyor and water engineer to the Mansfield Woodhouse Urban District Council, has received an increase of salary.

Mr. Charles Newell, Dungannon, has been appointed assistant surveyor under the Tyrone County Council in the place of Mr. J. H. Mitchell, resigned.

Mr. James Smellie, Airdrie, has been appointed water engineer to the Dumfries and Maxwelltown Water Commission, in place of Mr. Nigel B. Wilson, resigned.

Mr. John A. McLeod, burgh surveyor and inspector of Girvan, has resigned, and the town council are advertising for a successor at a commencing salary of £120 per annum.

Mr. H. T. Chapman, who was recently appointed to succeed Mr. H. P. Maybury as county surveyor of Kent, terminated his connection with the Somerset County Council on Tuesday.

Mr. H. Richardson, electrical engineer of Dundee, who was recommended by the Electricity Committee for appointment as electrical engineer of Salford, having withdrawn his candidature, the town

council on Wednesday appointed Mr. J. A. Robertson to the post at a salary of £1,000 a year.

Mr. H. C. Marks, city surveyor of Carlisle, has been felicitated upon the fact of the city having become a county borough. Mr. Marks is now one of the principal officers of a city of 52,000 inhabitants, a place which at the beginning of the eighteenth century was described as "a dirty little town of mud, and daub and thatched roofs, with deep gutters for filth running through all the streets, whose only trade lay in a weekly market."

Mr. E. J. Elford, borough engineer and surveyor of Southend, is to be congratulated upon the advance of his official status consequent upon the town having been made a county borough. A mayoral banquet was held on Wednesday to celebrate the event, and in the course of the proceedings striking figures were quoted showing the borough's growth and development. In twenty-one years, it was stated, £276,650 had been spent upon sewerage works. The death-rate was 10.3, whereas the average of the ninety-five towns was 14.7. It was added that the completion of the sea front would provide a promenade nearly 5 miles in length.

FOR OTHER ADVERTISEMENTS

See End of Paper.

COUNTY COUNCIL OF EAST SUSSEX. SEA DEFENCES.

Tenders are invited for the carrying out of certain Sea Defence Works between the Ventilating Shaft at Roedean and Rottingdean, and also at Saltdean, in the Parish of Rottingdean.

Plans may be seen, and copies of the Specification, Conditions of Contract, and Bills of Quantities may be obtained, at the County Surveyor's Office, or at the Office of Dr. J. S. Owens, 47 Victoria-street, London, S.W., upon payment of a deposit of Three Guineas, which will be returned upon the receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Tender for Sea Defence Works," and addressed to the Chairman of the Roads and Bridges Committee, must be delivered at the County Hall, Lewes, not later than Saturday, the 25th April, 1914.

The County Council does not bind itself to accept the lowest or any Tender, and will not pay any expenses incurred in the preparation thereof.

F. J. WOOD, ASSOC. M. INST. C. E.,
County Surveyor.

County Hall, Lewes.

April 1, 1914.

(1,500)

MANCHESTER CORPORATION.

The Rivers Committee invite Tenders for the Construction of Main Drainage Work No. 2c. (New Outfall Sewer, Chester-road to the Cheshire Lines Railway).

Plans may be seen, and Specifications, Bills of Quantities, and Forms of Tender obtained, on application at the City Surveyor's Office, Town Hall, Manchester, on payment to the City Treasurer of the sum of £10 10s., which sum will, after the Corporation have come to a decision upon the Tenders received, but not before, be returned to the person submitting a *bonâ-fide* Tender.

All cheques or postal orders are to be made payable to the order of "The Corporation of Manchester."

Tenders, enclosed in the official envelope, and addressed to the Chairman of the Rivers Committee, are to be delivered at the City Surveyor's Office not later than 9.30 a.m. on Monday, April 20, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender.

THOMAS HUDSON,

Town Clerk.

Town Hall, Manchester.

April 2, 1914.

(1,501)

CORPORATION OF THE CITY OF CAPE TOWN.

APPOINTMENT OF ROAD ENGINEERING ASSISTANT.

The undersigned are authorised to receive applications for the position of Road Engineering Assistant, at a commencing salary of £500 per annum, rising by increments to a maximum salary of £600 per annum.

Candidates must have had considerable experience

in the construction and maintenance of modern roads, and be capable of preparing plans and estimates for new works, of supervising all road works within the limits of the Municipality, setting out new works, and seeing that the various works foremen are keeping their districts in good order and securing the best results from the votes provided for road maintenance.

The Corporation will supply the officer appointed with a first-class passage from England to Capetown.

Applications, accompanied by copies of not more than six testimonials of recent date, must be forwarded to the undersigned not later than Monday, 20th April, 1914.

DAVIS & SOPER,

Agents of the Corporation of the City
of Capetown.

54 St. Mary-axe,

London, E.C.

March 31, 1914.

(1,497)

BOROUGH OF NUNEATON.

Applications are invited for the appointment of Second Assistant. Salary commencing at £100, rising by annual increments of £10 to a maximum of £120 per annum.

Candidates must have had architectural experience, and preference will be given to those possessing the diploma of the Institution of Municipal and County Engineers.

Applications, stating age and qualifications, endorsed "Assistant," enclosing copies of three recent testimonials, must be delivered to me on or before Wednesday, the 15th inst.

F. C. COOK,

Borough Surveyor.

Municipal Offices,

Nuneaton.

April 1, 1914.

(1,499)

ARTICLED PUPIL.—The Engineer to an important London Suburban District has a vacancy for well-educated youth. Very varied experience. Moderate premium.—Box 1,410, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,498)

JUNIOR ASSISTANT (20) desires appointment in Office of Surveyor and Sanitary Inspector for wider experience. Three years' Articles served in large district near London; twelve months with builder. Small salary expected.—Box 1,411 office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,502)

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—MR. J. W. COCKRILL, M. INST. C. E., A. R. I. B. A.,
Borough Surveyor, Great Yarmouth.

EASTERN DISTRICT.

A meeting of the Eastern District is to be held at Chelmsford on April 18th.

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District is to be held at Sheffield on May 2nd.

DOVER MEETING.

A meeting of the institution is to be held in the South-Eastern District at Dover on May 9th.

SALISBURY MEETING.

A meeting of the institution is to be held in the Southern District at Salisbury on May 16th.

WEST MIDLAND DISTRICT.

A meeting of the West Midland District is to be held at Birmingham on May 23rd.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on Saturday, June 13th.

ANNUAL MEETING.

A town planning, housing and road conference and the forty-first annual general meeting is to be held at Cheltenham from June 24th-27th.

THOMAS COLE,

Secretary.

92 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

NORTHERN DISTRICT.

Meetings will be held at Darlington on Saturday, April 18th, Hexham on Saturday, May 2nd, Cumberland in June, Alnwick on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

GENERAL MEETINGS.

A general meeting will be held in London in May, for the discussion of a paper—"The Water Supply of New York," by W. T. Taylor, M.I.E.E., M.A.M.I.E.E. (member).

A general meeting will be held at Birmingham in May, when a visit will be paid to the works of the General Electric Company.

COUNCIL MEETING.

A council meeting will be held in London on Wednesday, April 29th.

EASTERN AND NORTH-EASTERN DISTRICT.

A joint Eastern and North-Eastern District meeting will be held at Finedon and Kettering on Thursday, May 7th, when a visit will be paid to the works of the Excelsior Stone Company at Finedon, and certain municipal works inspected at Kettering.

A joint Eastern and North-Eastern District meeting will be held at Hunstanton in July.

NORTHERN DISTRICT, WITH YORKSHIRE.

A Northern District meeting, in combination with Yorkshire, will be held at Hull on Saturday, May 16th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

WESTERN DISTRICT.

A Western District meeting will be held at Tisbury on Saturday, June 13th, when the municipal works of the town will be inspected and a paper, "Wiltshire Roads, Past and Present," will be read by Mr. E. Plummer Davies (member).

39 Victoria-street, S.W. B. WYAND, Secretary.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

TEMPORARY ASSISTANT.—April 6th.—Hiracombe Urban District Council—Mr. O. M. Prouse, engineer and surveyor.

INSPECTOR OF NUISANCES.—April 6th.—Faringdon Rural District Council. £80 per annum.—Mr. A. G. Haines, clerk.

SANITARY INSPECTOR.—April 6th.—River Tees Port Sanitary Authority. £150 per annum.—Mr. G. W. W. Barnley, clerk.

WATERWORKS MANAGER.—April 6th.—Neath Rural District Council. £300 per annum.—Messrs. Cuthbertson & Powell, clerks.

SURVEYOR'S OFFICE ASSISTANT.—April 6th.—Urnston Urban District Council. £1 per week.—Mr. T. J. Rowland, clerk.

ENGINEERING ASSISTANT.—April 6th.—Battersea Borough Council. £150 per annum.—Mr. W. Marcus Wilkins, town clerk.

ASSISTANT CONSTRUCTIONAL ENGINEER.—April 6th.—Corporation of Birmingham. £250—£300.—Mr. R. A. Chattock, city electrical engineer and manager, 14 Dale-end, Birmingham.

EASTER HOLIDAYS.

Owing to the necessity for going to press earlier than usual, news and advertisement matter intended for insertion in next week's issue of "The Surveyor" must reach us not later than Wednesday morning, April 8th.

CLERK OF WORKS.—April 7th.—Ely Urban District Council. £2 10s. per week.—Mr. G. M. Mall, clerk.

CLERK OF WORKS.—April 11th.—Croydon Rural District Council. £4 per week.—Mr. R. Chart, junr., surveyor, Katharine-street, Croydon.

INSPECTOR OF NUISANCES.—April 14th.—Miford and Launditch Rural District Council. £150 per annum.—Mr. W. J. Barton, clerk, Guildhall, East Dereham.

CLERK OF WORKS.—April 15th.—Corporation of Leigh. £2 10s. per week.—Mr. Tom Hunter, borough engineer.

INSPECTOR OF NUISANCES.—April 16th.—Coseley Urban District Council. £125—£145 per annum.—Mr. W. Lees, clerk.

TEMPORARY ASSISTANT.—April 17th.—Chorley Town Council.—Mr. J. Mills, town clerk.

WATERWORKS ENGINEER.—April 18th.—Diss Urban District Council.—Mr. Alfred Cooper, waterworks superintendent.

GENERAL ASSISTANT.—April 20th.—Corporation of Leigh. £97 10s.—£104.—Mr. Tom Hunter, borough engineer.

SANITARY INSPECTOR.—April 20th.—West Riding County Council. £170 a year.—Mr. F. A. Darwin, clerk, County Hall, Wakefield.

SURVEYING ASSISTANTS.—April 21st.—Shanghai Municipal Council. £385 per annum.—Messrs. John Pook & Co., agents for the Shanghai Municipal Council, 68 Fenchurch-street, London, E.C.

CLERKS OF WORKS.—Rivers Committee of the Manchester Corporation. £3 3s. per week.—Chairman of the Rivers Committee.

ASSISTANT SURVEYOR OF ROADS.—Public Works Department, Gold Coast Government. £300—£350, with £7 10s. per month allowance.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

GLASGOW.—May 1st.—Models for four groups of symbolical sculpture, for the Glasgow Corporation.—Mr. J. Lindsay, town clerk.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

HYTHE.—May 30th.—Designs for a concert hall and public shelter, for the Hythe Corporation. Premiums, 50, 25 and 10 guineas.—Mr. B. C. Drake, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

LIVERSEDGE.—April 6th.—For the rubble fencing walling to be constructed around the new circular sewage filters, for the urban district council.—Mr. A. Rothera, engineer and surveyor.

BELFAST.—April 6th.—For laying mains and other works in connection with water supply works, for the rural district council.—Mr. R. G. Jackson, clerk.

BOURNEMOUTH.—April 6th.—For the erection of elementary schools and alterations to existing buildings, for the corporation.—Borough Engineer.

ESSEX.—April 6th—24th.—For additions to Chelmsford High School for Girls, for the Education Committee.—County Architect, 73 Duke-street, Chelmsford.

HOWDEN.—April 6th.—For the erection of an iso-

lation hospital, for the rural district council. Mr. T. N. Ullathorne, architect, Selby.

WEST HAM. April 6th-20th. For alterations and additions to a school, for the Education Committee.—Mr. W. Jacques, architect, 2 Fen-court, Fenchurch-street, E.C.

BUCKFASTLEIGH. April 6th. For sewer and water main extensions, for the urban district council.—Mr. W. J. Goode, surveyor.

STRANORLAR. April 6th. For the erection of twenty-nine cottages, for the rural district council. Mr. G. McLaughlin, clerk.

WITNEY. April 6th. For the construction of a concrete lining to a dug well 82 ft. deep, laying about 1,800 yds. of 3-in. service mains, with necessary fittings, and the supply and fixing of a vertical oil engine, three-throw pump, two air compressors, air-lift plant, and necessary piping to connect existing main, for the rural district council.—Mr. H. Howard Humphreys, engineer, 28 Victoria-street, Westminster, S.W.

RICHMOND (Surrey). April 7th.—For the erection of public conveniences, for the corporation.—Mr. J. H. Brierley, borough surveyor.

GILLINGHAM. April 7th. For the erection of workmen's dwellings, for the corporation.—Mr. J. L. Redfern, borough surveyor.

BOSTON. April 7th.—For the erection of cottages, for the rural district council.—Mr. H. Kidd, architect, Solent House, Kirton, Boston.

MONAGHAN.—April 7th.—For the conversion of military barracks into eleven cottages, and the erection of sixteen new cottages, for the urban district council.—Mr. J. J. Inglis, 36 Dawson-street, Dublin.

DEPTFORD. April 7th.—For repairs and redecoration to mortuary and coroner's court, for the borough council.—Borough Engineer.

BARNES.—April 7th.—For building a sports pavilion, for the urban district council. Mr. G. Bruce Tomes, surveyor.

NORMANTON. April 9th.—For the erection of seventy-six workmen's dwellings, for the urban district council.—Mr. A. Hartley, architect and surveyor.

CLONMEL. April 11th.—For the erection of a report-house and coal store in concrete or, alternatively, in stone, at the gasworks, for the corporation.—Mr. Henry O'Connor, 1 Drummond-place, Edinburgh.

KEIGHLEY.—April 11th.—For the construction of a storage reservoir, filter-beds, clear-water basin, and other appurtenances, for the corporation.—Mr. Ratcliffe Barnett, engineer.

NEWTON-IN-MAKERFIELD.—April 11th.—For the erection of thirty cottages, for the urban district council.—The Surveyor, Town Hall, Earlestown.

FELIXSTOWE.—April 14th.—For extensions to the electric lighting station, for the urban district council.—Mr. H. Clegg, Town Hall.

ST. NEOTS.—April 14th.—For alterations to corn exchange, for the urban district council.—The Surveyor.

WINCHESTER.—April 14th.—For the erection of two shelters in the recreation ground, for the corporation.—City Engineer.

EDMONTON.—April 14th.—For the erection of a public convenience, for the urban district council.—Mr. C. Brown, engineer and surveyor.

HASTINGS.—April 14th.—For the erection of two cottages, for the corporation. Mr. P. H. Palmer, borough engineer.

HEREFORD.—April 14th.—For the erection of sixty-two cottages, for the corporation.—Mr. J. Parker, city surveyor.

WARMINSTER.—April 17th.—For the erection of eight cottages, for the rural district council. Mr. C. C. Hancock, surveyor.

CHESHIRE.—April 18th.—For the erection of certain new buildings and alterations, for the county council.—Mr. W. H. Lancaster, 49 Northgate-street, Chester.

BURNLEY.—April 18th.—For the completion of the construction of an impounding reservoir, with catchwaters, aqueducts, and meter-houses, for the corporation.—Messrs. James Diggle & Son, engineers, Hind Hide-street, Heywood, Lancs.

HUNTS.—April 20th.—For the enlargement of a school, for the Education Committee.—County Surveyor, Market-place, Huntingdon.

CHELMSFORD.—April 20th.—For sinking a 14-in. borehole, for the corporation.—Borough Surveyor.

MARGATE.—April 20th.—For the erection of a pumping engine house, for the corporation.—Mr. A. E. Borg, borough engineer.

LISBURN. April 21st.—For the erection of sixty cottages, for the rural district council. Mr. W. Sinclair, clerk.

WALLASEY.—April 21st.—For the erection of a town hall, for the corporation.—Messrs. Briggs, Wolstenholme & Thorneley, Royal Liver Buildings, Liverpool.

GLASGOW. April 22nd.—For the extension of the municipal buildings, for the corporation.—Messrs. Watson & Salmon, architects, 242 George-street, Glasgow.

KEIGHLEY. April 20th.—For the erection of a two-span bridge, for the rural district council.—Messrs. R. B. Broster & Sons, engineers, Craven Bank Chambers, Keighley.

WEST RIDING. April 24th.—For alterations to a school, for the Education Committee.—The Clerk, County Hall, Wakefield.

WARWICKSHIRE.—April 24th.—For the enlargement of the police station and the erection of a pair of cottages and works incidental thereto, for the county council.—Mr. John Wilmot, county surveyor, 6 Waterloo-street, Birmingham.

CUMBERLAND. April 25th.—For the reconstruction in ferro-concrete of "Metal Bridge" across the river Esk, for the county council.—Mr. William Finch, county surveyor and bridgemaster, The Courts, Carlisle.

PONTEFRACI.—April 27th.—For deepening a well and other incidental works, for the corporation.—Messrs. G. & F. W. Hodson, engineers, Bank Chambers, Loughborough.

BURTON-UPON-TRENT.—April 29th.—For the extension of the refuse destructor, Bond End, for the corporation. Mr. George T. Lynam, borough engineer and surveyor.

ASHFORD.—April 30th.—For the erection of baths and attendant's room, for the urban district council.—Mr. W. Terrill, surveyor.

Iron and Steel.

LONDON.—April 6th.—For the supply of welded steel pipe, for the Metropolitan Water Board.—The Engineer, Savoy-street, Strand, W.C.

MANCHESTER.—April 8th.—For the supply of cast-iron water pipes and cast-iron hydraulic pipes, for the corporation.—Secretary, Waterworks Offices, Town Hall.

BRIDGWATER.—April 13th.—For the supply of 124 tons of 3-in. cast-iron pipes and other castings, for the rural district council.—Mr. W. A. Collins, engineer.

BRISTOL.—April 13th.—For the supply of wrought-iron and steel, for the Sanitary and Improvement Committee.—City Engineer.

TAUNTON.—April 14th.—For the supply of sluice valves, air valves, hydrants, surface boxes, cast-iron mains, carting and laying cast-iron water mains, including fixing valves and hydrants, for the rural district council. Mr. Sidney S. Orchard, engineer and surveyor.

ABERDARE.—April 15th.—For the supply of steel tubes and cast-iron pipes, for the urban district council.—The Surveyor.

HULL.—April 18th.—For the supply of 200 tons of cast-iron lining for pumping well and shaft, for the water and gas department.—Mr. C. B. Newton, city water and gas engineer.

Roads.

EAST STEYNING.—April 6th.—For the execution of street works, for the rural district council.—Mr. G. W. Warr, surveyor.

RAMSEY. April 6th.—For the supply of tarred slag, broken granite, granite chips, and Tarvia, for the urban district council.—Mr. R. F. Sergeant, clerk.

PUDSEY.—April 6th.—For the supply of shovels, street sweeping brushes, granite, lime, flags, knell setts, and granite setts, for the corporation.—Mr. Alfred E. Evans, town clerk.

HENDON.—April 6th.—For making up certain streets, for the urban district council.—Mr. S. Slater Grimley, engineer and surveyor.

Haverhill.—April 6th.—For the supply of broken granite, slag and tar-macadam, for the urban district council.—Mr. John H. Clarke, surveyor.

Bootle.—April 6th.—For the construction of tar-asphalt carriageway and footways, for the corporation.—Borough Engineer.

Teddington.—April 6th.—For making up a certain street, for the urban district council.—Mr. M. Hainsworth, surveyor.

Melton Mowbray.—April 6th.—For asphaltting and repairing footpaths, for the rural district council.—Mr. E. C. Moorhouse, surveyor.

Doover.—April 6th.—For work of making up, for the corporation.—Mr. W. C. Hawke, borough engineer.

Bulkington.—April 6th.—For the supply of stone, for the urban district council.—Mr. H. W. Wilson, surveyor.

Stanley.—April 7th.—For levelling, paving and metalling fifteen streets, for the urban district council.—Mr. A. Routledge, surveyor.

Caerphilly.—April 7th.—For road widening and improvement, and bridge construction, for the urban district council.—Mr. A. O. Harpur, engineer and surveyor.

Torpoint.—April 7th.—For making up certain roads, for the urban district council.—The Surveyor.

Samford.—April 7th.—For the supply of broken granite, washmill flints, and Kent ragstone, for the rural district council.—Mr. A. J. Haward, clerk.

Blaydon.—April 7th.—For making up certain streets, for the urban district council.—Mr. G. Symon, surveyor.

Margam.—April 7th.—For the execution of street improvements, for the urban district council.—Mr. J. Cox, surveyor, Taibach.

Glamorgan.—April 8th.—For making footways and road widening, for the county council.—County Hall, Cardiff.

East Ashford.—April 8th.—For the supply of flints, Kentish rag and gravel, and haulage, for the rural district council.—Mr. T. W. Pullen, surveyor.

Rochdale.—April 8th.—For making up certain streets, for the corporation.—Borough Surveyor.

Enfield.—April 8th.—For making up certain streets, for the urban district council.—Mr. R. Collins, surveyor.

Erith.—April 8th.—For private street works, for the urban district council.—The Surveyor.

Sligo.—April 8th.—For steam rolling 3½ miles of main road, for the corporation.—Mr. J. McGovern, town clerk.

Southend.—April 9th.—For making up certain streets, for the corporation.—Mr. E. J. Elford, borough surveyor.

Houghton-le-Spring.—April 9th.—For the supply of blast-furnace slag, road metal and slag riddings, for the rural district council.—Mr. D. Balfour, surveyor.

Isle of Thanet.—April 9th.—For the supply of broken flints and broken granite, for the rural district council.—Mr. C. L. Butterworth, surveyor, Birchington.

Inverness.—April 11th.—For the upkeep of roads and bridges, for the Badenoch District Committee.—Mr. A. M. Grant, district road surveyor, County Buildings, Kingussie.

Tangier.—April 14th.—For the supply of paving and kerbstone, for the Public Works Department.—Commercial Intelligence Department of the Board of Trade, 73 Basinghall-street, London, E.C.

Birmingham.—April 14th.—For making up a road, for the corporation.—Mr. H. E. Stilgoe, city engineer and surveyor.

Oakworth.—April 15th.—For road improvement works, for the urban district council.—Mr. A. Bradley, clerk.

St. Neots.—April 16th.—For the supply of broken granite, basalt, slag tar-macadam, and slag dust, for the urban district council.—Mr. J. Edey, surveyor.

Gravesend.—April 16th.—For the supply of English basalt, English basalt chippings, granite setts, scoria setts, and ragstone chippings, for the corporation.—Mr. F. T. Grant, borough surveyor.

Uttoxeter.—April 17th.—For the supply of broken granite, limestone, and cold blast slag, for the rural district council.—Mr. W. Walker, surveyor.

Merton and Morden.—April 17th.—For surfacing about 22,000 sq. yds. of the carriageway in Kingston-road, for the urban district council.—Mr. G. Jerram, engineer and surveyor.

Kidderminster.—April 17th.—For the supply of broken granite, granite screenings, broken slag and slag screenings, for the rural district council.—Mr. G. J. Shepherd, surveyor.

Bedwellty.—April 18th.—For the construction of an access road, for the urban district council.—Mr. D. H. Price, surveyor, Aberbargoed.

Ruskington.—April 18th.—For the supply of granite, slag, and ironstone, for the urban district council.—Mr. E. H. Godson, clerk.

Rotherham.—April 18th.—For the supply of broken granite, broken slag, Portland cement, tarred slag, tarred limestone, concrete flags, gritstone setts and kerbs, for the corporation.—Mr. E. B. Martin, borough engineer.

East Sussex.—April 27th.—For the widening, improvement, and reconstruction of the Lewes-Newhaven road, for the county council.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

Madras.—May 4th.—For the supply of 400 40-gallon casks of tar, for the corporation. A copy of specification and conditions may be obtained at the office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

Sanitary.

Mansfield.—April 6th.—For laying stoneware pipe sewer and manholes, for the corporation.—Mr. T. P. Collinge, borough engineer and surveyor.

Belfast.—April 7th.—For the supply of pitch-pine penstock doors, complete with fittings, for 6 ft. 6 in. square outlet sewer, for the corporation.—City Surveyor.

Widley.—April 7th.—For the construction of sewage disposal works at the asylum, for the Committee of Visitors.—Mr. J. T. Wood, Bank Chambers, 3 Cook-street, Liverpool.

Whiston.—April 8th.—For the construction of earthenware pipe sewers, manholes, and incidental works, for the rural district council.—Mr. J. T. Wood, engineer, 3 Cook-street, Liverpool.

Bridlington.—April 11th.—For main sewer extension, for the rural district council.—Mr. S. Dyer, architect.

Eccles.—April 11th.—For the supply of engine packing, waste, wading boots, shovels, forks, and valves, for the Sewage Disposal Committee.—Mr. G. W. Willis, Sewage Works, Peel Green-road, Patricroft.

Nantwich.—April 11th.—For the construction of pipe sewers, for the urban district council.—Mr. W. F. Newey, surveyor.

Tiverton.—April 13th.—For the execution of sewerage works, for the rural district council.—Mr. J. Reynolds, clerk to the Parochial Committee, Cullompton.

Kendal.—April 14th.—For the construction of filter floors, channels, humus tanks, storm-water tanks, and alterations to septic tanks, for the corporation.—Mr. F. W. Oxberry, borough engineer.

Oakworth.—April 15th.—For scavenging certain districts, for the urban district council.—Mr. A. Bradley, clerk, North-street, Keighley.

Kiveton Park.—April 15th.—For works of sewerage, for the rural district council.—Mr. F. Hewitt, engineer and surveyor.

Oundle.—April 16th.—For supplying and laying earthenware pipes and construction of manholes, for the rural district council.—Mr. S. Broadbent, inspector, 3 Gordon-road, Oundle.

Hawarden.—April 17th.—For alterations to outfall works, for the rural district council.—Mr. A. Caradoc Williams, engineer, 6 Godstall Chambers, Chester.

Rhymney.—May 18th.—For the construction of sewers, storage tank and discharge pipe, for the Sewerage Board.—Mr. J. S. Alford, 9 Victoria-street, Westminster; Messrs. Wilcox & Raikes, 63 Temple-row, Birmingham; and Mr. T. J. Thomas, 36 High-street, Bargoed.

Goole.—April 20th.—For the construction of branch sewers and connections, consisting of about 6 miles of stoneware pipe sewers, with manholes and other appurtenances, for the urban district council.—Mr. Robert Tyson, clerk.

STONE.—April 20th.—For the construction of sewers, manholes, pumping station, and rising main, for the rural district council.—Mr. H. W. Makepeace, engineer, Leek-road, Stoke-on-Trent.

BRIGHTON.—April 21st.—For the supply of glazed drain pipes, for the corporation.—Borough Surveyor.

Stores.

WOLVERHAMPTON.—April 6th.—For the supply of pitch and tar, Portland cement, macadam, broken slag, brooms, stoneware pipes, sewerage and castings, for the corporation.—Mr. George Green, borough engineer.

MANCHESTER.—April 8th.—For the supply of sluice valves, manhole frames, firecock boxes, lead piping, oils and paints, paraffin oil, ferrule taps, hydraulic valves and fittings, and hydraulic bolts, for the corporation.—Secretary, Waterworks Offices, Town Hall.

COLWYN BAY.—April 15th.—For the supply of drain pipes, kerbs, channels, ironmongery (manhole covers), disinfectants, creosote oil, granite macadam and chippings, and limestone chippings, for the urban district council.—Mr. William Jones, engineer and surveyor.

ROTHERHAM.—April 18th.—For the supply of broken granite, broken slag, tarred slag, tarred limestone, concrete flags, Portland cement, timber, pitch and creosote oil, gritstone setts and kerbs, and granite setts, for the corporation.—Mr. Ernest B. Martin, borough engineer.

SUTTON (Surrey).—April 22nd.—For the supply of road materials, ironmongery, oils, paints, coal, coke, horse forage, and team labour, for the urban district council.—Mr. W. Hedley Grieves, surveyor.

TEES VALLEY.—For the supply of road and valve boxes, brass castings, taps, ferrules, and general stores, for the Water Board.—Mr. Hugh Wilson, clerk.

Miscellaneous.

BOURNE.—April 11th.—For the supply of a covered-in refuse removal cart, for the urban district council.—Mr. A. R. Agnew, surveyor.

BRIGHTON.—April 21st.—For the supply of Portland cement, for the corporation.—Borough Surveyor.

GRIMSBY.—For the erection of public conveniences for both sexes at Nos. 7 and 9, East Marsh-street.—Mr. H. Gilbert Whyatt, borough engineer and surveyor:—

J. H. Thompson & Sons, Limited	4522
G. Dixon	512
E. Marshall	510
E. Smith	490
Edwards & Raynor	486
D. Seamer	485
W. Kirton	477
H. & C. Thompson	467
Swaby & Walsham	460
Taylor & Richardson	453
Borrill & Cheesman	435

HODDESDON.—For the construction of stoneware pipe surface-water drain and relief sewer, for the urban district council.—Mr. H. W. Flood, surveyor:—

Hampton & Son, Palmer's Green, N.	4742
G. Bell & Son, Limited, Tottenham, N.	658
W. & C. French & Sons, Buckhurst Hill	603
Jennings & Grenfell, Waltham Cross	596
W. Jackson, Forest Gate, E.	572
E. J. Betts, Enfield, N.	535
Pilgrim & Son, Whetstone	525
W. J. Howard, Hoddesdon	489

Surveyor's estimate, £540.

LEWISHAM.—For the enlargement of the Kilmorie-road school, for the London County Council:—

W. Downs, Walworth	£11,382
W. Akers & Co., Limited, South Norwood	10,993
Triggs & Co., Clapham	10,841
F. & T. Thorne, Isle of Dogs	10,644
G. E. Wallis & Sons, Limited, Haymarket	10,560
C. Wall, Limited, Chelsea	10,518
G. Godson & Sons, Kilburn-lane	10,466
T. D. Leng, Deptford	10,270
J. Smith & Sons, Limited, South Norwood	10,209
W. Smith & Son, Harleyford-road	10,165
W. Moss & Sons, Limited, Loughborough	10,020
F. & H. F. Higgs, Herne Hill	9,993
J. & C. Bowyer, Limited, Upper Norwood	9,889
H. L. Holloway, Deptford †	9,876

Architect's estimate, £9,786.

ST. PANCRAS.—For the remodelling of Burghley-road school, for the London County Council:—

Thomas & Edge, Woolwich	£19,198
W. King & Son, Vauxhall Bridge-road	19,030
Rowley Brothers, Wood Green	18,967
McCormick & Sons, Limited, Essex-road	18,733
G. E. Wallis & Sons, Limited, Haymarket	18,656
J. Smith & Sons, Limited, South Norwood	18,548
J. Chessum & Sons, South-place	18,388
W. Lawrence & Son, Finsbury-circus	17,872
C. P. Roberts & Co., Dalston	17,844
L. H. & R. Roberts, Lower Clapton-road	17,654
Brand, Pettit & Co., Tottenham	17,368
J. Willmott & Sons, Hornsey	17,289
J. & C. Bowyer, Limited, Upper Norwood †	17,167

Architect's estimate, 17,985.

WAKEFIELD.—For repaving work, for the corporation.—Mr. J. P. Wakeford, city surveyor:—

Wilson Brothers, Wakefield.

WHITECHAPEL.—For the erection of Vallance-road school, for the London County Council:—

Comyn, Ching & Co., Limited, Long-acre	£1,920
J. C. Christie, Aldgate	1,830
Wilson & Smith, Limited, Strand	1,780
Brightside Foundry and Engineering Company, Limited, Victoria-street	1,725
E. Deane & Beal, Limited, Monument-street	1,607
H. J. Cash & Co., Limited, Westminster	1,568
Cannon & Heford, Peckham	1,563
J. Cormack & Sons, Limited, Westminster	1,553
W. G. Cannon & Sons, Limited, London-road	1,550
R. H. & J. Pearson, Limited, Notting Hill-gate	1,549
Arding & Dyne, Southwark Bridge-road	1,529
Palowkar & Sons, Queen-street	1,493
G. & E. Bradley, Lever-street †	1,469

Architect's estimate, £1,600.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted † Recommended for acceptance.
‡ Provisionally accepted.

ASHINGTON.—Accepted for work of sewerage, for the urban district council.—Mr. G. Beatty, surveyor:—
R. Baxter, Blyth, Northumberland, £1,980.

CASTLEFORD.—For works of road improvement, for the urban district council.—Mr. W. Green, surveyor:—
E. A. Greaves, Castleford £379
Jonas, Rodgers & Son, Castleford † 377

CHESHAM.—For the reconstruction with cast-iron pipes of about 712 lin. yds. of 12-in., 977 yds. of 9-in., and 935 yds. of 6-in. existing stoneware pipe sewers and house connections with manholes and flushing chambers, for the urban district council.—Mr. Percy C. Dormer, engineer and surveyor:—

A. Mead & Son, Chesham	£3,658
E. Free & Sons, Maidenhead	3,635
W. Wright, Chesham	3,539
F. W. Southson, Leicester	3,380
W. H. Shaddock, Plymouth †	3,162

Engineer's estimate, £3,363.

CHESHAM.—For the erection of twenty workmen's dwellings, for the urban district council.—Mr. Percy C. Dormer, engineer and surveyor:—

Honour & Son, Fring	£5,400
Hanson Brothers, Southall	4,279
H. & R. Abbott, Chesham	4,275
T. Bow, Nottingham	4,220
Organ & Son, Oxford	4,200
W. W. Freeman, Chesham	3,775
Clarke Brothers, Watford	3,700
Mead & Son, Chesham	3,650
Rust & Ratcliffe, Chesham	3,580
— Clark, Melton Mowbray	3,567
Grimsdell & Haddock, Chesham †	3,525

Engineer's estimate, 3,537.

GRIMSBY.—For the erection of a public convenience at Welholme-road level crossing.—Mr. H. Gilbert Whyatt, borough engineer and surveyor:—

J. H. Thompson & Sons, Limited	£466
G. Dixon	401
Borrill & Cheesman	349
Edwards & Raynor	329
Hewins & Goodband	320
W. Kirton	313
W. Gilbert	307
Swaby & Walsham	300
Taylor & Richardson	296
D. Seamer †	294

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

APRIL.

- 3.—Royal Sanitary Institute: Meeting at Southampton. Discussion on "The Housing, Town Planning, &c., Act, and its Application to the County Borough of Southampton." 7 p.m.
- 6.—Society of Engineers: Mr. A. S. E. Ackermann on "The Utilisation of Solar Energy." Institution of Electrical Engineers. 7.30 p.m.
- 7.—Institution of Civil Engineers: Mr. F. W. Cowie, M.I.N.S.T.C.E., on "The Transportation Problem in Canada and Montreal Harbour." 8 p.m.
- 20.—Institute of Sanitary Engineers: Mr. E. A. Lees, A.I.N.S.T.C.E., on "The Birmingham Waterworks." Caxton Hall, Westminster. 8 p.m.

MAY.

- 9.—Institution of Municipal and County Engineers: Meeting at Dover.
- 13.—Royal Sanitary Institute: Annual Dinner, Langham Hotel.
- 23.—Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham; Mr. A. S. Parsons on "Bridge Construction."

JUNE.

- 6.—Institution of Municipal and County Engineers: Meeting at Southend.
- 13.—Institution of Municipal Engineers: Western District Meeting at Tisbury. Mr. E. Plummer Davies on "Wiltshire Roads, Past and Present."
- 17.—Royal Institute of British Architects: Annual Dinner, Hotel Cecil.
- 24-27.—Institution of Municipal and County Engineers: Annual Meeting and Town Planning, Housing and Road Conference at Cheltenham.

100 PER CENT BETTER TERMS.

THE REASONS WHY.

(By a SPECIAL CONTRIBUTOR.)

"While giving thirty years for Cast-iron Tubes, we give only twenty years for Steel Tubes when not tapped, and fifteen years when tapped."

This, under any circumstances, would be a very notable announcement, whatever be the Business matter to which it related. For it means in the first instance 50 per cent, and in the second instance 100 per cent better terms.

It becomes outstanding—indeed, in more senses than one commanding—when we learn that the statement describes the conditions under which the Government sanctions loans for certain Public Health, Sanitation, and Illuminating Purposes.

The works were used in an explanation offered to the Representative of a leading South Wales Journal who had sought information at the Offices of the Local Government Board as to the reasons for a communication addressed by the Board to the Tredegar Urban District Council.

What *can* be the reasons for Terms so contemptuous of Steel Tubes?

"It is," continues the report in the *South Wales Daily News*, "because the Board are advised by their Engineering Experts that Steel Tubes have a shorter 'life' than Cast-iron Pipes."

A very sensible, sound, business-like reason, most people will agree—a reason to be taken to heart by municipal administrators everywhere.

This attitude upon the part of the Local Government Board, however, is scarcely justified—if we have regard, that is to say, to some recent instances of the "unservicability" of Steel Tubes for Water Mains—witness, among many others, the following:—

1. At Atlantic City, U.S.A., some seven miles of 48-in. pipe are being installed, at a cost of about £60,000 to £70,000, to replace steel piping only 12 years in use, this having already been found beyond repair.
2. At Troy, U.S.A., about seven miles of 30-in. steel pipe, which has gradually been going out of service since it was installed some thirteen years ago, is being replaced by Cast-iron Pipes, at a cost of about £45,000.

Are not the terms laid down by the Local Government Board, enormously favourable as they are to Cast-iron Pipes, altogether too generous to Steel Tubes?

One Hundred per Cent Better Terms! There must be very exceptional qualities in Cast-iron Pipes when they are so countenanced by a responsible Government Department. In addition to the initial economy, the community obtains reliable, and, in fact, almost everlasting work.

Surely the prudent men who man our municipal bodies will not permit themselves to be misled by the seeming cheapness of the first cost of a material capable of giving results like the above, so disastrous to the interests of the Commonwealth?—Adv't.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

BOROUGH OF CHORLEY.

The Chorley Corporation invite applications for the appointment of a Temporary Assistant, with experience in Town Planning.

Applications, in candidate's own handwriting, stating age, experience, present employment, and salary required, and accompanied by copies of not more than three recent testimonials, to be sent to the undersigned, endorsed "Town Planning Assistant," not later than Friday, the 17th of April, 1914.

JNO. MILLS,
Town Clerk.

Town Hall, Chorley.
March 27, 1914.

(1,486)

SHANGHAI MUNICIPAL COUNCIL.

PUBLIC WORKS DEPARTMENT.

FOUR SURVEYING ASSISTANTS.

Four thoroughly qualified Surveying Assistants, with experience in town surveys and cadastral work, are required in the Public Works Department.

Candidates should be about 25 years of age and unmarried.

Salary, taels 250 per mensem, without allowances, under a three years' agreement, with first-class passage from home, half pay on voyage, and medical attendance. There is an excellent superannuation scheme.

The value of the tael at the present rate of exchange is about 2s. 7d., but it is liable to fluctuation. Taels 250 per mensem taken at Exchange 2s. 7d. is equivalent to about £385 per annum. Particulars of the appointment may be obtained of the Council's Agents, and applications, in Candidate's own handwriting, stating qualifications, experience, &c., accompanied by copies of not more than three recent testimonials, and endorsed "Surveying Assistants," should be forwarded, on or before April 21st, to Messrs. John Pook & Co., Agents for the Shanghai Municipal Council, 68 Fenchurch-street, London, E.C.

March, 1914. (1,412)

BOROUGH OF LEIGH.

The Corporation invite applications for the appointment of General Assistant in the Borough Engineer's Office. Salary £97 10s., rising to £104 in March, 1915.

Candidates must have been trained in a Borough Engineer's Office, and must have passed in at least some of the subjects for the Testamur of the Institute of Municipal and County Engineers.

Forms of application may be obtained from Mr. Tom Hunter, Borough Engineer, Town Hall, Leigh, Lancashire.

Applications, on prescribed Forms, together with copies of three testimonials, are to be delivered to the undersigned on or before 13th April, 1914.

W. H. COWBURN,
Town Clerk.

Town Hall,
Leigh, Lancashire.
March 26, 1914.

(1,484)

SEVERAL first-class DRAUGHTSMEN wanted at once in London, with experience of sewage disposal plant and drainage, and, in one case, of dust destructor work. Two juniors for similar work also required, and one first-class mechanical draughtsman with good knowledge of hydro-extractor design. Apply, with full particulars of experience, age and salary required, to Box 1,407, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,485)

DISS URBAN DISTRICT COUNCIL.
WATERWORKS ENGINEER.

The above Council invite early applications from persons capable of taking entire charge of the Machinery and Plant in connection with the Waterworks at Diss, and also of making connections for House Services from the Mains to the Stopcocks.

The Plant consists of duplicate 6-h.p. Suction Gas Engines, Producers, Pumps, and Water Softener. There are about 5 miles of Water Mains.

Applications, in candidate's own handwriting, stating age, previous experience, and salary required (a house is provided by the Council), together with copies of two recent testimonials, to be sent to the undersigned not later than Saturday, 18th April.

The person appointed will be required to take up the duties as soon as possible.

ALFRED COOPER,
Waterworks Superintendent.

The Terrace, Diss.
March 31, 1914.

(1,492)

SURVEYOR'S ACCOUNTS CLERK.

Required, during extensive road reconstruction work, a competent and experienced Clerk, accustomed to keep accounts, prepare pay sheets, attend to correspondence.

Salary 2 guineas per week.

Details of past experience, age, and copies of three recent testimonials to Box 1,409, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, London, E.C. (1,495)

CLERKS OF WORKS.—Required, two Clerks of Works, thoroughly experienced in the reconstruction of country roads, the preparation and laying of tar-macadam, and the control and direction of labour, cartage, rolling, plant, &c.

Salary 3 guineas per week.

Full particulars of past experience (and age), with three recent testimonials (copies), to Box 1,408, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,494)

ENGINEER AND SURVEYOR to Urban District short distance from London has vacancy for Pupil. Large sewerage scheme in hand.—Apply Box 1,393, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,423)

TO LOCAL AUTHORITIES.

EXPERIENCED SURVEYOR,
USED TO MUNICIPAL WORK,

is prepared to make accurate surveys, plans, &c., for town planning or other public purposes.

References to many Municipal Engineers.

Address—

Box 1,403, office of THE SURVEYOR,
(1,452) 24 Bride-lane, Fleet-street, E.C.

TENDERS WANTED.

PONTEFRACT CORPORATION WATER- WORKS.

ROALL PUMPING STATION.

The Corporation of Pontefract invite Tenders from firms of experienced Well Sinkers for the execution of the works comprised in Deepening the Existing Pump Well at Roall from 124 ft. to 200 ft. below the Engine-house floor, and driving Headings from the sides of the Well, and other incidental works for in-

creasing the yield of water and maintaining the supply to the District.

Drawings and Specifications may be seen at the Pumping Station, or at the Office of the Engineers, Messrs. G. & F. W. Hodson, M.INST.C.E., Bank Chambers, Loughborough, and copy of Schedule of Quantities and Form of Tender may be obtained from them on deposit of cheque for £10 10s., which will be refunded to all persons making a *bonâ-fide* Tender, and on the return of the documents to the Engineers.

Tenders are to be made out on the Form supplied, and sent to the undersigned not later than the 27th April, 1914.

In the event of a Tender being withdrawn the deposit will be forfeited.

The Corporation do not bind themselves to accept the lowest or any Tender.

Dated this 25th March, 1914.

WILLIAM HADDOCK,

(1,480)

Town Clerk.

MERTON AND MORDEN URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

The above Council invite Tenders for Surfacing about 22,000 sq. yds. of the Carriageway in Kingston-road, Merton, with Bituminous Material.

Specification can be seen and further particulars obtained on application to Mr. G. Jerram, Engineer and Surveyor, Council Offices, Kingston-road, Merton, on and after the 3rd April.

Scaled Tenders, to be endorsed "Tender for Surfacing Work," must be delivered to the undersigned not later than 4 o'clock p.m. on the 17th April, 1914.

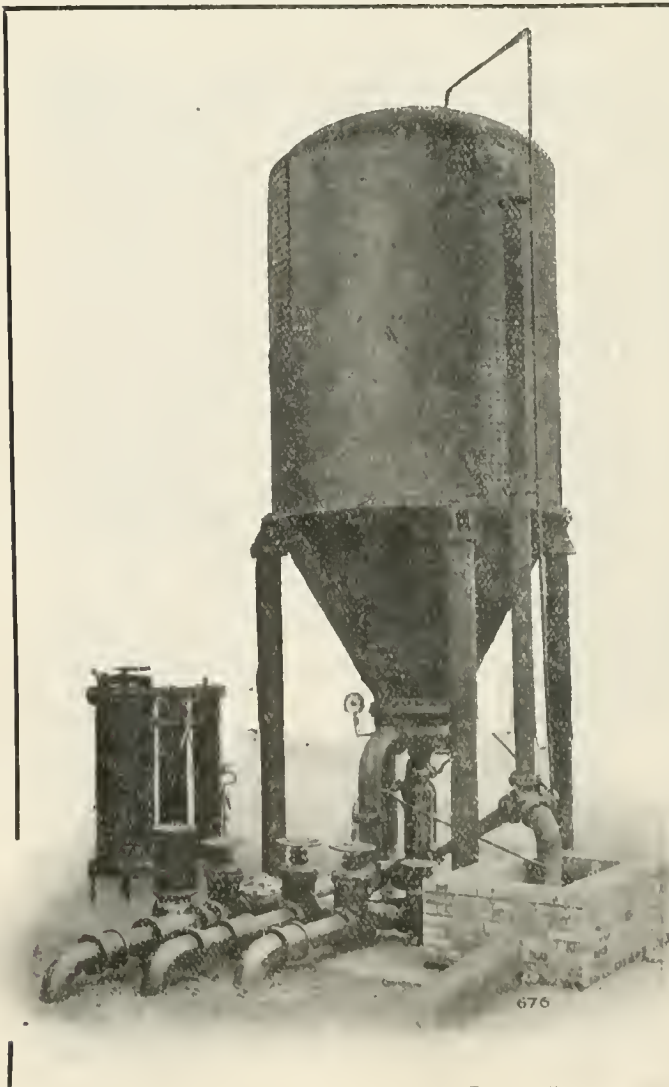
The Council do not bind themselves to accept the lowest or any Tender.

C. J. MOUNTFIELD,

Clerk to the Council.

District Council Offices,
Kingston-road, Merton, Surrey.
March 30, 1914.

(1,489)



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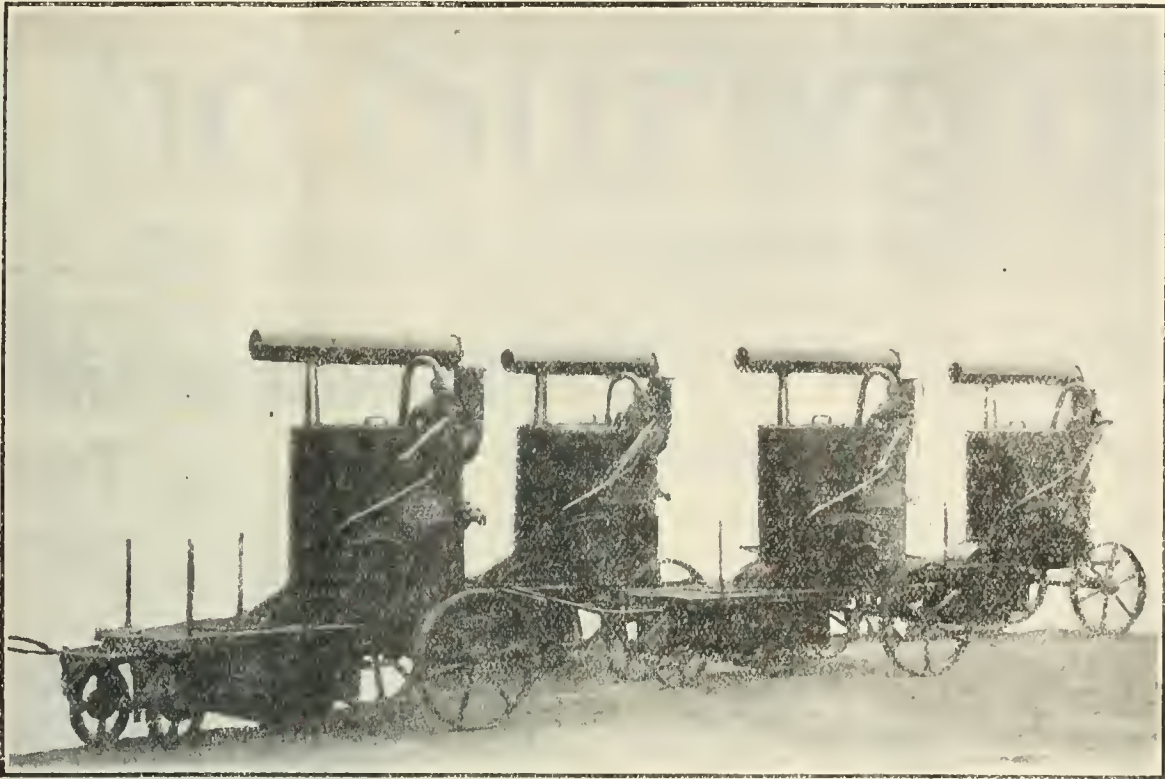
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COUNTY BOROUGH OF BURNLEY TO CONTRACTORS.

The Burnley Corporation invite Tenders for the Completion of the Construction of an Impounding Reservoir, with Catchwater, Aqueducts, Meter-houses, &c., at Hurstwood, near Burnley.

Plans may be seen, and Specification, Schedule of Prices, Form of Tender, and all other particulars obtained, on application to Messrs. James Diggle & Son, Engineers, Hind Hill-street, Heywood, Lancashire, on and after Monday, the 23rd February, 1914, on payment of a deposit of £5, which will be returned on receipt of a *bona-fide* Tender, accompanied by the Schedule of Prices, fully priced out, but not otherwise.

Scaled Tenders, endorsed "Tender for Completion of Reservoir," must reach me not later than Saturday, the 18th day of April, 1914.

Intending Tenderers are requested to notice that the time for sending in Tenders for the above works has been extended from April 10th to April 18th, 1914.

PEREGRINE THOMAS,
Town Clerk.

Town Hall, Burnley.
February 11, 1914. (1474)

COUNTY BOROUGH OF BURTON-UPON-TRENT. REFUSE DESTRUCTOR.

The Town Council invite Tenders for the extension of their Refuse Destructor at Bond End.

Particulars of capacity, site, &c., may be obtained from the undersigned, to whom Tenders must be delivered before 10 a.m. on Wednesday, the 29th April, 1914.

No Tender will be accepted from any party who pays his employees, whether artisans or labourers, less than the standard rate of wages paid in this Borough, or who does not conform to the hours and conditions of labour generally recognised in each branch of industry affected.

The Corporation do not bind themselves to accept the lowest or any Tender, and persons tendering must do so at their own expense.

GEORGE T. LYNAM,
Borough Engineer and Surveyor.

Town Hall.
March 31, 1914. (1491)

THE URBAN DISTRICT COUNCIL OF SUTTON (SURREY). TENDERS FOR MATERIALS.

The District Council invite Tenders for the Supply of the following Materials, &c., for the period ending 31st March, 1915—viz.:

- Form A Road Materials, &c.
- B Ironmongery, Oils, Paints, &c.
- C Coal and Coke.
- D Horse Forage.
- F Team Labour.

Forms of Tender may be obtained on application to the undersigned. Applications through the post

must be accompanied by a stamped addressed foolscap envelope.

Further particulars, if any, may be obtained from the Surveyor to the Council (Mr. Wm. Hedley Grieves), at the address below.

Scaled Tenders, endorsed "Tender for ——" must reach the undersigned not later than Wednesday, the 22nd April, 1914.

The Council do not bind themselves to accept the lowest or any Tender, and reserve the right of accepting any Tender, either for the whole or any of the items comprised therein.

H. BOLTON,
Clerk to the Council

Municipal Offices,
Sutton, Surrey.
March 31, 1914. (1493)

HAVE YOU CONSIDERED

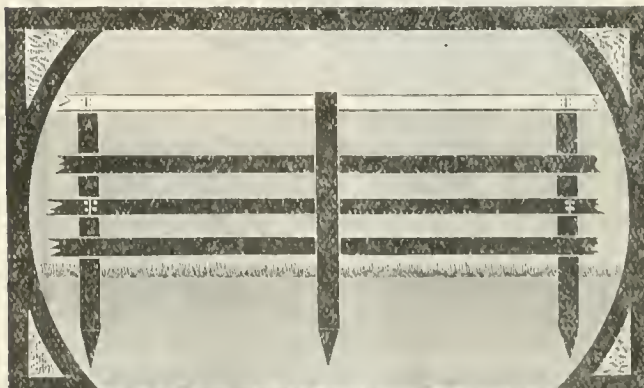
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The Surveyor

And Municipal and County Engineer.

Vol. XLV.

APRIL 10, 1914.

No. 1,160.

Minutes of Proceedings.

Skidding and Road Camber.

In its issue of March 26th, our contemporary the *Commercial Motor* returns to the subject of recent articles in its leading column and in our own "Minutes" pages, in which references were made to a particular accident and to certain aspects of vehicle design and of road crust construction. What first attracted our attention to the matter was a conclusion jumped at by the writer of a leading article in a daily paper—namely, that an accident having occurred as the result of the skidding of a motor omnibus, this accident was probably due to excessive camber of the street surface. We desired to defend municipal engineers, and, in this case, more especially the borough engineers of London, from the imputation that when a case of skidding occurs it is likely to be due to the defective design of the street pavement. The places where the camber of a street surface is too steep will, in most cases, be found to be dominated by the levels of footways, entrances to houses, and drainage outlets, and by the money value of the unused life of an existing and costly concrete foundation and pavement. It will be seen that the desired alteration to the road camber cannot be made except at a considerable expense and, sometimes, not without the concurrence of authorities or departments not advised by the borough surveyor. The cost of the change may not be in itself a sufficient reason for indefinitely postponing the carrying out of the work necessary to reduce the camber, but it may be a sufficient reason why all these works cannot be carried out immediately—especially in view of the fact that rapid developments in the design of vehicles render it impossible to say exactly what camber will be suitable. Mr. Shrapnell Smith, the able editor of the *Commercial Motor*, will realise the difficulty which he would have in making a general change in the design of the motor vehicles of an existing service, even if the design were unsatisfactory in certain respects. The desired improvement might be incorporated in new vehicles, or whenever a vehicle was undergoing a general overhauling; but, as a matter of practical economics he would not condemn the whole fleet of vehicles. As regards the data quoted in the *Commercial Motor* of February 19th, we cannot accept the figures as conclusive, but agree that they have a value as evidence, and may be held to be of some significance. It must be remarked, however, that if data of this

kind point to the need for adopting a camber which is, for other reasons, too flat, it may be necessary to seek another solution, or to introduce another factor, and to aim at obtaining a better coefficient of friction between the tyre and the road. We have not suggested that the solid rubber tyre should be condemned, but in view of the possibility that it is not the last word in tyre construction, we consider that surveyors would not be justified in allowing the coefficient of friction of rubber tyres on certain kinds of pavement to dominate the situation.

As regards the effect of the diameter of the wheel upon the tendency to skidding, there are certain considerations which cannot be set forth except by a careful presentment of the mathematics and dynamics of the subject. There are, however, four more simple reasons why there is less tendency to skid with wheels of larger diameter. The larger the diameter of the wheel the greater is the area of road surface covered, for the same width of tyre, or, at least, the length of this area is greater, and the probability that a patch of sufficient roughness to resist side-slip occurs in the portion of road covered is correspondingly increased. In the case of a wood pavement this would practically mean that the probability of covering an effective piece of imbedded flint is increased. This particular advantage is not very great for rubber tyres, but it counts. More important is the fact that a wheel of larger diameter holds the road better, and is less liable therefore to that momentary slackening of grip which often initiates skidding. Thirdly, there can be with the larger wheel a brake-drum of greater diameter. It can, while allowing for the necessary clearances, be larger in proportion to the diameter of the wheel, which is an advantage, reducing the tendency to locking of the wheels. But even if the radius of the drum be no greater in proportion to the diameter of the wheel, the combined lengths of the two levers, brake-drum diameter and wheel diameter, will be greater; and therefore for the same actual retarding effect the actual strain due to putting on the brake will be greater, measured circumferentially. This means that the force exerted in the production of the necessary degree of circumferential strain at the tread of the wheel will be smaller. Therefore, the loads being the same, a smaller coefficient of friction suffices, and the wheel has less tendency to skid when the brake is put on. The same reasoning

applies to those changes in the force at the tread which occurs as the braked wheel rolls on.

These changes of force are due to important changes in the amount of the load, as the vehicle sways, or as the wheel passes over humps and hollows, corresponding to changes in the degree of compression of the spring. The wheel and brake with the longer strain, measured as an angle or circumferentially, will absorb less extra coefficient of friction when the load becomes less, because the distance through which the force acts, while that condition attains, is a greater distance. Force multiplied by distance is equal to the work done. Putting it another way, we can say that the elastic reluctance of the wheel and brake drum, and therefore their efficiency as an intermediary between the force on the brake and the force on the road is a measure of one of the factors of efficient braking. The same considerations, it may be remarked in passing, apply to propulsion, and the wheel of larger diameter is therefore less severe upon the road. Lastly, the wheel of larger diameter and the same strength will be subject to an angular strain, sideways, of greater dimensions for the same force exerted centripetally at bends, or when the vehicle is being steered to one side, or when, having begun to side-slip, its wheel comes to a rougher or less slippery part of the surface. This reduces the chances of side-slip, because the amount of the coefficient of friction needed to prevent or check the side-slip is smaller than it would be with a wheel of less diameter. To show that the combined effect of a number of factors, such as the advantages stated above, can be very considerable, assume that the advantage in the first case is so small that it is expressed by the factor $\frac{10}{100}$, the second by $\frac{2}{3}$, the third by $\frac{1}{2}$, and the fourth by $\frac{1}{3}$; the resultant advantage is expressed by the quantity $\frac{1}{2}$, an advantage of over 70 per cent, numerically, but really much greater, because in these matters the difference between just enough and not quite enough is very great, and may be all-important. The above reasoning, we fully realise, cannot be followed except by those who are competent to make calculations in applied mechanics, and are, at the same time, trained and experienced engineers, but there is no other way of explaining our point.

* * *

**Road Maintenance
Costs:
Recommendations
of the
Departmental
Committee.**

The recommendations of the Departmental Committee on Imperial and Local Taxation, with respect to the distribution of the burden of road maintenance, have been made, one may assume, on the understanding that although they might suggest the expediency of changes in the administrative system, they could not include an outline of such changes, but must be confined to proposals which could be carried out without altering the present system. The recommendations themselves are of such a character that those who wish strongly for radical changes, such as those involved in the recommendations made by the British Committee reporting to the Third Road Congress on the subject of "Qualifications of Engineers and Surveyors," will find in them the suggestion that some such changes are desirable. On the other hand, the more conservative reformers who wish to reform financial arrangements without affecting, to any important extent, the administrative arrangements, will probably refuse to admit that the recommendations of the committee can be regarded as pointing to the need for interference with the duties of the present road authorities. If the committee had recommended grants, the total of which would reach some £3,500,000, say, instead of £2,400,000, this might have been held to point to State control; or, if they had recom-

mended grants of three-quarters of the cost of maintenance of the first class of roads, this might have suggested an extension of the Road Board's powers to include the direct management of that class. Again, had they recommended a smaller grant for main roads, and larger grants for county roads, and more especially if they had proposed that there should be four classes, a third of which, important district roads, would receive a small *direct* grant from the Exchequer, this also might have been considered to foreshadow, not direct control of main roads, but supervision, in some degree, of all highways. Looking at the matter from the other point of view, the proposed grant of one-half of the cost of maintenance of roads of the first class is too high to negative the suggestion that some measure of control by a central authority may be contemplated. The recommendations preserve the principle of the joint responsibility of county and district authorities for certain classes of roads. As regards county boroughs, the committee evidently recognise that a distinction must be made between those boroughs, usually the smaller ones, in which a main road may preserve its character right through the borough, and, on the other hand, those in which main roads are absorbed in a general network of important thoroughfares, or, as a matter of traffic, lose the character of a main route.

The actual effect of the new arrangements would depend very much upon the decisions of the classifying authority. We cannot congratulate the committee on their suggestions as to the principles to be taken into consideration in deciding which roads are to be main roads. The expression "the recognised main roads" is meaningless unless it is stated whether this recognition is that involved in the use of the word "main," as applying to a road under the control of the county, or whether it is to mean that the road is a main road in common sense. If the former, a large mileage of relatively unimportant roads would be included. The common-sense interpretation is also very difficult of application, everyone agreeing as to a large mileage, but opinions differing widely as to the further mileages which should be included. As, however, in the case of urban areas, the Road Board would, it is recommended, decide where main roads cease to have the characteristics of such roads, it seems to be taken for granted that the board will adopt some method of deciding when a road is a main road, the logical result of this procedure being that the mileage of main roads will have to be just what it turns out to be, unless the whole of the work were to be done over again on a different basis. The suggestion that a thoroughfare to a railway station is necessarily a main road seems very unpractical, and another suggestion, that the old turnpike roads may all be included, is one which, though it would be reasonable in most cases, might not be so in all. The present powers of the Road Board are no doubt sufficient for the purpose of carrying out a classification of roads, but it would perhaps be better that further powers should officially be given to the board in order that they might feel justified in carrying out the work on the scale that is desirable, having regard to its great importance. This classification could be used as an instrument for adjusting the burden of the cost of road maintenance, in the light of the effects of topography, soil, climate, local industries, the nature of the local and through traffic, and the distribution of population; and this not only for each county, but also for each district, while the capacity of the local population to bear the cost of maintaining roads in good condition might also be considered, as regards the mileage to which, in each case, the Exchequer and the county contributions

would apply. It may be pointed out that a district which is traversed by many main roads is in one respect much better off than a district in which there are few main roads. In the former case the local traffic uses the main roads to a considerable extent, while in the latter case the corresponding traffic wears out roads which are maintained by the local ratepayers. The same principle applies to assisted roads.

* * *

Liability for Contractor's Negligence.

When an independent contractor is employed to execute works, questions not infrequently arise as to whether the employer is liable for the negligence of the contractor or his servants. As a general rule, it would appear that the employer is not liable, unless he has the power of controlling the contractor's servants, and of regulating the manner in which they do their work. Thus, where a contractor agreed with a local authority to supply a horse and man to draw one of their water carts, the man being selected and paid by the contractor, and the authority having no control over him except to tell him what streets to water, it was held that they were not liable for an accident caused by the driver's negligence (*Jones v. Liverpool Corporation*, 49 J.P. 311). But to this rule there are certain exceptions—viz., (1) where the act which a contractor is employed to do is one which, if done by the employer, would, though lawful, be done at his peril; (2) where a contractor is employed to do works which the employer is under a statutory obligation to execute; (3) where the work is, on the face of it, unlawful; (4) where the contractor is employed to do work in a place where the public are in the habit of passing, which work will, unless precautions are taken, cause danger to the public. In cases falling within either of the above categories the employer is liable for injury sustained by third parties by the negligence of the contractor's workmen, whatever may be the terms of the agreement as between the contractor and the employer.

From a practical point of view, and more especially as affecting local authorities, the second and fourth exceptions are, perhaps, the most important. In illustration of the second, there is, among others, the leading case of *Hardaker v. Idle District Council* (60 J.P., 196), in which a contractor employed by the council to construct a sewer had to remove soil from beneath a gas main. In replacing the soil the workmen neglected to repack it securely under the main, which broke and let gas into the plaintiff's house, and the council had to pay for the damage done. As an instance of the fourth, reference may be made to the recent case of *Hurlstone v. London Electric Railway and Another* (29 T.L.R., 514), in which the facts were rather special. A building agreement was entered into between the railway company and a firm of contractors, under which the latter were to build a superstructure over a station, and were to take a ninety-nine years' lease of it when finished. The necessary scaffolding and hoardings were to be erected by the contractors in such a way as should be reasonably approved by the company, and a gantry (necessary for raising materials to the top of the existing building) was to be erected in the manner specified in the agreement. The plaintiff, while walking in the street, was injured by timber which fell from the building during the carrying out of the works. It was held that the railway company were liable on the ground that they had a duty to safeguard the public during the building operations, and could not delegate that duty to an independent contractor. It appears, however, that it is quite competent to the employer, in such cases as these, to take an indemnity from the contractor in respect of liabilities of this kind, and that such an indemnity is not against public policy. Such, at any rate, was the decision of Mr. Justice Darling in *Newcombe v. Yeven and Croydon Rural District Council* (THE SURVEYOR, Vol. xliii., pp. 370, 388).

The Utilisation of Solar Energy.

The practical utilisation of the vast resources of energy which reach the earth in the form of solar rays is a problem which has attracted the attention and fascinated the imagination of mankind from very early times. Simple applications of the sun's heat—as, for instance, for cooking purposes—have long been practised by means of some device for concentrating the rays, but the conversion of this heat into other forms of practically useful energy on a commercial scale has hitherto been regarded rather as an inventor's dream. The history of the past hundred years ought to be sufficient to convince the most sceptical that there is practically no limit to the frontier of scientific research, but it is difficult for most people to realise matters which are beyond their own experience. A most exhaustive paper on "The Utilisation of Solar Energy" was read at the last meeting of the Society of Engineers. The author, Mr. A. S. E. Ackermann, confessed that he himself felt very doubtful as to the possibility of much achievement in this direction until he witnessed experiments in which water was made to boil by the unconcentrated rays of the sun. Since that time Mr. Ackermann has spared no pains to make himself a thorough master of the whole subject, in which he has done a good deal of pioneer work. The Society of Engineers were thus peculiarly fortunate in hearing a paper from one so eminently well qualified to deal with the matter. Beginning with an historical introduction, Mr. Ackermann proceeded to describe the several types of the Shuman sun-heat absorber, tracing the improvements which have been effected since the installation of the first plant in 1907, and discussing the conclusions to be drawn from the several trials of the various absorbers. The subject is essentially one of the future, and, as we believe, of a very great future, and in setting forth for the first time the results of reliable and official trials of sun power plants, the author of this extremely able and interesting paper has earned the thanks of all engineers who are interested in this vast question.

* * *

Attacks on Public Officials.

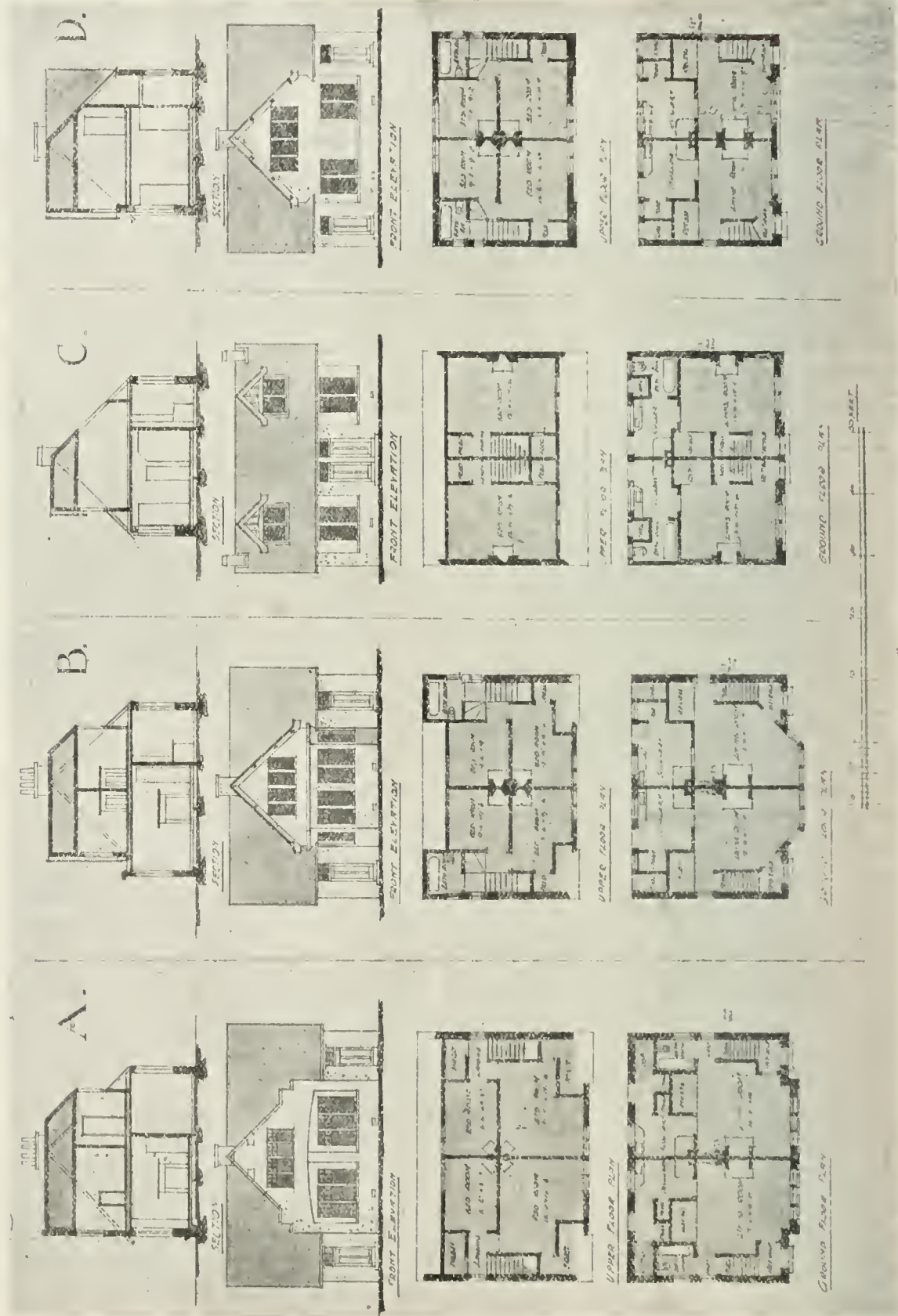
Public officials, who are so frequently the target of uninformed criticism, will be interested to know that in Bradford not criticism only is indulged in by newspaper correspondents, but libel of a particularly odious and wholesale type. Recently there appeared in the *Bradford Daily Telegraph* an anonymous letter in which the eleven road foremen of the city were pilloried most unmercifully. It was insinuated that their work involved no responsibility, though they are responsible for maintaining in repair over 120 miles of macadamised roads, not to mention other duties. Then it was suggested that they were incompetent and unfaithful to their employers, and by inference it was, of course, imputed that the city surveyor, Mr. W. H. S. Dawson, was lax in his superintendence of the foremen. On behalf of the latter a firm of solicitors has written a letter of protest to our contemporary, to which the editor appends the following footnote: "We regret that we have unwittingly been the means of reflecting upon the persons named in the above letter. At the same time we may also say that we disclaim any sympathy whatever with the views expressed in the letter to which exception is taken by Messrs. Sutcliffe & Trenholme on behalf of their clients, and accept their assurance that the allegations of our anonymous correspondent are unfounded." Some such withdrawal and correction was certainly called for, as it is obvious that a serious error of judgment had been committed in giving publicity to the letter. The incident serves to show how public servants are made inconsiderately the objects of promiscuous attack for no other reason, apparently, than because they are public servants.

Motherwell Housing Scheme.

THREE TYPES OF DWELLINGS ADOPTED.

As reported in our issue of last week, Mr. John Wilson, of the Local Government Board for Scotland, recently made his award in the competition for

type E, as illustrated in the accompanying plans. The cost, we now learn, will be rather over £14,000, including streets and sewers.



MOTHERWELL MUNICIPAL HOUSING SCHEME.
(Mr. A. Victor Wilson, B.Sc., L.R.I.B.A., Architect.)

a municipal housing scheme for the burgh of Motherwell. The successful architect is Mr. A. Victor Wilson, B.Sc., L.R.I.B.A., Motherwell. The council propose to erect thirty houses of type C, ten houses of type A, and eight houses of

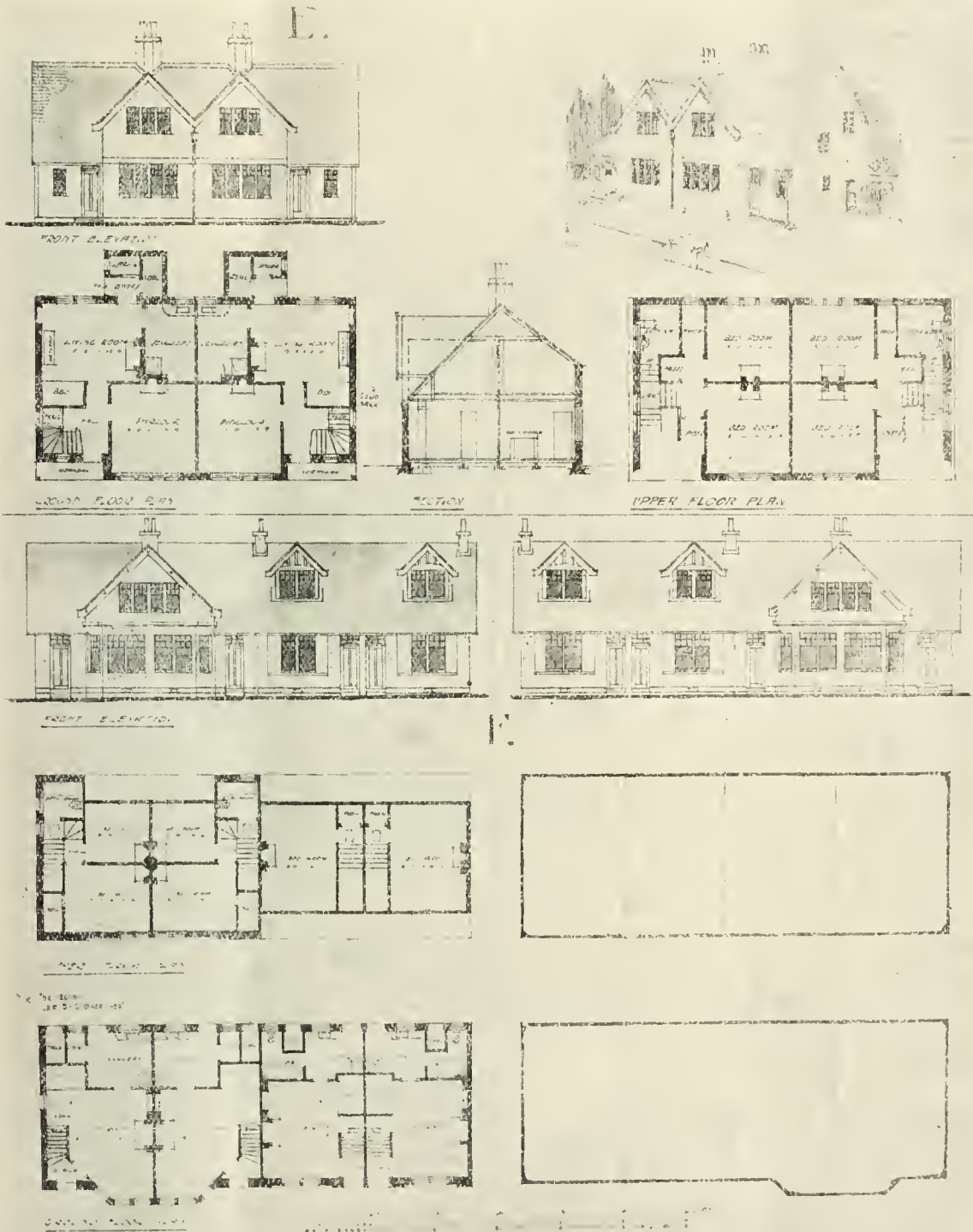
The area of land has been obtained from Lord Hamilton of Dalzell at £10 per acre, on condition that the council make all the streets and lay the sewers, and agree to reserve as a playground a triangular area facing the dwellings.

The houses are to be let at an economic rent—i.e., sufficient to clear all burdens—and so make the building not burdensome on the rates. There has been a great dearth of house-building in Motherwell, and the council have been compelled to take action in the matter.

The houses will be built of brick and roughcast with cement, and have slated roofs. The finishings

IS THE STREET TRAMWAY DOOMED ?

This is the somewhat startling heading given to an article which "A Well-known Municipal Engineer" contributes to last week's issue of the *Commercial Motor*. The increasing use of motor 'buses by the public is noted by the author, and after comparing the flexi-



MOTHERWELL MUNICIPAL HOUSING SCHEME.
(Mr. A. Victor Wilson, B.Sc., L.R.I.B.A., Architect.)

will be kept as plain as possible to give the best accommodation at the cheapest possible rent.

The Northwich Water Scheme.—Northwich Urban District Council have arrived at an agreement with the Middlewich Urban District Council by which Middlewich withdraw their opposition to the Northwich Parliamentary Water Bill on the Northwich Council undertaking, on the payment of pumping costs only, to make up any diminution in the Middlewich supply occasioned by the new undertaking, which is to cost £20,000.

bility of this means of conveyance with that provided by the tramcar, he asks whether the latter vehicle should be continued. "Is it right that any portion of a highway should be devoted to one class of traffic which is of such a rigid and inflexible nature that it cannot give way $\frac{1}{2}$ in. in order to accommodate the general traffic? The tramcar has no flexibility; it can only move in two directions—forwards and backwards—and consequently is, at times, the inevitable cause of serious obstruction. If a tramcar breaks down, or the line of tramway is obstructed in any way, the whole service of tramcars on that route is dislocated, with very serious results to the whole of the

traffic on that particular road. The speed also of a tramcar is governed by that of the traffic immediately in front of it; there is no possibility of escape either to right or left, and consequently everything has to get out of its way in order that it may proceed."

The writer of the article proceeds to point out that the enormous size of the modern tramcar makes it a serious source of danger to the ordinary traffic. "It is impossible for anyone driving behind a tramcar to see what is coming in an opposite direction, and the great length involves considerable time when trying to pass it when travelling in the same direction. A further danger arises from the fact that, owing to the position of the tram lines, the 'rule of the road' cannot be always followed in passing a tramcar, and consequently it has frequently to be passed on the wrong side. . . . It is even more dangerous when passengers are leaving a tramcar in order to reach the footpath. . . ."

"There is also the fact that, owing to the tram lines being constructed generally in the centres of carriageways, and that they are paved within their statutory limits, where the margins are unpaved tends to attract all the slow-moving vehicles to follow the lines of tramway instead of keeping to their proper near side, an obviously dangerous and most inconvenient practice, and quite contrary to the now generally agreed upon necessity that all slow-going traffic should keep as near the kerb on the near side as possible.

"There is another serious objection to the position of the tram lines in the centres of the carriageways where the margins between the statutory limits and the kerb are macadamised. It is universally agreed that the crossfall or camber of a carriageway can be greatly reduced where an impervious surface is adopted; but when tram lines were originally constructed, the margins were almost universally left macadamised, and now that this practice is being abandoned the camber cannot be altered except at the enormous cost of relaying the whole of the tram lines and paving, or by raising the kerb and footpath, which is often impracticable owing to the frontagers naturally objecting to being 'buried.'

"There is another point worth consideration, and that is with regard to the repair of the tramway lines. This obviously takes time, with the consequent dislocation of traffic, both of tramcars and the ordinary vehicles using the road or street."

The repair of the tramway lines is another point which the writer of the article suggests is deserving of consideration. "This obviously takes time," he remarks, "with the consequent dislocation of traffic both of the tramcars and the ordinary vehicles using the road or street." He admits that before the introduction of the internal combustion quick-running engine the tramcar was the democratic transporter of the "masses," but it was not, and never could be, a "door-to-door" or "kerb-to-kerb" conveyance like the motor omnibus.

"On the contrary, the passengers by tramcar have to walk to a stopping-place, and then have generally to cross half the carriageway, sometimes at the risk of their lives, to reach their vehicle. The same performance has to be repeated at the end of their journey, whereas with a motor omnibus all this is rendered unnecessary. Then again, for rapidity of transit the tramcar cannot compete with the motor omnibus for reasons already given, and also from the fact that high rates of speed with a tramcar may mean its leaving the rails with serious consequences. A breakdown of the tramway service means walking the rest of the journey, whereas if a motor 'bus breaks down the conductor will always transfer the passengers, free of cost, to another omnibus if of the same company. For 'cross' routes also it is evident that no tramcar can afford the facilities which are now given by any well-organised motor-omnibus service."

The article suggests, in conclusion, that the street tramway has become old fashioned and out of date, and must give way to the more popular, lively and mobile motor omnibus. "We have," the author observes, "put up with the improper use of our streets and roads for many years, but has not the time now arrived when this obstructive form of traffic should disappear, and our highways revert to the independent circulation of traffic for which they were originally intended?"

[It would be interesting to know whether the general body of municipal engineers are in agreement with the views expressed in the article above quoted, and we should be glad if readers would favour us with their opinions on the subject.—Ed. SURVEYOR.]

EXPERIMENTS ON THE OXIDATION OF SEWAGE WITHOUT THE AID OF FILTERS.*

By EDWARD ARDEN, M.Sc., and WILLIAM T. LOCKETT, M.Sc.

Under the above title is described an investigation which has been carried out at the Manchester Corporation sewage works at Davyhulme during the past twelve months.

The line of enquiry was suggested by Dr. Fowler, in the light of allied researches by the Massachusetts State Board of Health and others.

The essential point in the method now described is the production from sewage of a residuum, which has been termed "activated sludge." This is obtained as an accumulated deposit when successive quantities of sewage are completely oxidised by prolonged aeration.

This "activated sludge," once obtained in sufficient quantity, brings about the rapid purification of sewage when intimately mixed with it in the presence of a sufficient supply of air.

It is possible therefore by its means completely to purify sewage in a tank without the use of filters.

The experiments show that Manchester sewage can be purified by simple aeration in contact with this "activated sludge" in a period of from six to nine hours. By this means there is obtained an effluent showing at least as high a percentage purification as that resulting from the treatment of sewage by any system of bacterial filters.

The activated sludge differs very considerably in character from ordinary sewage sludge. It is in a well-oxidised state, and consequently entirely innocuous, and possesses an abnormally high nitrogen content as compared with the usual tank sludge.

During the course of the investigations, endeavours have been made to determine the conditions controlling the activity of the sludge and consequent purification of sewage.

The scope of the enquiry has been up to the present largely confined to experiments under laboratory conditions, and while the results have shown conclusively that the purification process can be readily maintained, a large amount of further research is required in order to obtain a thorough knowledge of its character and mechanism.

The method is, however, of so simple a nature that there would not appear to be any insuperable difficulties in translating the experiments described on to a working scale.

In view of the obviously great reduction in the area of works required and capital expenditure involved, the available data in regard to the probable cost of aeration are such as to lend encouragement to the idea that the adoption of aeration methods on the lines of these experiments would result in a considerable reduction in the total cost of sewage purification. In this connection it may be stated that the enhanced value of the resultant sludge should at least cover all costs incidental to its disposal.

The Langholm Water Scheme.—A report received from Messrs. Taylor & Wallin, Newcastle, the engineers of the scheme for augmenting the Langholm water supply, shows that the scheme has cost £7,177, which is £1,349 in excess of the estimate. The greater part of this was due to unforeseen circumstances.

Mold's Need of a Municipal Slaughterhouse.—The medical officer of health of Mold (Dr. Edward Williams) says in his yearly report that the slaughterhouses in that town are a serious nuisance and injury to health owing to their situation, want of supervision, and close proximity to dwellings. An abattoir should be seriously considered.

Kent and Road Board Grants.—The Kent County Council are making application to the Road Board for grants towards the improvement of a number of roads in the county, the improvement schemes embracing the following: Orpington, widening road and constructing new footpath, £325; Crayford, purchase of property, widening road, £870; Stone, constructing new footpath and widening portion of road, £925; Gravesend to Strood, extension of surface-water drains, constructing new footpaths, widening portion of road, £6,060; West Wickham, widening road, £3,225; and Bromley Rural, improving corner and widening Motttingham-lane, £638.

* Abstract of paper read before the Manchester Section of the Society of Chemical Industry on Friday last.

New York Sewage Problem.

METROPOLITAN COMMISSION AND EMSCHER TANKS.

Sedimentation is a standard form of sewage treatment which the Metropolitan Sewerage Commission of New York has recommended strongly in connection with some of its projects for the preparation of New York's sewage before discharge into the tidal waters, and its application as a general procedure for the sewage of Manhattan and Brooklyn, preparatory to discharging the effluent into the inner harbour, is a subject which has received much study. Such experiments as the commission has been able to make with New York's sewage, and such experience as has been gained elsewhere with sewage of similar composition, indicates that the optimum period of time to provide for the sedimentation of New York's sewage would be two hours, this allowance to be based on the average rate of dry-weather flow. Under these circumstances, settling basins should be able to remove about 60 per cent of the suspended solids, of which one-half would be organic matter and capable of putrefaction. By the addition of chemicals, the efficiency could be increased so as to remove 85 per cent of suspended matter and 50 per cent of organic matter. As compared with screens, such as experience indicates could be employed in New York without undue refinement and difficulty with operating details, sedimentation would be about four times as effective as screening.

The commission has given serious consideration to the use of Emscher tanks as a means of preparing the sewage of New York for local discharge and for discharge from centrally located points, such as Ward's Island and the ocean island. Desiring to obtain an authoritative opinion upon their use, and believing that the arguments which might be put forward in their favour by an advocate would contain the most favourable statements which could be made in comparison with other forms of sedimentation, the commission, in 1912, requested Dr. Imhoff to make a report upon his invention as applicable to New York.

As a basis for his report, a series of questions was placed before Dr. Imhoff. He was requested to express an opinion as to whether Emscher tank treatment was sufficient to bring about the standard of cleanness for the harbour which the commission proposed in its report of August, 1912; how and where Emscher tanks could be installed in the New York territory, and, if Emscher (or Imhoff) tanks were not sufficient to accomplish the desired results, what other process should be combined with them.

REPORT BY DR. IMHOFF.

Dr. Imhoff's report states that the suggestions made as to the practicability of constructing Emscher tanks in the built-up parts of New York, and the use of chemicals are based upon assumptions, and might have to be materially modified by local conditions. He says the question whether it would be feasible to build such works on the shores of the inner harbour depends upon the possibility of acquiring proper sites and upon the cost of land. He disclaims sufficient familiarity with conditions in the metropolitan district to warrant him in giving technical details. He has therefore only given capacity figures, intending that they should be used as a basis for calculation by the commission.

Dr. Imhoff considers the most difficult provisions of the commission's standard of cleanness to comply with are those which relate to deposits and to oxygen. He thinks it unavoidable that deposits somewhat resembling sewage sludge should occur through the death and decomposition of plankton, which he says cannot thrive in the mixture of ocean and upland water which exists. Owing to the fact that sea water has a precipitating action upon all suspended matter, and because of the unfavourable conditions for the plankton, the harbour is not regarded by Dr. Imhoff as affording favourable conditions for the assimilation of sewage. He agrees with Dr. Adeney that it is the sewage sludge which produces the intense nuisance which exists in places, and not the liquid part of the sewage. The average figures for dissolved oxygen are not, in Dr. Imhoff's opinion, capable of indicating the presence of offensive conditions due to the fermenting sludge.

As to efficiency, Dr. Imhoff does not consider that Emscher tanks are capable of satisfying the commis-

sion's standard either with respect to dissolved oxygen or to the deposit of sewage matters in the vicinity of sewer outfalls, but all the other requirements of the standard can easily be complied with. It is impossible for him to say how much sludge can be held back by tank treatment; he is inclined to consider the probable amount about one-half. He thinks that which would be retained would be more objectionable than that which escaped into the harbour.

If Emscher tanks were not sufficient, their efficiency might be augmented by the addition of chemicals. The effect would be to remove practically all the suspended matter and much of the colloid matter. More sludge would be produced, and this, Dr. Imhoff says, would require that the sludge chamber in the tanks be increased about 70 per cent above the size required for plain sedimentation. The report states that Emscher tanks are capable of reducing the volume of sludge, even when chemicals are used.

Dr. Imhoff is of the opinion that if chemicals were used, that part of the commission's standard which refers to deposits could be practically satisfied, but it is doubtful whether the reference to oxygen could be complied with.

In the outlying districts of the city, Emscher tanks could, in Dr. Imhoff's opinion, be advantageously combined with percolating filters. In the city limits, filters of this type would not be admissible because of the large areas required and the nuisance from odours and flies which would be practically certain to arise from them. Chemical treatment combined with Emscher tanks is recommended by Dr. Imhoff as an alternative to sedimentation combined with percolating filters for such situations as are suitable for them. The plants which he proposes would consist of Emscher tanks with the application of precipitating chemicals, aeration and rapid filtration. This process, Dr. Imhoff states, would be cheaper and require less area than percolating filters. In winter, when the best treatment procurable was not needed, it would not be necessary to employ the chemicals, thereby saving a considerable amount of money over percolating filters, which would represent a considerable investment.

In Dr. Imhoff's opinion, Emscher tanks can be installed in the built-up parts of the city. For local use, he says they should be placed at the mouths of the sewer outfalls, suitably grouped by means of intercepting sewers so as to produce a minimum total cost for Emscher tank treatment. The tanks could be built, in his opinion, beneath the streets, or in other open spaces, and covered like the subways so as not to interfere with traffic overhead. Sludge pipes would carry the sewage by pumping to steamers at the water front, which, after receiving the sludge, would carry it to the ocean for final disposal. Tanks built beneath the streets would not give rise to nuisance, the report says, because little odour would be produced, and the gases could be taken care of by ventilation.

Assuming 700,000,000 gallons per day as the quantity of sewage to be dealt with, and that one-eighteenth of the daily flow would run off in one hour, the cubic space which should be provided for settling basins on the Imhoff tank principle would be about 10,000,000 cub. ft. if it was intended to provide for one hour's period for sedimentation without chemicals. The amount of sludge produced would be about 1,330 cub. yds. per day. If chemicals were to be added to facilitate deposition, the sludge digesting chambers would have to be larger than for plain sedimentation. Instead of allowing 4,200,000 cub. ft. as Dr. Imhoff advises that 7,000,000 cub. ft. be provided.

THE COMMISSION'S COMMENTS

It will be observed, state the commission in a recently issued report, that the sedimentation period provided for by Dr. Imhoff in his estimates is one hour instead of two, which most authorities regard as the optimum. The commission considers that 50 per cent is a rather large removal of suspended matter to expect for settling basins operating with a one-hour period. "In this connection, it must be remembered that the supply of sewage is not uniform, and that there are times when the flow is so much greater than

the average that the settling period in basins intended to provide for one hour would be much reduced. Exceptionally large amounts of suspended matter would be likely to be brought down by the sewage when the flow was greatest, in consequence of which it is possible that considerably more deposit-forming material would be carried through the settling basins into the harbour than might be expected."

The commission is in favour of chemical precipitation for certain situations where the purification effected by plain sedimentation may in time not prove sufficient, and where sufficient protection to the harbour can be effected by settling the sewage more thoroughly.

The assumption that the sewage deposits in the harbour do not make a material effect upon the dissolved oxygen is not in accordance with the commission's opinion, nor with that of most other investigators of the New York problem. "It is true," they say, "that the amount of dissolved oxygen present in any large section of the harbour does not afford an infallible indication of the local nuisance which may occur from fermenting sludge; but the evolution of gas carries particles of the putrefying sludge into the overlying water, and these particles possess a strong avidity for oxygen which makes itself felt not only where the bubbling occurs, but elsewhere by diffusion."

The water of New York Harbour is not unfavourable to plankton, so far as the commission's knowledge of the facts extends.

After giving careful consideration to Dr. Imhoff's report, and making various studies for such works in various locations, the commission is compelled to state that, in its opinion, the suggestion that Emscher settling basins could be located in the built-up parts of the city would not be satisfactory. They would not be satisfactory because of their cost, probability of nuisance, and the practical certainty of public opposition. The relatively small efficiency which could be accomplished by them would not be commensurate with the cost of construction and maintenance. These statements, the commission point out, apply to Emscher tanks and all other settling basins operating on the principle of plain sedimentation, and they have equal reference to tanks operated on the principle of chemical precipitation.

It appears that tentative plans for the construction of Emscher tanks beneath the city streets had been prepared by the commission before Dr. Imhoff's report was made, and his report states that he examined these plans and regarded them favourably. The plans provided for a plant of eight Emscher tanks having a capacity of 12,000,000 gallons per twenty-four hours, with a settling period of one hour. It was proposed that they should be located beneath a marginal street bordering the Hudson River or Lower East River. The principle was sedimentation without the use of chemicals. The tanks were circular in plan, 35 ft. outside diameter, and arranged closely together in a single row, which took up a large part of the space available between the sidewalk kerbing on the one side and the bulkhead of the marginal street on the other. A pumping plant operated by direct-connected electric motors carried the sewage away from the works for discharge by means of submerged outlets or otherwise. The settling basins were protected by means of a coarse screen, simple grit chamber and automatic gate to prevent flooding. Blowers and air ducts were to be used in order to carry away the gases and water-saturated air from above the tanks; inlets were arranged for the supply of fresh air. The tanks were to be 35 ft. deep from the surface of the sewage to the extreme bottom. There was to be a space of 12 ft. between the sewage and the top of the street paving overhead, the total depth of construction beneath the street pavement thus amounting to 47 ft. The total length of the plant was 343 ft.

The sewage would be supplied through interceptors, which would run along the water front to collect the sewage from the common sewers, which otherwise would discharge into the harbour. Provision would be made for sending storm water in excess of the capacity of the plant direct to the harbour and tide gates would be provided to keep the harbour waters from backing up past this overflow. The sewage would enter at one end of the plant, pass through the coarse screen and grit chamber, and thence to the tanks by means of a channel running along one side of the row of eight tanks. After passing through the settling tanks, the effluent would be collected in a channel lying alongside of the tanks parallel to the channel supplying the raw sewage, and would flow

to the pumps. The sludge would be retained until it was thoroughly decomposed by fermentative action. It would then be removed by the hydrostatic pressure of the overlying sewage to a sump well, whence it would be forced to a tank ship lying at a neighbouring pier. The screenings would be removed in the same vessel.

In their comments on these proposals the commission say: "It is possible that in some cases an Emscher tank plant could be constructed without pumps, thereby effecting a considerable saving both in first cost and in maintenance charges. Where, however, the effect of the tide would be felt in sewers at the site of the plant, it would be necessary either to exclude the harbour water by tide gates and pump the sewage, or so construct the works as to act without reference to the tidal levels. Since a large part of the water front of Manhattan is at so low an elevation that the sewers lying but a few feet beneath the surface are tide-locked for 500 ft. or more inland, there is poor opportunity for building Emscher tanks without excluding the tide water. Provision of head room, amounting preferably to about 12 ft. above the sewage, would be impossible in most cases if the tanks were to be located upon the marginal streets. It is not clear whether Emscher tanks, unprotected from tidal influence, would operate satisfactorily even if the structural difficulties, due to want of head room, height of ground water and crowded space, could be overcome. The average period of sedimentation would be short and irregular, due to the alternate backing up and outflow of the sewage under the action of the tidal head.

"The tanks might be built at a sufficient distance back from the water front to be free from interference by the tides, but this would require the reconstruction of the common sewerage system throughout that part of the city which lay between the tanks and the water front. Another difficulty to be overcome, and a more serious one, would be found in the fact that the streets beneath the surface are already occupied with water and steam pipes and conduits for electric light, telegraph, telephone and power purposes. The Emscher tanks would have to be arranged in single file, and, for a plant of moderate size, the length of street appropriated would be more than one block long. A plant to deal with 20,000,000 gallons would be about 570 ft. long if the period for sedimentation was to be one hour, and about 1,100 ft. long, or more than one-fifth of a mile, if the sedimentation period provided was two hours. To deal with all the sewage which will be produced by Manhattan Island in 1940 an aggregate of about 3½ miles of tanks would be required if the sedimentation period was one hour, and about 7 miles if this period was two hours."

Serious question might be raised, in the commission's opinion, as to the probability of trouble from the gas given off in the fermentation of sludge in Emscher tanks when placed in crowded positions beneath the city's streets. The odours might not be offensive, although this was not certain, but large volumes of inflammable gas would be produced, and that, when mixed with air in the confined space beneath the street pavements, might lead to explosions. Private property might be acquired, either by purchase or by condemnation, to serve as sites for Emscher tank installations, and, if this were done, some of the difficulties, especially those which related to crowding, want of ventilation and inconveniently long collections of tanks, could, in large measure, be overcome. Settling basins so located would not, however, reduce the chance of nuisance nor the public protest which might reasonably be expected against them; nor would they add to the ability of the works to purify the sewage, and the cost of the land would add to the expense.

There was no precedent, so far as the commission was aware, for such extensive underground sewage treatment works. No city seemed to have placed settling tanks of large capacity, operating with or without sludge fermenting chambers, beneath the street pavements. No plant of Emscher settling tanks had thus far been constructed to operate with such tidal interference as would be met with (unless avoided by tide gates and pumping) in the most congested sections of the city. As to the removal of the sludge, Emscher tanks, in the commission's views, undoubtedly afforded one of the best means of overcoming the difficulties of cost of sludge disposal in inland cities; but New York was particularly favoured in being close to the sea, and so able to ship its sludge to the open ocean at less cost than any other method of disposal, and whether it would be feasible to trans-

port fermented sludge, charged as it was with gas, unless special provision for the escape of the gas was made on the ships, appeared doubtful. The comparative value of Emscher tanks and other deep tanks in which sludge was not digested lay in the opportunities which were afforded by Emscher tanks for the fermentation of the sludge and the consequent reduction in its volume. This advantage was gained at the cost of providing a large storage place for the sludge at the bottom of the compartment in which the suspended matter deposited and fermented. In New York the construction of the deep sludge chamber would be very costly. So far as the commission had been able to cover the point in its studies and estimates, it would appear that the peculiar advantages which the Emscher type of tank afforded over the Dortmund were not warranted by the greater cost of the Emscher tanks.

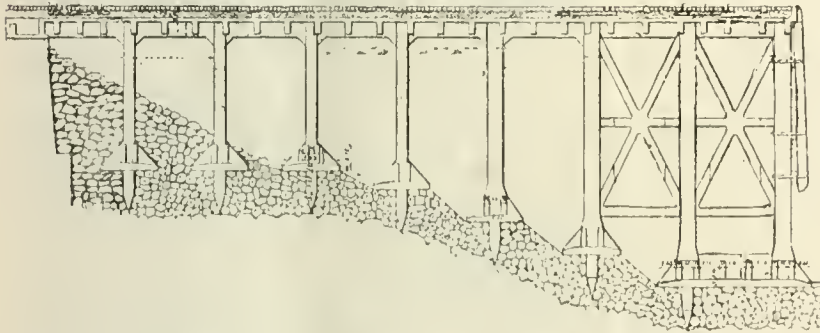
NOVEL TYPE OF FOUNDATIONS.

AN INCENIOUS APPLICATION OF FERRO-CONCRETE.

Every civil engineer worthy of the name must be able to recall numerous instances of invention begotten by sheer necessity. A case in point is furnished by the recent extension of the quays in the French port of Saint-Nazaire.

After the port authorities had made an unsuccessful attempt to construct foundations for the extension in the soft mud of the harbour, the problem was submitted to M. Hennebique, of Paris. Owing to the extremely low bearing power of the soil, the foundations were formed of ferro-concrete piles having an extended footing a short distance above the point so as to distribute the load.

As shown by the drawing, the footings rest upon platforms constructed of rock and rough concrete. The footings were first adjusted in position by divers,



FERRO-CONCRETE QUAY, SAINT-NAZAIRE FRANCE.

and the ferro-concrete piles were then driven through a square hole moulded at the centre of each footing. The piles take a secure bearing upon the footings, and effectually prevent any transverse movement of the latter. The piles were grouted into the footings after having been driven, thereby rendering the whole perfectly monolithic.

In order to render the structure additionally secure, the front rows of footings were connected by horizontal beams, and the front rows of piles by horizontal and diagonal bracing, as shown by the drawing. The works were completed several months ago, and have given every satisfaction to the port authorities.

The quay extension is 1,272 ft. long, and the entire structure was carefully tested after completion under the uniformly distributed superload of 4 metric tons per square metre.—*Ferro-Concrete* for April.

Roads Improvement Association.—The annual general meeting of the Roads Improvement Association will be held in the Council Chamber of the Institution of Civil Engineers, Great George-street, Westminster, S.W., on Thursday, April 23rd, at 4.30 p.m.

R.I.B.A. and Registration.—In pursuance of a resolution passed at a special general meeting on January 3th last, the council of the Royal Institute of British Architects have considered in detail proposals for obtaining a new charter and by-laws to enable the institute to constitute and maintain a register of qualified architects, and a draft has been submitted for the consideration of the general body. If the proposals receive the approval of members, the institute solicitors will be instructed to prepare the necessary petition for submission to the Privy Council.

THE UTILISATION OF SOLAR ENERGY.

By A. S. E. ACKERMANN, B.SC.(ENG.), ASSOC.M.INST.C.E.

A paper on the above subject was read before the Society of Engineers on Monday evening last by Mr. A. S. E. Ackermann, B.SC.(ENG.), who has been associated with the work (as joint consulting engineer with Mr. C. T. Walrond, to the Sun Power Company and the Shuman Engine Syndicate) for nearly four years. The paper is the first of its kind, and deals with the whole of the experiments which have been made during the four years, and which have cost about £30,000.

After naming the principal workers in this field, the author gives determinations of the solar constant and deals fully with the varying percentages of this quantity that are available throughout the day for power purposes. He then describes four types of Shuman sun-heat absorbers, and gives in great detail the results of his forty-eight trials of these absorbers, the latest pattern (that erected near Cairo, Egypt) of which gave a maximum thermal efficiency of no less than 40.7 per cent, and a maximum output of steam of 1,442 lb. per hour, at a pressure of 15.8 lb. per square inch abs. The results of these types of absorbers are compared by means of tables and curves, and from these the author has constructed a formula by means of which it is easy to calculate for a given type and size of absorber the total amount of steam per hour if three things are known—(1) the time of day, (2) the humidity, and (3) the steam pressure. It has been known that humidity adversely affects the quantity of solar radiation arriving at the Earth's solid surface, but this is the first time that its effect on solar steam production has been quantitatively determined.

The difference between the thermal efficiency of the solar boiler and the commercial value of the steam produced is ingeniously brought out, the author making it clear that in the case of such low-pressure boilers a high thermal efficiency is not necessarily the same thing as the most economical conditions of working, and he shows that, up to a certain limit, the higher the steam pressure the more economical the working, though the thermal efficiency is then lower. Two of the types of absorber did not move with the sun, and one did. The greater constancy of output of steam in the case of the latter is very marked.

In order to utilise the low-pressure steam economically,

Mr. Frank Shuman designed a special engine, which has also gone through several stages. This engine is fully described with drawings, and the author gives the results of his fourteen trials of the several engines, and compares their results with those of exhaust steam turbines and the low-pressure cylinders of compound and triple expansion engines, showing that the Shuman engine is the more economical. The steam consumption of one of these engines was only 22.1 lb. per b.h.p. hour, when the output was 94.5 b.h.p., and the steam pressure only 16.2 lb. per square inch abs. The thermal efficiency of the engine compared with an engine working on the Rankine cycle was 54.75 per cent. In the case of a Shuman high-pressure non-condensing engine with an output of 29 b.h.p., the steam consumption was 23.8 lb. per b.h.p. hour, and the relative thermal efficiency 71.7 per cent.

Finally, the author gives the results of his trials of the complete sun power irrigation plant at Cairo, and describes his design of a special form of weir tank for measuring greatly differing quantities of water. The bibliography of the subject, which is a very short one, is given as an appendix.

The Surveyors' Institution.—The Special Diploma Examination in Sanitary Science will be held on June 9th, 10th and 11th. The Special Diploma Examinations in Forestry and Surveying will not be held this year, the entries having been insufficient.—The sixth meeting of members, students and examinees under the age of thirty, authorised (subject to certain conditions) by the council to be held during the present session, will take place on Monday, April 27, 1914, when a paper on "Jerry-building" will be read by Mr. H. Thorne. The chair will be taken at 7 o'clock.

State Assistance Towards the Cost of Roads.

RECOMMENDATIONS OF DEPARTMENTAL COMMITTEE ON LOCAL TAXATION.

In last week's issue we set out briefly the important recommendations contained in the recently issued final report of the Departmental Committee on Local Taxation. As to highways, it will be recollected, they recommend that these should be classified by the Road Board into main roads, county roads, and district roads, and half the maintenance of main roads and a quarter of that of county roads be met by the Exchequer grants; that the balance of the cost of main roads and a quarter of that of county roads should be borne on county funds, the remaining half of the cost of the latter roads being charged to the highway district responsible for them, and that the necessary Parliamentary authority should be obtained as soon as possible to enable the Road Board to commence a provisional classification of highways.

The total grants for main roads is estimated at £1,800,000, and that for county roads at £600,000.

Sir George Gibb, chairman of the Road Board, suggested that the roads in administrative counties should be divided into four classes, and that Exchequer grants should be given towards the first two classes, a higher proportionate grant being given for the first class, which would comprise the most important roads of the country, than for the second. He was of opinion that the greater number of classes would facilitate classification, and make it possible to give assistance towards the maintenance of a greater mileage. His suggestion that there should be two classes of roads subsidised by the State was supported by representatives of local authorities, but they generally contemplated only a threefold classification. Some witnesses proposed that the entire responsibility for the maintenance of "trunk" roads should be assumed by the State.

The evidence given on behalf of London and the county boroughs was generally in favour of the simpler classification into main roads and other roads, grants being given in respect of the former class only.

"After careful consideration," the committee state, "we agree that such a classification would be sufficient in these areas, but in the case of the administrative counties the proposed threefold classification seems to us the most suitable. In arriving at this conclusion, we have been greatly influenced by three considerations. The first is that in rural districts during quite recent years large additions have been necessary in the highway rates in consequence of the growth of motor and other traffic not required by the locality, and this additional burden is more acutely felt in these districts in consequence of the comparatively low level of their ability to bear rate burdens. The second is that the cost of maintenance of rural roads is charged on the rate to the relief of which the grants under the Agricultural Rates Act and the Tithe Rentcharge (Rates) Act are applied, and on the withdrawal of those grants, which we recommend, it seems necessary to substitute some better form of Exchequer aid. The third is that the constitution of an intermediate class of roads, of which the county authority will bear part of the cost, will furnish means for equalising rates."

The committee recommend, therefore, that roads in administrative counties outside London should be classified by the Road Board into (a) main roads, (b) county roads, (c) district roads, and that Exchequer grants should be given in respect of the first two classes; and that in London and the county boroughs the classification should be into (a) main roads, (b) streets, grants being given only in respect of main roads.

MAIN ROADS.

The committee are of opinion that it is impracticable to lay down any rules for determining main roads which can equitably be applied to all areas, their view being that the variations as regards the nature of the traffic and the conditions of maintenance are too great.

"As regards the administrative counties—other than London—we recommend that, in determining whether a road shall be classed as a main road, the Road Board should have regard to one or more of the following considerations:—

"(a) That it was originally constructed as a turnpike road or is now a main road,

"(b) That it is a medium of communication between towns, or a thoroughfare to a railway station.

"(c) That a substantial portion of traffic upon it is not of a purely local character.

"Before any determination is arrived at with regard to a road, all local authorities concerned should be afforded an opportunity of making representations; also every local authority responsible for the maintenance of highways should be authorised to apply to the Road Board with regard to any road within its area.

"In many cases substantial improvements will be necessary before a road can properly be classed as a main road. The expenditure on such improvements would appear to be a suitable object for grants from the Road Improvement Fund.

"A grant of one-half of the cost of maintenance, and minor works of improvement of all main roads so determined, should be made to the local authority financially responsible, such cost to include payments to sinking fund and interest on all moneys borrowed for those purposes, and all items now paid for by county councils under sec. 11 (2) and (3) of the Local Government Act, 1888.

"As regards London and the county boroughs, and other boroughs where the Road Board so decide, the mileage of roads to be recognised as main roads for the purposes of the maintenance grant should, we think, be determined by ascertaining the length of the continuation of all the recognised main roads impinging on the boundary of the borough to some central point or points at which, in the opinion of the Road Board, they cease to have the characteristics of main roads. The councils of these towns should have the same privileges and powers as other authorities of being consulted by, or of making representations to, the Road Board with respect to their roads.

"A grant should be paid on the mileage of main roads so determined at the average cost per mile of main roads in the urban areas of the adjacent administrative county or counties. In the case of London, this will be the average cost for the four counties Essex, Middlesex, Surrey and Kent. In Lancashire, where main roads are a charge upon the 'hundred,' the average should be taken over the urban areas of the adjacent hundred or hundreds.

"In all cases the grant should be conditional on the efficient and economical maintenance of the roads, and where this condition is not fulfilled the Road Board should have power to reduce or withhold it. The amount of the grant should be based upon the expenditure of the local authority for the last financial year.

"The total amount of the grant for main roads will, of course, depend upon the standard adopted in the classification. Doubtless, many of the present district roads will in future be classed as main roads, and many main roads will be removed from that category; but on the whole we see no reason why the total mileage of main roads in administrative counties should be appreciably different from the present figure. This would involve a grant on the expenditure for 1911-12 of about £1,600,000, to which we may add £200,000 for roads in London and the county boroughs, giving a total of £1,800,000. If our suggestion that the standard of the class should be adjusted to give the desired mileage proves to be impracticable, an adjustment might be made in the percentage of expenditure met from grants in order to give a total grant, calculated on the basis of the figures for 1911-12, approximately equal to the above amount. The adjusted percentage should, of course, be the same over the country, and should remain constant.

COUNTY ROADS.

"The class of county roads should include all roads in administrative counties which, though less important than main roads, may yet be regarded as serving more than merely local purposes. As already indicated, our proposals with regard to grants for this class of road are closely bound up with our recommendation for the withdrawal of the grants under the Agricultural Rates Act and the Tithe Rentcharge (Rates) Act. We may, however, so far anticipate our conclusions as to state that they involve an Exchequer grant of one-quarter of the cost of maintenance of

such roads, our estimate for the total grant being £600,000.

INTERIM ARRANGEMENTS.

"A complete classification of roads on the lines suggested above, with the necessary collection of statistics, consideration of objections, &c., will probably take some time to carry out. Meanwhile grants might be based upon a provisional classification, or, alternatively, they might take the form of a percentage of the total expenditure on roads of all kinds within each area. The former course appears to us the more satisfactory, as the provisional classification would gradually merge in the complete classification without any large and sudden alteration in the amount of the grant to any authority. But even a provisional classification cannot be produced at once. Inasmuch as our recommendations, if adopted, will involve the abolition of the Assigned Revenues System, and the consequent withdrawal of all subventions at present available for the maintenance of main roads, it is most important that steps should be taken well in advance to secure that the new classification will be ready when the whole question of State subventions to local authorities comes under review. We accordingly recommend that the necessary Parliamentary authority should be obtained to enable the Road Board to commence the work of classification at once."

In a concluding paragraph on this question the committee mention that they have experienced exceptional difficulty in dealing with the various problems involved on account of the lack of information as to the present position in regard to this service, and the great uncertainty prevailing as to its future. Most of their recommendations under this head should therefore be regarded as of a somewhat tentative character, and subject to modification in the light of further experience.

LOWER THAMES VALLEY DISTRICT SURVEYORS' ASSOCIATION.

MEETING AT TWICKENHAM.

The above-named association held its last meeting of the present session at the Town Hall, Twickenham, on Saturday last, when there was a full attendance of members.

A considerable amount of business was transacted. Nominations were received for the election of president, vice-president, hon. secretary and treasurer, and hon. auditors for session 1914-1915. The question of the annual dinner was discussed, and it was decided that this year it should take the form of a dinner and social evening to which ladies should be invited, the date fixed being May 9th.

Mr. G. W. Manning, engineer and surveyor to the Staines Rural District Council, then read a most instructive paper entitled

NOTES ON RECENT ROAD MAINTENANCE EXPERIENCES.

Mr. Manning recommended that all roads should be classified into various heads, and stated that in his district such classification consisted of (1) main through roads, (2) important connecting links, (3) merely residential streets or lanes. Proceeding, Mr. Manning stated that since 1903 upwards of 30 miles of tar-constructed roads had been formed, the water-bound system gradually being converted into tarmac roads. The cost of water-bound roads in 1901 to 1904 was £205 per mile per annum for repairs and renewals, or about 4d. per super. yard. The cost of reconstruction and resurfacing amounted to practically 2s. 6d. per super. yard, with a maintenance of about 3½d. per yard super. per annum for a clean road as against 4d. for a dirty, dusty surface. Mr. Manning next outlined his experience with grouting methods, and showed that some very good results had been obtained, the cost per super. yard averaging about 2s. 9d. Tarrivated Leicestershire granite, graded from 1½-in. to ½-in., was tried, the cost of this working out at about 1s. 8½d. per super. yard. Mr. Manning next gave some comparative costs of different materials laid at Sidcup during June and July, 1911.

A full discussion ensued on Mr. Manning's paper, and a hearty vote of thanks was accorded to him for the trouble he had taken in bringing this subject before the association.

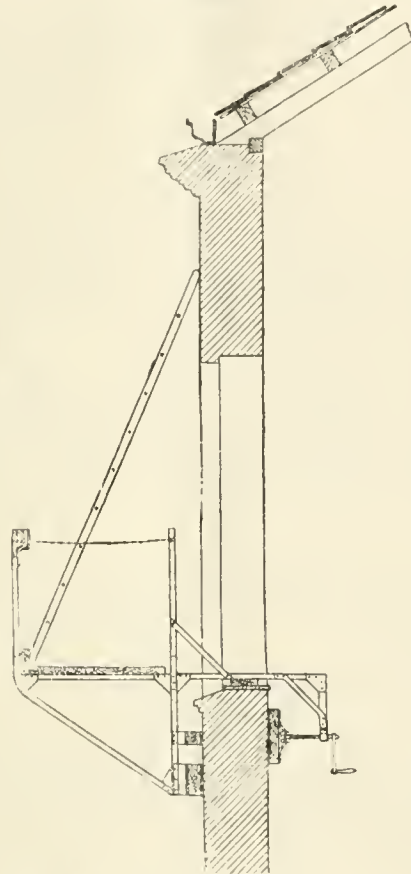
Other matters discussed were the allocation by the county council of Road Board grants for road construction and maintenance, and the propulsion of motor rollers by means of paraffin.

MARTEN'S ADJUSTABLE SCAFFOLD BRACKETS.

These brackets, which are made of steel throughout, are largely used in place of the ordinary scaffolding, built up from the pavement and swing cradles hung from the roof.

They are extremely light, yet very strong, and can be fitted by unskilled labour in two or three minutes. They can be used for any number of jobs, and when not in use can be stored easily, as each single bracket is only 4 in. wide.

They are fixed, at any window opening, from the inside of building, by means of square threaded



MARTEN'S ADJUSTABLE SCAFFOLD BRACKET.

steel screw and handle, the wood blocks which clamp against the wall being padded with thick felt.

Double brackets, about 2 ft. 6 in. wide, are made with fixed wood platform and handrail complete, and are suitable for working at a fixed position.

Single brackets may be fixed at each window of a building, and scaffold boards laid from one to the other, thus providing a continuous platform along the front of same.

Messrs. E. A. Reed & Co., Limited, 14 Victoria-street, S.W., are the sole manufacturers, and will be pleased to send full particulars and prices upon application.

Tarco.—The Corporation of Liverpool, for the sixth year in succession, have sealed an order for the supply of 80,000 gallons of Tarco, and the Staines Rural District Council have accepted a tender for the supply of Pitchmac for grouting purposes.

Electrical Plant at Norwich Sewage Works.—Specially prepared, electrically driven, air-compressing plant is now being erected in the city of Norwich, under the supervision of Mr. Arthur E. Collins, M.I.N.S.T.C.E., the city engineer, in connection with an extensive scheme for the purpose of raising the sewage from one level to another, and for conveying it to the irrigation sewage farms at Newmill. This air-compressing plant, costing about £1,000, has been made in Aberdeen, and operates ejectors of the latest automatic type. A special feature about the plant is that the electric motor is directly coupled to the air-compressor, and no gearing or belts are used for the transmission of the power. The motor develops 65-horse power, and the output of the compressor is about 800 cub. ft. of free air per minute, amply sufficient for its purpose. It is expected the plant will be in full operation in about one month.

The Design of Sewage Works.

CANADIAN PUBLIC HEALTH DEPARTMENT'S SUGGESTIONS.

The following suggestions with reference to the design of sewage treatment works are formulated upon principles of sewage treatment which are in accordance with present-day practice, and are being issued by the Bureau of Public Health of the Province of Saskatchewan to serve as a guide to those preparing schemes for municipalities in the province.

SCREENING.

(a) That where sewage is to be pumped, provision be made for screening, cleaning the screens at regular intervals, and for removing and disposing of screenings.

(b) That where works are of a character producing a large quantity of screenings, mechanical means must be provided for their removal.

GRIT CHAMBERS.

(a) The function of grit chambers (or detritus tanks) being to arrest the heavier mineral particles carried in suspension, the construction of such tanks is, generally speaking, unnecessary in this province, where the majority of sewerage systems are designed on the "separate" principle.

(b) That in special cases where sand or other mineral particles cannot be kept out of the sewerage system, it is advisable to introduce grit chambers.

(c) That these be constructed in multiple compartments to take care of the varying volume of flow.

(d) That a lineal velocity of 1 ft. per second be aimed at, calculated to retain the heavy mineral, but not the organic matters.

PUMPING.

(a) That where it is necessary to raise the sewage at the works, it is advisable that all machinery be in duplicate with alternative forms of power in case of failure.

(b) That appliances for raising sewage be specified with reference to efficiency in dealing with solids.

SEDIMENTATION.

(a) That there be at least two sedimentation tanks.

(b) That such tanks be so constructed that the precipitated solids are automatically and continuously removed from that portion of the tank in which precipitation takes place, and that a tank or chamber combined with, or separate from, the sedimentation tank, be provided, into which the precipitated solids may pass by gravitation immediately following settlement.

(c) That consequent upon the modern requirement of the continuous removal of sludge, as above stated, all base slopes of sedimentation tanks be made as near to the perpendicular as is practicable, relative to general construction.

(d) That the tank capacity be equal to one-fifth of the dry-weather flow in twenty-four hours, or equal to three hours' flow calculated upon the twenty-four hours' dry-weather flow taking place in fifteen hours.

(e) That the cross-sectional area of the tanks provide a velocity of flow of not more than .05 ft. per second, while lower velocities are preferable. Flows may be either vertical or horizontal.

(f) That consideration be given to the design of the inlets and outlets with a view to ensuring uniformity of flow throughout the breadth of the tank, and the absence of stagnant sections; and that all channels and parts of the tanks apart from the sludge storage area, be so constructed that no solids are retained.

SLUDGE STORAGE.

(a) That the overall depth of the sludge storage chamber from the surface of sewage in sedimentation tank be generally not less than 15 ft. Greater depths may be adopted, producing a more concentrated form of sludge.

(b) That in deep tanks, wherever possible, provision be made for breaking up the sludge at the inlet to the sludge removal pipe.

(c) That the capacity of the sludge storage chamber be equal to at least four months' precipitation of sludge, containing 85 per cent of water. Greater storage capacity is preferable as septic action is delayed in winter months. The cubic capacity of the sludge storage chamber shall be taken as only that space which is below the level of the deepest point of the sedimentation tank. In general, the average

accumulation of sludge may be taken as $3\frac{1}{2}$ cub. yds. per 1,000,000 gallons of sewage on the above basis of dilution.

(d) That ample provision be made for the escape of gases from the surface of the sludge storage chamber.

(e) That pipes for the conveyance of sludge be of an internal diameter of not less than 8 in., and that the inclination of such pipes, where the sludge is discharged by gravity, be at least 3 per cent, and preferably 5 per cent.

BIOLOGICAL FILTRATION.

(a) Where a dosing or syphon chamber is constructed to regulate the flow of the sewage over the surface of filter-beds, that the capacity of such chamber does not exceed a ratio of two gallons of sewage to each square yard of filter surface. For instance, if the area of the filtering surface be 200 sq. yds. the capacity of the dosing chamber should not exceed 400 gallons, representing a dose of $\frac{1}{2}$ in. depth of sewage over the whole surface of the filter.

(b) That the depth of the filter media be not less than 4 ft., and preferably 7 ft.

(c) That the filter media for effluents from the above form of tank be composed of hard broken stone or other suitable material, broken from 1-in. to 2-in. cubes.

(d) That the surface area of filtering media for domestic sewage be in proportion to the population using the sewers—i.e., in proportion to the amount of oxidisable matter present in the sewage.

Where a high degree of oxidation is required, the ratio of population to surface area of filter media should be approximately 17,500 persons to the acre (or 275 sq. yds. per 1,000 population).

This corresponds to a rate of filtration of 1,750,000 imperial gallons per acre per day, or 155 imperial gallons per cubic yard per day (assuming depth of filter media to be 7 ft.), at a per capita flow of 100 imperial gallons per day.

The efficiency of filters will not be materially affected by increasing the rate of filtration during periods of storm, to, say, three times the above stated rate, provided that the increase in volume is due to clear water.

In cases where the volume of dilution at the point of final discharge exceeds twenty times the volume of the sewage effluent higher rates of filtration may be adopted.

(e) That the method or apparatus adopted for the distribution of liquid over the filter-bed shall ensure a uniform distribution over the whole surface.

(f) That all filter-beds be drained at the base by tile pipes, or preferably by means of a false floor over the entire base of the filter.

(g) That sufficient provision be made for ventilation to allow of oxygen being present at all times and in all parts of the filter-bed.

HUMUS SETTLING TANKS.

(a) That it is generally advisable to provide settling tanks for the removal of the humus which is unloaded by the filter-beds from time to time.

(b) That such tanks be constructed in every case where disinfection of the final effluent is adopted.

(c) That humus tanks have a capacity equal to one forty-fifth of the dry-weather flow in twenty-four hours, or equal to twenty minutes' flow calculated upon the twenty-four hours' dry weather flow taking place in fifteen hours.

(d) That it is desirable that such tanks have separate storage compartments, as in the sedimentation tanks above described.

DISINFECTION.

(a) That where chloride of lime is used for the disinfection of the final effluent, provision be made for weighing, measuring and storing the disinfectant in a dry covered building.

(b) That the period of contact between the disinfectant and the sewage be not less than fifteen minutes. An open pond or lagoon will serve this purpose.

EFFLUENT PIPE.

That the effluent from the works be discharged into the watercourse or lake in such a manner as will ensure a maximum amount of dispersion.

HOUSING OF TANKS AND BEDS.

(a) That all parts of the works containing sewage under treatment be housed to conserve the latent heat of the sewage during low temperatures and to prevent fly nuisance in summer.

(b) That such covers be designed to enclose the minimum amount of space, at the same time giving room for accessibility and inspection.

(c) That with properly designed covers the introduction of artificial heat is unnecessary in sedimentation tanks, and may be obviated in filter-beds.

(d) That provision be made in all covers for the access of light and for efficient ventilation.

LABORATORY.

That wherever the size of a municipality or other circumstance warrants its construction, a small laboratory be provided and equipped in which simple tests may be made of the sewage and effluents.

LAYING OUT THE SURROUNDING GROUNDS.

That provision be made in the specifications and estimates for laying out, grading and improving the appearance of the surrounding grounds by terracing and seeding the slopes.

LONDON BEFORE THE FIRE.

AS REFERRED TO IN SIXTEENTH AND SEVENTEENTH CENTURY LITERATURE.

A paper on the above subject was read at the ordinary general meeting of the Surveyors' Institution last week by Mr. W. Wilberforce Jenkinson (Fellow).

The period of English literature chosen for reference was more exactly defined by the author in his opening sentence as "the latter half of the sixteenth and the first half of the seventeenth century; or, with a little elasticity, the years lying between the Dissolution of the Monasteries and the Great Fire; perhaps the most vigorous as it is the most intellectually expansive era in the range of our national literature." The limits of the period are, indeed, marked by two destructive events, of which the first at least was not accidental, but within those limits it was an era of great creative vigour and expansive energy, not only in our national literature, but in our national life.

Mr. Jenkinson's second sentence may also be quoted almost in its entirety: "Should it be objected that the subject treated in this way savours more of the literary or the antiquarian than of the technical, I would reply, first, that I assume that the study of English literature and history is neither at variance with the tastes nor opposed to the professional pursuits of the members of this institution; and, secondly, that the references I have been able to collect . . . include many facts and details directly in touch with the practical work of the surveyor." Not only is there no necessary antagonism between surveying and literature, but their connection has sometimes been very close indeed. To say nothing of Dante and Goethe among foreign literary surveyors, the "father of English poetry," Geoffrey Chaucer, was himself a surveyor, and at the close of the period now under discussion, as Mr. Jenkinson reminds us, the surveyor-general for the rebuilding of St. Paul's Cathedral was Sir John Denham, better known "as a poet and dramatic writer of no mean powers." Many of our readers will recall with pleasure the delightful and scholarly paper which the late secretary, Mr. Julian C. Rogers, read on "An Evening in the Surveyors' Institution Library," the leading points of which were reproduced in THE SURVEYOR of February 2, 1912, when we welcomed the contribution as a stimulating plea for the widest culture on the part of "surveyors" in all the branches which that comprehensive term covers. This high standard is worthily maintained by Mr. W. Wilberforce Jenkinson, and it would be difficult to find any one more competent to address a meeting of surveyors on "London Before the Fire." He is not only a Fellow of the Surveyors' Institution of long standing, and a London citizen still actively engaged in business in the City, but he knows London well, both past and present, and is remarkably well read in the literature of the period chosen and of his special subject. He is, moreover, an active member of the Elizabethan Literary Society, a society whose catholic interests embrace all that concerns the life, as well as the literature, of the period.

The practical value of such a paper to the modern surveyor is probably to be sought in the fact that while the period described had, of course, its own special problems, many of its problems are still present with us, and their treatment in the past may afford some encouragement or warning even to this more scientific age. Such very live questions as water supply and water rate, sanitation, overcrowding, leaseholds, ground rents, building regulations, contract prices and extras, as well as such comparatively minor questions as "ancient lights," found mention in Mr. Jenkinson's paper. The City had long been supplied with "sweet water conveyed by pipes of lead from Tiborne," or "from Paddington." Moreover, "there were wells and pumps. The pump at Aldgate still stands, and there are traces of the one (though out of use) attached to the holy well of St. Bridget (shortened to Bride), which gave a name to the palace of Bridewell adjacent. . . . The water of the Thames could hardly have been pure, considering that the river received such streams as the Fleet, which was used as a common sewer." This being the case, it is startling to find that "water was taken from the river," and in 1582 it was conveyed "into divers men's houses in Thamis Streete, new fish streete, &c., and up unto the north-west corner of Leadenhall . . . being since at the charges of the Cittie brought up into a standard . . . serving to the use of the inhabitants neere adjoining that will fetch it." It is not stated either in this quotation from Stow's "Annals," or by Mr. Jenkinson himself, that the Thames water was actually used for drinking purposes, and for other purposes we know that a public service of non-potable water still exists, especially on the Continent, where one sometimes comes across a warning legend to the effect that the water is not drinkable. A little over 300 years ago the New River was designed and carried out by Sir Hugh Middleton, and in view of its present value and utility it is sad to note that "it did not in the first instance meet with adequate appreciation, or afford much, if any, profit to the adventurer, as Middleton was termed."

The expansion of London was not assisted by the building regulations under Queen Elizabeth and her successors, who "endeavoured by legislation or royal enactment to arrest all increase of houses," not only in London itself, but "likewise in the suburbs." But, as Mrs. Partington could not keep back the Atlantic with her mop, nor King Canute the waves at Southampton by his command, so neither Tudor nor Stuart monarchs could stop the growth of London.

South Shields Tramways Extensions.—The South Shields Town Council recently decided to extend the tramway system within the borough boundary, at a cost of £8,000. The eighth year of the undertaking, just completed, shows a profit of £4,000 over the previous year.

The Concrete Institute.—With reference to the proposed alteration of the Memorandum of Association of the Concrete Institute, some members have taken up an attitude of opposition, preferring that the institute should be one solely concerned with concrete and reinforced concrete.

Swinton Waterworks.—The new waterworks at Swinton, provided at a cost of £30,000, were formally opened last week. The urban district is now in the position of being able to command two watersheds within its boundaries, and, although the population is less than 15,000, there are two good supplies.

The Derwent Valley Water.—The Nottingham Town Council on Monday confirmed the action of the Water Committee in discontinuing entirely the supply from the Derwent Valley reservoirs, and the city is thrown back on its old resources of pumping from wells in sandstone. Nottingham, Sheffield, Derby, and Leicester, Nottinghamshire and Derbyshire, are all concerned in the Derwent Valley scheme, which up to the present has cost nearly £7,000,000 sterling, and is little more than half completed. Nottingham's contribution, which, if the present situation is permanent, will be entirely wasted, is £25,000 per annum. The Water Committee stated that owing to widespread complaints they made exhaustive investigations, and found that the continued use of Derwent water would in a short time choke all wrought-iron pipes, cylinders, and boilers in the city. In the course of a few months the pipes were found to be corroded and choked with metal.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. M. INST. C. E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

385. Chimney Design.—Design a brick chimney shaft 130 ft. in height from ground level, the internal diameter at the base being 10 ft. (F. S., Plumstead.)

388. Reactions on Beams.—Show how to find (graphically or otherwise) the pressures on the two supports of a horizontal beam which is loaded at any given point. If the distance between the supports be 20 ft., and if one of the loads be 12 cwt., find the

changes in the pressures produced by shifting this load through a space of 5 ft. along the beam. (A.M.I.C.E.)

389. Design of Floors.—What loads should be allowed for in designing a floor (a) in a general warehouse, and (b) in a platform to which the public are to be admitted? What factor of safety would you adopt in each case?

390. Removal of House Refuse.—A new urban district has just been formed in the neighbourhood of London of which the following are particulars: Area, 3,500 acres; population, 9,000, increasing at rate of 700 per annum; number of houses, about 2,300; length of district, north to south 3 miles, east to west 1½ miles; mileage of roads, 17; character of district, flat in northern part, hills up to 1 in 16 in southern part; distribution of population, 2,000 at north end in 240 villas, shops, &c., 500 in north-east in large houses with long approach drives, 1,000 in south and south-west in small villas and workmen's cottages. The refuse for the present will be utilised at brickfields on the southern boundary of the district. It is desired to organise the removal of house refuse on the most up-to-date methods compatible with economy. Describe fully the methods of collection and transport, the organisation of the staff, the plant required, and give an estimate of the capital and annual charges for this work. Trade refuse is negligible, and no plant has been taken over from the rural authority who formerly had control of the area. (Togun.)

391. Concrete Floor.—A concrete floor is to be constructed as shown in the sketch, with 4-in. by 3-in.

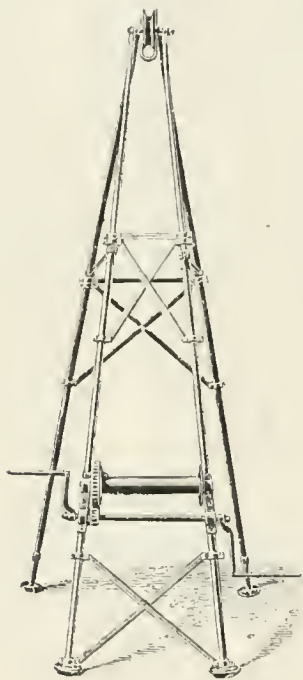
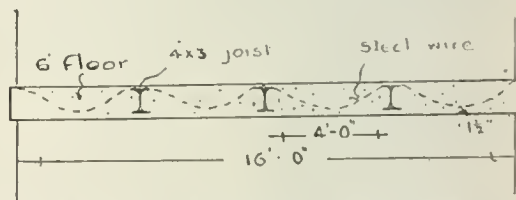


Fig. 1.—Boring Sheerlegs with Geared Windlass.



R.S. joists, and woven mesh steel wire with a 3-in. lap. The R.S. joists have a 4½-in. wall hold, and

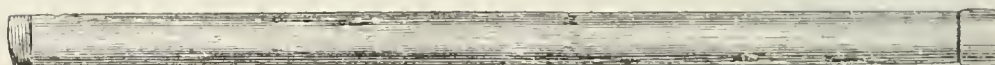


Fig. 2.—Borehole Lining Tube.

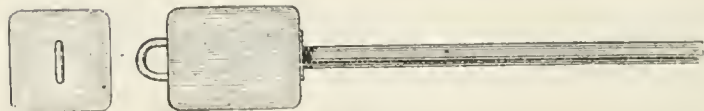


Fig. 3.—Driving Monkey.

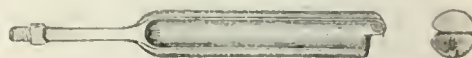


Fig. 4.—Auger.



Fig. 5.—Boring Rod.



Fig. 6.—Rod Tillers.



Fig. 7.—Flat Chisel.



Fig. 8.—Shell.



Fig. 10.—Lifting Dog



Fig. 9.—Circular Obisel.

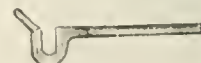


Fig. 11.—Hand Dog.

The Surveyor

And Municipal and County Engineer.

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the floor a 2-in. wall hold. The size of the room is 16 ft. by 13 ft. Calculate the safe distributed load per super. foot, also the breaking load. (Assistant.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

387. Boring.—Describe, with sketches, the appliances necessary in carrying out borings to a depth of 100 ft. for the purpose of ascertaining the character of the soil. (W. N. B., Cambridge, N.Z.)

The following is a brief description of the primary essential tools and appliances necessary for a trial borehole: First, a light set of geared sheerlegs (Fig. 1) is erected over the site selected, a small pit about 3 ft. square and 3 ft. deep is dug, and a lining tube (Fig. 2)—say 6 in. diameter—is inserted and driven tightly into the ground with a monkey (Fig. 3) weighing about 400 lb. The material inside this tube is then removed with an auger tool (Fig. 4), to which is screwed a boring rod (Fig. 5), which is rotated by means of rod tillers (Fig. 6) by two or more men. More rods are screwed on as the tool descends, and soil, bit by bit, is brought to the surface by pulling out the rods from time to time and removing the soil from the auger. Should the ground be somewhat hard, then a chisel (Fig. 7) is used first in place of the auger; this loosens or breaks up the ground, which can then be removed either with the auger or with a shell (Fig. 8), this latter being essentially a tube fitted with a clack-valve near the bottom end. Hard grounds may be more expeditiously cut through by means of a circular chisel (Fig. 9), which, in its simplest form, consists of a tube with a steel cutter screwed on to the end. As this progresses downward, the soil passes up inside in the form of a core, which is brought to the surface. To raise or lower the rods a lifting dog (Fig. 10) is attached to the top length of rod, the dog being hooked to a rope which passes over the pulley at the apex of the sheerlegs, and down to the windlass. The rods are unscrewed by means of a hand dog (Fig. 11). Should the sides of the hole show a tendency to cave in while boring, then further lining tubes of small diameter (usually of 10-ft. lengths) must be inserted. (J. P. Le Grand.)

Royal Sanitary Institute.—The annual congress and exhibition will be held at Blackpool from July 4th to 11th.

THE ROAD BOARD.

GRANTS TO HIGHWAY AUTHORITIES: FOURTEENTH LIST.

During the months of January, February, and March, 1914, the Road Board indicated additional advances to highway authorities amounting in the aggregate to £684,940, of which £445,005 was by way of grant and £236,935 by way of loan.

The total advances made and indicated up to March 31, 1914, amount to £5,213,812—£3,829,105 by way of grant and £1,384,707 by way of loan.

The formal advances by way of grant made, with the approval of the Treasury, during the last quarter, amounting to £500,499, were applied as follows:—

To road crust improvements	£461,520
To road widenings and improvement of curves and corners	20,173
To road diversions	12,620
To reconstruction and improvement of bridges	6,186

During the same period advances by way of loan, amounting to the sum of £101,160, have been arranged.

Included in the foregoing totals are advances (£56,321 by way of grant and £31,450 by way of loan) to a scheme submitted by the Oxfordshire County Council for improving 63 miles of main roads in the county, at an estimated cost of £95,465. The work will take three years to complete.

County or County Borough.	Amount of grant for			
	Improvement of road-crusts.	Road widenings, corners and diversions.	New roads and reconstruction of bridges.	Total.
ENGLAND.				
Bedford	£ 4,313	£ 498	—	£ 4,811
Bucks	16,643	120	—	16,763
Cheshire	19,250	7,699	3,500	30,449
Cornwall	10,970	807	—	11,777
Cumberland	—	289	—	289
Derby	—	75	—	75
Devon	—	710	—	710
Dorset	—	438	—	438
Durham	15,800	8,249	2,084	26,133
Huddersfield (C.B.)	13,000	—	—	13,000
Huntingdon	500	—	—	500
Isle of Ely	1,863	—	—	1,863
Kent	20,363	—	—	20,363
Leicester	100	—	—	100
Lines (Kesteven)	3,800	—	—	3,800
London (Area of the Metropolitan Police District)	23,720	500	—	24,220*
Monmouth	5,000	—	—	5,000
Newport (C.B.)	—	1,000	—	1,000
Nottingham (C.B.)	3,000	—	—	3,000
Northampton	16,250	—	—	16,250
Northumberland	6,950	1,663	602	9,215
Oxford	56,841	—	—	56,841
Salop	—	1,400	—	1,400
Southampton	300	—	—	300
Stockport (C.B.)	4,000	—	—	4,000
Sunderland (C.B.)	2,000	—	—	2,000
Surrey	1,495	—	—	1,495
Sussex (East)	27,338	—	—	27,338
Sussex (West)	16,000	—	—	16,000
Tynemouth (C.B.)	1,500	—	—	1,500
Warwick	46,675	—	—	46,675
Wolverhampton (C.B.)	162	—	—	162
Worcester (C.B.)	627	—	—	627
Worcester	33,874	—	—	33,874
Yorks (N. Riding)	19,766	1,412	—	21,178
Yorks (W. Riding)	9,058	205	—	9,263
WALES.				
Anglesey	23	21	—	44
Brecon	1,380	112	—	1,492
Cardiff	31,126	—	—	31,126
Cardarvon	1,200	625	—	1,825
Denbigh	1,840	100	—	1,940
Pembroke	625	2,033	—	2,658
SCOTLAND.				
Ayrshire	100	—	—	100
Banff	67	—	—	67
Caitness	—	130	—	130
Dumfries	3,987	—	—	3,987
Edinburgh (C.B.)	—	5,000	—	5,000
Fife	1,823	—	—	1,823
Forfar	220	—	—	220
Lanark	1,835	—	—	1,835
Linlithgow	715	—	—	715
Nairn	20	—	—	20
Perth	1,475	—	—	1,475
Ross and Cromarty	1,741	—	—	1,741
IRELAND.				
Antrim	7,360	—	—	7,360
Cork	21,601	—	—	21,601
Roscommon	352	—	—	352
Sligo	385	—	—	385
Westmeath	3,309	—	—	3,309

* This amount of £24,220 is made up as follows:—Barking Town £1,788, Chelsea £1,000, Croydon R.D.C. £82, Enfield £1,000, Greenwich £7,000, Hammersmith £1,000, Hackney £250, Poplar £3,000, Ruislip-Northwood £250, Shoreditch £1,500, St. Marylebone £4,000, St. Pancras £2,500, Twickenham £500, Wanstead £350.

TAR MACADAM ROADS.

EXPERIENCE WITH QUENAST STONE AND SLAG AT TUNBRIDGE WELLS.

Mr. W. H. Maxwell, Assoc. M. Inst. C. E., the borough engineer of Tunbridge Wells, whose paper, "Have Bituminous Methods of Construction Solved the Modern Road Problem," presented at the recent South-Eastern District meeting of the Institution of Municipal and County Engineers held in that town, was reproduced in our issue of last week, has favoured us with some additional particulars respecting the tar-macadam work referred to in his contribution.

It will be recollected that in his paper Mr. Maxwell mentioned that he had experienced good results from Quenast stone. The Quenast used cost 13s. 3d. per ton delivered into depot, and the cost of converting the material into tarred-macadam ready for use was 7s. 1d. per ton, or a total of 20s. 4d. The tar-macadam plant is capable of properly heating the stone and tar, and of mixing it in a rotary cylinder driven by motive power. The plant has an output of 30 tons per day. The work is carried on and the material stored under cover. This tarred macadam when laid an average of about 3 in. thick over an existing macadam road surface cost slightly under 2s. per square yard. The work has been completed nearly three years, and is giving every satisfaction.

Slag tar-macadam was laid by Mr. Maxwell in 1907 on a main road, which was at the same time sewered and widened from about 20 ft. to 60 ft. The traffic on this thoroughfare is considerable, there being an average of 5,373 vehicles per day, equivalent, on the Road Board basis of calculation, to 2,892 tons per day, which represents a total traffic-weight of about 310 tons per yard width of carriage-way per day. These statistics were taken in the month of September, 1913, during wet and unsettled weather, and do not include the night traffic between 10 p.m. and 6 a.m.

This road, for about two-thirds of its width, had to be constructed on made-up ground over an adjoining ditch and field, and a wide and deep trench with two sewers side by side, ran through the whole length of the road. Notwithstanding these unfavourable conditions, the slag tar-macadam, which was laid on a strong foundation of 12-in. to 18-in. hardcore, has stood the test extremely well, and after seven years of wear under a traffic as above described, the surface is still in a good, sound serviceable condition.

"QUARRITE" AT SUTTON.

In our report last week of the discussion of Mr. Maxwell's paper we omitted to record certain passages in the speech of Mr. W. H. Grieves, engineer and surveyor to the Sutton, Surrey, Urban Council, having reference to the use of "Quarrite" in that district. Mr. Grieves, it will be recalled, mentioned that he had yet to obtain any very satisfactory results from granite tar-macadam, and he then went on to say that the nearest approach to solving the difficulty in that connection was to be found in the three sections of "Quarrite" which had been put down two years ago on the main road from Sutton to Epsom, and which had stood very well. The material in question consists of Leicester granite mixed with special bitumen, and is laid in two coats of a total thickness of 3 in.

Road Board Policy.—In the House of Commons on Tuesday, Mr. Bridgeman asked the President of the Board of Trade whether it was the policy of the Road Board and Development Fund Board, in spending the accumulations of their funds at a time when employment was scarce, only to make grants to local authorities when those authorities were willing to raise money from the rates for the same purpose. Mr. Montagu, who replied, stated that since the establishment of the Development Commission and the Road Board employment had been generally good, and it was impossible at present to make any general statement as to the policy to be pursued in different circumstances. Mr. Bridgeman inquired whether the hon. gentleman could point out to the Road Board that the effect of carrying out such a policy would be to help rich districts and to leave poor districts alone. Mr. Montagu said he would convey the suggestion to the Road Board, but added that he had no control over that body.

SOME RECENT PUBLICATIONS.*

ARCHITECTURAL DRAFTING. By A. Benton Greenberg, B.A., and Charles B. Howe, M.E. Price 6s. 6d. nett. London: Chapman & Hall, Limited.

This volume forms one of the Wiley Technical Series for Vocational and Industrial Schools. The object of the authors has been not only to lay a practical foundation for those whose vocation demands a knowledge of the subject, but also to instil an appreciation of good architecture in the minds of readers of the work. The authors have departed from the plan of presenting a series of plates to be copied by the student, holding that mere copying leads to superficial knowledge and mechanical skill, instead of promoting originality. The book is divided into six sections, respectively dealing with drafting implements, theory and practice of drafting, materials of construction, building construction and design; while specifications and estimating are dealt with in appendices. The book is not a text-book of either building construction or drawing in the ordinary sense, but for the particular purpose for which it is written it will be found very useful. Its title indicates that the work is an American one.

SCREW PROPELLERS AND ESTIMATION OF POWER FOR PROPULSION OF SHIPS. By Captain Charles W. Dyson, United States Navy. Price 31s. 6d. nett (two volumes). London: Chapman & Hall, Limited.

This work, which consists of a volume of text and an atlas of charts, is based upon several papers which have from time to time been contributed by the author to the journal of the American Society of Naval Engineers. In an interesting introductory chapter the history of the development of screw propeller propulsion is shortly traced, while subsequent chapters deal with the conditions governing the design of propellers and their propulsive coefficients, including the geometry and drawing of the screw propeller. The subject, if technical, is undoubtedly of the highest importance, and a carefully arranged work like that under notice will prove of great value to those practically interested.

Proposed Dublin Housing Scheme.—If the recommendations of the recent Departmental Committee of the Local Government Board are adopted and carried out (writes a correspondent of the *Manchester Guardian*), 14,000 urban cottages will be provided in Dublin, the fast-rotting tenements and dilapidated small houses in which over 100,000 people exist in an environment of hopeless degradation will be gradually swept away. It is estimated that the 14,000 cottages would cost £250 each, and the committee suggest a State loan of £3,500,000 at 3½ per cent, with a 16 per cent free grant. Fixing the rentals at 3s. 7d. a week per cottage, it is assumed that a burden of about 6d. in the £ would be left to be borne by the rate-payers. The first tangible result of the inquiry is that the Irish Local Government Board has appointed one of its inspectors, Mr. J. F. MacCabe, who was a member of the committee, to carry out a survey of the city. This is the first official survey to be undertaken in the United Kingdom.

Preliminary Studies in Bridge Design.—This little book,† a reprint of articles which appeared in *THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER*, is intended as the first of a series of similar volumes which, taken together, will form a treatise on the design of ordinary highway bridges of moderate spans. This first volume goes further back in the evolution of the bridge than do most treatises, and considers the bridge in its essential elements, that is as the means of providing a crossing for man and beast across a watercourse. The bridge engineer is apt to forget this primary purpose and to consider his bridge merely as a framework or a carrier of stresses. Mr. Ryves, in a refreshingly original manner, has emphasised the necessity for studying natural and economic predispositions, one might say, of the bridge site, with a view toward producing, not the best type of bridge, but the best method of getting the river and the traffic across one another. . . . —*Engineering News*, New York.

* Any of the publications reviewed or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

† By Reginald Ryves, Assoc. M. Inst. C. E. London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Coventry T.C. (March 27th. Mr. F. H. Tulloch).—£6,110 for paving footpaths, and sums amounting to £565 for the widening of Narrow-lane, Beechwood-avenue and Stoke-row.—The town clerk, Mr. G. Sutton, stated that the council had had two previous paving schemes—in 1906 and 1910 the total amount of the cost being £23,690. The corporation now proposed to spend £10,785, but the balance between £6,110 and £10,785 it was intended to provide out of revenue—i.e., slabs made at the refuse destructor works would be used. This was a class of paving which local inhabitants liked. It was further stated that much of the new paving was for the Red-lane and Narrow-lane districts, which of late years had passed from the character of semi-rural neighbourhoods to well-inhabited ones. With respect to the proposed street widenings, there were land purchases to be made, and building developments were going on in each district. The price to be paid for land in Narrow-lane was closely scrutinised by the inspector, and the city engineer, Mr. J. E. Swindlehurst, expressed the view that a reasonable figure had been arrived at. In Beechwood-avenue and Stoke-row the price was 5s. a yard.

Hebburn U.D.C. (April 1st. Mr. R. H. Bicknell).—£215 for sewerage works, and £135 for the provision of public urinals.—Mr. H. Paterson, surveyor, gave evidence bearing upon the proposed works. In reply to the inspector, the clerk, Mr. T. Stewart, said that the schemes were governed by consideration of cost. The rates were appallingly high, and would probably go up 3d. this year.

Mitchelstown R.D.C. (March 24th. Mr. A. D. Price).—£1,598 and £2,890, respectively, for the purpose of sinking wells and erecting pumps in the Mitchelstown No. 1 and Kildorrery dispensary districts.—The engineer to the council, Mr. Patrick Coughlan, outlined the scheme. He said that he had had much success in finding water by the divining rod. With reference to the proposed pump at Farahy school house, there was an underground stream. He selected that site from his observation with the rod.

Westbourne R.D.C. (April 1st. Mr. A. W. Brightmore).—£7,810 for the purposes of a water supply.—The clerk, Mr. Loader Cooper, asked for sanction to borrow over the longest possible period. The water from the bore, he stated, was adequate for the requirements of the district, and absolutely pure.

Wharfedale R.D.C. (March 25th. Mr. M. K. North).—£2,741 for purposes of sewerage and sewage disposal in the Middleton township. The district council in 1908 received sanction to borrow £2,650 for the purpose of carrying out a sewerage scheme for Middleton, and the whole of the sum now required, with the exception of £170 bank interest, has also been absorbed in the undertaking. Mr. Edgar Newstead (clerk to the Wharfedale Council) explained that additional cost had been incurred through delay occasioned in respect to a land restriction, also through leakages, and the necessity of substituting iron for earthenware pipes, and by a claim by the contractor.

APPLICATIONS FOR LOANS.

- Barnoldswick U.D.C.**—£2,000 for paving works.
- Bexhill T.C.**—£6,420 for an isolation hospital.
- Darwen T.C.**—£5,000 for conversions to the water-carriage system.
- Devonport T.C.**—£4,900 for Swilley-road widening.
- Doncaster R.D.C.**—£4,000 for sewage works extension.
- Epsom U.D.C.**—£2,000 for water main extensions.
- Halifax T.C.**—£2,800 for electricity plant.
- Hoyland U.D.C.**—£1,300 for sewage works improvement.
- Leeds T.C.**—£200,000 for a new electricity station.
- Maidstone T.C.**—£550 for electricity offices extension.
- Mansfield T.C.**—£3,750 for street works.
- Midhurst R.D.C.**—£780 for the erection of four cottages.
- St. Asaph R.D.C.**—£1,855 for a housing scheme, and £2,000 for a water supply.
- St. Helens T.C.**—£42,191 for gasworks extensions.

Salford T.C.—£70,000 for gas mains, services, and meters.

Tilbury U.D.C.—£2,695 for surface-water and soil sewers, £63,500 for the erection of 231 dwellings, £840 for channelling, and £651 for the purchase of a depot.

Wrexham T.C.—£1,207 for surface water drainage and sewerage.

LOANS SANCTIONED.

Bradwell Joint Hospital Committee.—£7,448 for hospital extensions.

Brighton T.C.—£2,490 for the purchase of property for a street improvement (period forty years).

Felixstowe U.D.C.—£460 for the erection of public baths.

Hereford T.C.—£11,752 for the provision of workmen's dwellings.

Silsden U.D.C.—£485 for rotary washers for the gasworks.

FORTHCOMING INQUIRIES.

	APRIL.	£
11.— Newquay. For a housing scheme (Mr. H. A. Chapman)		1,000
11.— Orsett. For a housing scheme (Mr. H. S. Stewart)		5,592
11.— Walton-on-the-Naze. For the purposes of public walks and a depot (Mr. Edgar Dudley)		515
11.— Winchelsea. For a water supply (Major J. Stewart)		250
15.— Buckfastleigh. For a housing scheme (Mr. Courtenay Clifton)		3,151
15.— Herne Bay. For pavilion extension (Major J. Stewart)		2,620
15.— Tynemouth. For the purposes of street widening and pleasure grounds (Mr. R. H. Bicknell)		1,000
15.— Whitley. For road improvement (Mr. R. H. Bicknell)		2,300
16.— Burnley. For the purposes of a recreation ground, refuse tip, and street improvement (Mr. W. M. Cross)		10,581
16.— Blaydon. For road diversion (Mr. R. H. Bicknell)		1,620
16.— Colwyn Bay. For a housing scheme (Mr. H. S. Stewart)		18,700
16.— East Grinstead. For the provision of a destructor and public convenience (Major J. Stewart)		1,170
16.— Seaton. For a housing scheme (Mr. Courtenay Clifton)		2,600
16.— Spalding. For a housing scheme (Mr. C. H. Eyles)		2,750
17.— Axminster. For a housing scheme (Mr. Courtenay Clifton)		1,846
17.— Birmingham. For sewerage and park extension (Mr. R. H. Bicknell)		46,410
17.— Merton. For the provision of pleasure grounds (Mr. Edgar Dudley)		8,000
17.— Shoreham. For the purposes of the town hall and public baths (Mr. M. K. North)		450
17.— Wisbech. For a housing scheme (Mr. C. H. Eyles)		3,550
17.— Wisbech. For the erection of cottages (Mr. C. H. Eyles)		400
TOWN PLANNING.		
17.— Tynemouth. (Mr. George L. Pepler)		—
21.— Otley. (Mr. George L. Pepler)		—
28.— Newport. (Mr. George L. Pepler)		—

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Dudley £40,000, Margate £12,000, Oxford £21,500, Wrexham; housing and town planning—Chester, Llanelly, Southgate; roads and materials—Dundee, Hartlepool, Strood £6,060, Wigtownshire, Woolwich £20,681; sewerage and sewage disposal—Banbury £37,900, Dewsbury £17,000, Hull, Kidderminster £38,000; water, gas and electricity—Hove £20,000.—Particulars of other works projected will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Birmingham T.C.—Extensions to two council schools are recommended by the Education Committee, at a cost respectively of £6,000 and £5,185.

Dudley T.C.—The Public Works Committee recommend that a large municipal building scheme, involving an expenditure of £40,000, should be proceeded with at once. The scheme includes a town hall, municipal offices, police accommodation, an art gallery, and a museum, and has been rendered necessary owing to the refusal of the Home Office to pay the police grant until modern premises are provided.

Margate T.C.—It has been decided to build a new school at Garlinge, at an estimated cost of £12,000.

Middlesbrough T.C.—The Streets Committee are giving consideration to a report by the borough surveyor, Mr. S. E. Burgess, with respect to a proposed bridge over the railway from Grove Hill to North Ormesby. A 7-ft. bridge, he estimates, would cost £500, but if the council wanted a road bridge suitable for the requirements of modern traffic, one 60 ft. wide could be erected at Saltwell's-road for £55,000, or one 50 ft. wide for £50,000. If such a bridge were built from Longlands to Millfield-road the cost would be £35,000.

Nottingham T.C.—Alterations estimated to cost £1,000 are to be carried out at the Meadow baths.

Oxford T.C.—A scheme has been approved by the Education Committee for building a technical school, at an estimated cost of £21,500.

Padiham U.D.C.—The surveyor, Mr. John Gregson, has received instructions to prepare plans for a public mortuary in the town's yard.

Reading T.C.—It is proposed to erect at the cattle market a building for the disposal of condemned food, at an estimated cost of £985.

Swansea T.C.—The training college in Nelson-terrace is to be converted into an elementary school, at an estimated cost of £6,044.

Worthing T.C.—The borough surveyor, Mr. F. Roberts, has submitted to the General Purposes Committee schemes and plans for extending the Parade bandstand enclosure at an estimated cost of £5,800, and for the erection of an additional shelter on the Parade, opposite Steyne-gardens, at an estimated cost of £900. The borough surveyor has also submitted an alternative sketch plan of a shelter which could be erected at the south end of the Steyne-gardens. The committee have deferred further consideration of the matter.

Wrexham T.C.—The question of providing new municipal buildings is to be reported on by a committee.

HOUSING AND TOWN PLANNING.

Chester T.C.—The Local Government Board have sanctioned the proposed housing scheme, by which it is proposed to build 130 houses as a garden suburb.

Hemel Hempstead R.D.C.—The surveyor, Mr. T. H. Lightbody, is preparing a housing scheme for King's Langley.

Llanelly U.D.C.—The council are recommended by the Housing Committee to build sixty cottages at Capel Ueka, at an estimated cost of £15,805.

Sevenoaks U.D.C.—For the accommodation of the council's workmen, it has been agreed to build four-teen cottages, at an estimated cost of £4,550.

Southgate U.D.C.—The council have resolved upon a scheme for the provision of 160 dwellings, of which 115 will contain three bedrooms, and thirty-one two

bedrooms, while fourteen will consist of tenements.

Scarborough T.C.—The borough engineer, Mr. H. W. Smith, has prepared plans defining the areas of the proposed housing schemes in the east and central districts, and these have been duly forwarded to the Local Government Board.

Winchester T.C.—The Sanitary Committee have been authorised to prepare a scheme for the erection of fifty houses.

York T.C.—It is proposed to purchase a site near Tang Hall-lane for the purpose of a housing scheme.

PARKS AND OPEN SPACES.

Folkestone T.C.—The Parks Committee have adopted a scheme for the provision of a covered promenade and shelter on the Leas, at an estimated cost of £500.

REFUSE COLLECTION AND DISPOSAL.

Worthing T.C.—The Sanitary Committee recommend the adoption of a scheme for the removal of trade or garden refuse—as distinct from ordinary house refuse, at a charge of 2d. a bushel, or 2s. 6d. a cart load of 20 bushels. The regulations lay down that in no circumstances will the corporation in future remove garden refuse without payment, and householders must not therefore place it in the bin used for household refuse.

ROADS AND MATERIALS.

Bath T.C.—Acting upon a report prepared by the borough surveyor, Mr. C. R. Fortune, it has been decided to proceed at once with further repairs of the Grand Parade, at an estimated cost of £1,500. The cost of the work in hand at present is £900.

Blean R.D.C.—The surveyor, Mr. F. A. Ward, reports the completion of the Herne Bay and Whitstable road, at a cost within his estimate (£235). A grant in aid of the scheme was sanctioned by the Road Board.

Cheadle R.D.C.—It has been agreed to make a contribution of £150 towards the Black Horse corner improvement, and it is hoped that the county council will make up the balance—£600.

Devonport T.C.—The council have approved the plans and estimates of the borough surveyor, Mr. J. F. Burns, for the widening of Swilley-road as follows: Purchase of Rose Cottage and land, £1,021; constructing sewer and widening and completing road, £3,888; total, £4,909.

Derby T.C.—The Road Board have signified their willingness to grant £5,300 towards the cost of tarmacadamising and tar-spraying of roads in the borough, £500 each towards the widening of London-road and Uttoxeter-road, and £700 towards the widening of Mansfield-road. For the improvements in the two last-mentioned thoroughfares a grant of £3,700 is asked from the council.

Dundee T.C.—The Works Committee have resolved to carry out repairs to Clepington-road, at an immediate cost of about £6,000. In regard to the controversy as to whether the trackless trolley trams were responsible for the state of the road, it was argued that the traction engine and other heavy traffic was equally responsible. The ultimate cost of the work along the whole of the trackless tramway route will be about £14,000.

Droitwich T.C.—The borough surveyor, Mr. H. Hulse, has prepared a scheme for raising the level of the High-street to prevent floodings, and the matter is under the consideration of a committee, the borough surveyor meanwhile to have a conference with the engineer to the Salt Union.

Hartlepool T.C.—An improvement scheme is to be carried out from Sheraton-lane to the borough boundary, at an estimated cost of £16,000.

Helensburgh T.C.—The council have accepted the offer of the Road Board of a loan of £1,800, free of interest for four years, and a grant of £150 for road improvements.

Killarney R.D.C.—The council have agreed to make a contribution of 10 per cent towards the cost of

works on the road from Rathmore to Killarney, estimated at between £7,000 and £8,000. The scheme will be under the direction of the Road Board, which has sanctioned the necessary outlay.

Malton R.D.C.—The surveyor, Mr. J. T. Wiseman, has received instructions for asphaltting various footways, at an estimated cost of £210.

Oldham T.C.—It appears from a return by the sanitary superintendent that the flagmaking department earned during last year a profit of £303. It was hoped next year to make a profit of £350 so that the deficiency might be wiped out and a sum of £203 given in aid of the rates. The quantity of flags sold to private traders during the year amounted to 6,563 sq. yds., or an increase on last year's sale of 800 sq. yds. The total sales of flags had been 19,794 sq. yds., representing £2,812.

Perthshire C.C.—The road surveyor, Mr. W. L. Gibson, has submitted to the Western District Committee a report on the proposed reconstruction of 25 miles of roads in the Killin district, at an estimated cost of £11,558. The Road Board propose to give a grant of three-fourths of the cost and a loan for the remainder free of interest. The roads to be treated are those from Lix Toll to Tyndrum, from Tyndrum to the county march on the Fort-William-road, and from Crianlarich to Invernan through Glenfalloch. The roads will be widened, levels raised where necessary, and narrow, old-fashioned bridges will be widened and improved.

Shipley U.D.C.—The tramway track is to be partially reconstructed at an estimated cost of £8,365.

Strood R.D.C.—The Gravesend-road from Denton to Strood, is to be improved, at an estimated cost of £6,060.

Stockport T.C.—Grants of £2,500 and £1,500 have been made by the Road Board for reconstruction works in Edgeley-road and Bramhall-lane.

Uckfield U.D.C.—It has been agreed to adopt the scheme of the surveyor, Mr. E. Johnson, for repairs to the roads at Grub-road and Limney, including the driving of pitch-pine piles, and drainage, at a cost of £243.

Wigtownshire C.C.—The Mackers District Committee have approved the report of the road surveyor with reference to the proposed improvements in aid of which the Road Board had promised a grant of £2,500 and a loan for six years of £2,900. The scheme includes the reconstruction of the Barhill road for 6 miles, also reconstruction work on the Clachan-easy and Glenling roads, and the widening and improvement of others.—The Rhins District Committee propose to reconstruct and surface with tar 50 miles of main roads in the district within the next three years at an estimated cost of £25,000, the Road Board having given a grant of £8,500 and a loan of £16,500, free of interest, repayable in eight years.

Woolwich B.C.—Subject to a loan of £20,681 being obtained, it has been agreed to resurface portions of the motor-bus routes as detailed in the report of the borough engineer, Mr. J. Rush Dixon.

Worcester T.C.—The Streets Committee recommend the council to accept an offer from the Road Board of £627 for the application of tarmac to various roads. They also recommend that the foundations of the Bath road should be strengthened, at an estimated cost of £2,344.

SEWERAGE AND SEWAGE DISPOSAL.

Banbury T.C.—The Local Government Board have sanctioned a loan for £37,000 for carrying out the scheme of sewerage and sewage disposal for the borough which has been prepared by Messrs. Willecox & Raikes, of Westminster and Birmingham, and tenders are at once to be obtained for the first portion of the work, including the erection of a refuse destructor and pumping plant, the construction of pump well, sedimentation and storm tanks, and bacteria beds, together with the sewerage of the district of Grimsbury.

Bath R.D.C.—The tender of Mr. Hill, Kidderminster, at £17,403, has been accepted for laying a sewer from Monckton Combe along the Claverton Valley, *via* Batheaston, to connect with the Bath city sewerage system.

Bowland R.D.C.—The council recently approved the scheme prepared by Mr. Johnson of the proposed

sewage disposal works at Grindleton. The estimated cost of the scheme is £2,180.

Dewsbury T.C.—It is proposed to carry out alterations at the sewage disposal works at Mill Bank, at an estimated cost of £15,000.

Gateshead T.C.—A letter has been received from the Local Government Board on the subject of domestic sanitary conveniences in the borough. It is pointed out that the borough compares unfavourably with the majority of the ninety-five great towns of England and Wales in the proportion of dry-closets and in the matter of the conversion of these to water-closets. In view of the many disadvantages of the dry system, the board urge the council to reconsider the question of undertaking the systematic and general conversion of these closets wherever a sufficient sewer and water supply are available, and of prohibiting in similar circumstances the erection of closets other than fresh water-closets in new buildings. The council have sent a reply to the effect that having further considered the question, they did not see their way to alter their previous decision.

Halifax T.C.—A letter has been received from the Local Government Board Committee urging the council to formulate a scheme for the systematic and general conversion, where adequate sewers and water supply are available, of all existing conservancy closets in the borough.

Hull T.C.—It has been agreed to borrow £20,000 as an instalment towards the cost of a scheme for conversions to the water-carriage system.

Isle of Thanet R.D.C.—The Local Government Board have called the attention of the council to the need for a drainage scheme in order to safeguard the water supply of Birchington.

Kidderminster T.C.—The corporation have instructed Messrs. Willecox & Raikes, of Westminster and Birmingham, to at once prepare and submit to the Local Government Board a scheme for the sewerage of the areas recently added to the borough, the provision of new pumping plant at the sewage disposal works, the construction of storm-water tanks, as well as the works necessary for the extension of the sewage farm, and including sedimentation tanks for dealing with the whole of the sewage of the borough. The estimated cost of the scheme, together with the land, is £38,000.

Kids Grove U.D.C.—The surveyor, Mr. F. C. Crimes, has been instructed to prepare a scheme of sewage disposal.

Nuneaton T.C.—A scheme of surface-water drainage and sewage disposal is to be carried out, at an estimated cost of £1,750.

Truro T.C.—The city surveyor, Mr. F. A. Barnes, has submitted to the Sanitary Committee alternative schemes of sewage disposal, and it is understood that the committee regard favourably the one which provides for the filtration of the effluent. It is proposed to carry the sewage from Truro by a tunnel under the river to Calenick, where the effluent will be treated on a portion of the foreshore before going into the river. In addition, it is proposed to take the drainage of Trennick Row up Malpas-road and across the river by means of a siphon to the corporation yard.

Witham U.D.C.—A proposal is under consideration for a sewage disposal scheme, which is estimated to cost £8,000.

Worthing T.C.—The council have referred to the borough surveyor, Mr. F. Roberts, for report, a proposal by the Steyning West Rural District Council for draining a portion of Lancing into the Worthing outfall. The rural council also ask upon what terms the corporation will undertake the disposal of the council's sewage.—The Highways Committee recommend the acceptance of the tender of Mr. A. G. Osenton, of Horsham, at £3,193 3s. for the laying of two sewage and surface-water additional outfalls.

WATER, GAS, AND ELECTRICITY.

Banffshire C.C.—A water supply scheme for the special Findochty district has been agreed upon by the Banff District Committee, the estimated cost being £2,555, exclusive of compensation to tenants.

Bath T.C.—A difficulty having arisen with the gas company as to street lighting, the Street Lighting Committee considered the question of obtaining a supply of gas from the company and lighting and maintaining the lamps either by their own men or by contract. The present payment to the gas company,

which covers the supply of gas at the current price of 1s. 10d. per 1,000 cub. ft., and the lighting and maintenance of the lamps, is £2 10s. per lamp per annum. The committee ascertained that the company would supply gas for public lighting at the price from time to time charged to ordinary consumers. This price, upon an assumed consumption of 17,000 cub. ft. of gas per annum for 3,650 hours of lighting, will amount to £1 11s. 2d. per lamp per annum. The council have agreed to enter into an agreement with the gas company for a supply of gas, and have also accepted the tender of Messrs. Horstmann Brothers & Edgar for fitting automatic controllers and lighting, cleaning and maintaining the lamps at 19s. 4d. per lamp, thus making the total cost £2 10s. 6d. per lamp, which is practically the same as the amount now paid for the lighting and painting of the columns.

Blackrock (Co. Dublin) U.D.C.—The council have approved a report by Mr. Tierney for a scheme for the erection of a power station for the production of electricity, and Mr. Tierney, assisted by the surveyor, has been authorised to prepare a scheme of electric lighting.

Bognor U.D.C.—The surveyor, Mr. O. A. Bridges, has been authorised to purchase ten automatic controllers at 30s. each, to be fixed to the all-night lamps.

Camelford R.D.C.—The Camelford water supply has been extended by the council to Valley Tuckle, a village $\frac{3}{4}$ mile from the town on the Bodmin road. The inaugural ceremony took place on Saturday last.

Darwen T.C.—Mr. H. Howard Humphreys, the arbitrator appointed by the Local Government Board to go into the matter, has directed the corporation to pay to the Bolton Town Council 7½d. per 1,000 gallons for a supply of water.

Eastbourne T.C.—The Electric Lighting Committee are advocating alterations to the electricity mains, at an estimated cost of £4,656.

Fraserburgh T.C.—The alterations and extensions at the Broad-street site of the gasworks has been approved. The tender of Messrs. Henry Balfour & Co., Limited, Durie Foundry, Leven, has been accepted for the ironwork, and that of Messrs R. & G. Hyslop, Paisley, for the new chimney and retorts.

Hove T.C.—The purchase being completed, the Hove electric lighting undertaking was last week formally handed over to the corporation. The property includes two generating stations, 10 miles of feeder and distributing mains valued at £70,000, machinery representing about £68,000, and meters £12,000. The purchase price was £180,000. Most of the plant is in good condition, the cables particularly so, but the engineers contemplate an expenditure of £20,000 in modernising the machinery.

Kingsbridge R.D.C.—It was stated in council that Dr. J. R. Hinchinson, Local Government Board medical inspector, had been directed to make an inquiry into the water supplies of Modbury and Kingston, and he requested that the sanitary surveyor, Mr. W. H. Whitaker, should meet him.

Lincoln T.C.—It has been agreed to pay £5,500 from the profits of the gas undertaking, and £1,500 from the electricity and tramways profits in relief of the rates.

Newcastle (Ireland) U.D.C.—An agreement has been signed with the Irish Towns Electric Light and Power Company, Limited, Belfast, to provide for nine months in the year, from half an hour after sunset till 11 p.m., 100 50-c.p. lamps and 30 25-c.p. lamps, and for the three summer months three lamps of 300-c.p. each in the main promenade, for the sum of £185 per annum.

Norton R.D.C.—The tender of Messrs. H. C. Puller, at £674, has been accepted for the Leavening water supply scheme.

St. Germans R.D.C.—The council have approved a scheme prepared by the surveyor, Mr. P. B. Govett, for a water supply for St. Germans, showing that it would be necessary to drive an adit in a field near Lanjore and to construct intake chambers. In addition, a reservoir to contain about 15,000 gallons would have to be made at Pennadown and piped to the village for distribution. The total length of pipe would be about 3,700 yds. Mr. Govett suggested that application should be made to the Local Government Board for a loan of £1,500, repayable in thirty years.

Scarborough T.C.—The Corporate Property Committee have instructed the town clerk to ascertain upon what terms the Scarborough Electric Supply Company are willing to sell their undertaking.

Sleaford R.D.C.—It has been agreed to proceed with the water supply scheme for Evedon, Ewerby, Haverholme and Kirby Laythorpe, at an estimated cost of £2,300.

Swanage U.D.C.—The business of the Swanage Water Company has been bought by the council on behalf of the ratepayers for £22,550.

MISCELLANEOUS.

Bootle T.C.—The council last week accepted the tender of Messrs. Merryweather & Sons, London, at £1,257, for the supply of a petrol motor fire engine with Hatfield (reciprocating) pump.

Conway T.C.—It has been agreed to purchase a site at Deganwy for the purposes of a cemetery, and the borough surveyor, Mr. F. Delamotte, has received instructions to make trial borings on the land to ascertain the nature of the subsoil.

Derby T.C.—The Tramways Committee report that they are considering the question of substituting motor traction for all the horse traction used in connection with the tramways, and that they have arranged for the purchase for £800 of 1,779 sq. yds. of land at Alvaston for a waiting-room and depot, and for street improvement.

Devonport T.C.—It has been agreed to accept a tender, at £1,150, for the supply of a motor fire engine, subject to the loan being sanctioned.

Kent C.C.—The council have accepted the tender of Messrs. J. & E. Hall, 10 St. Swithin's-lane, E.C., for a repeat order of six of their 5-ton "Hallford" tip-wagons. The council have had in use for some time past four vehicles of this firm's manufacture.

Loftus U.D.C.—An illuminating discussion took place recently at the council upon a proposal that the surveyor, Mr. B. J. Wormleighton, should be authorised to take an articulated pupil, the council to pay such pupil 5s. per week. Several councillors were indignant that the ratepayers should be asked to pay this money. It would actually go on for three years! The chairman said the surveyor had asked for a pupil on account of the increased office work. That work had been much increased by the requirements of the Local Government Board during the past few years. The surveyor would then be able to devote more time to his outside duties. A councillor said it had been admitted that the surveyor spent many nights at the office till 10 o'clock—the surveyor added: "And at home till midnight"—whereupon another member retorted that he did not get to the office till 9.30 a.m. In the end the proposition was agreed to.

Stowmarket U.D.C.—The council are seeking to obtain prices for the supply of a motor or steam fire engine.

Town Planning Scheme for Wallsend.—The borough surveyor of Wallsend, Mr. G. Hollings, has received instructions to prepare the necessary information in order that formal application may be made to the Local Government Board in connection with a town planning scheme.

Institution of Civil Engineers: Students' Meeting.—At a students' meeting held at the Institution of Civil Engineers on the 3rd inst. at 8 p.m., Mr. Edward Sandeman, M.A., M.Sc., E., in the chair, a paper on "The East Stirlingshire Waterworks and a Note on Earthen Embankments" was read by Oswald Irving Bell, STU.A.M.S.T.C.E. The first part of the paper consisted of a description of the methods employed in the construction of the waterworks supplying the eastern district of the County of Stirling. It was accompanied by a number of very interesting slides, which were explained by the author in the course of his reading. The second part of the paper dealt with the design and construction of earthen embankments employed for impounding water, and was illustrated by diagrams. The discussion was opened by Mr. W. C. Mitchell, and was continued by Messrs. D. A. Stephens, F. R. Freeman, W. H. Cooper, P. V. Hoare, P. J. Bowie, and H. E. Denny. The author, in his reply, dealt at length with the various points raised in the discussion, and the chairman made some remarks on the design and construction of the puddle wall in earthen embankments. The meeting concluded with a vote of thanks to the chairman, proposed by Mr. W. C. Mitchell. After the meeting nominations were received for the London Students' Committee for the year 1914-15.

PERSONAL.

Mr. P. T. Harrison, borough surveyor of Chelmsford, has been voted an increase of his salary to £360 per annum, rising to a maximum of £400.

Mr. Charles Durie, highways surveyor of the eastern district of the Williton Rural District Council, has been voted an increase of salary of £60 per annum, to commence from the 1st inst.

Mr. J. H. Walters, borough surveyor of Congleton, has been appointed architect to the Education Authority, and has been instructed to report on available sites for the erection of the proposed new schools.

Mr. Thomas Tadwell Thomas, Conway, has been appointed surveyor and inspector to the Holywell Urban District Council, at a commencing salary of £105 per annum, in succession to the late Mr. R. A. Thomas.

Mr. Measham Lea, ASSOC. M. INST. C. E., chief engineer, Karachi Municipality, will arrive in England during May for a six months' stay. Communications will find him if addressed c/o Dr. F. C. Lea, Professor of Civil Engineering, Birmingham University.

Mr. G. W. Mitchell, sanitary surveyor to the Pocklington Rural District Council, has been voted £30 for his services in connection with the Shipton sewage disposal scheme, at the same time being complimented on the excellent way he had superintended the work.

Mr. W. McK. Brown, water engineer to the Lincoln City Council, was on Monday voted £1,000 for his services in connection with the new waterworks. It was stated that he had carried through the scheme—the total cost of which was £227,000—at a saving to the rates of £10,000.

Mr. J. H. Sagar and Mr. W. H. Hall, B.S.C., surveying assistants to Mr. Arthur Harrison, M. INST. C. E., borough engineer of Southwark, have been elected associate-members of the Institution of Civil Engineers. Mr. Sagar, who was resident engineer for the passenger subways at the Elephant and Castle, completed in 1911, at a cost of £15,000, holds the testamur of the Institution of Municipal and County Engineers. Mr. Hall is a Professional Associate of the Surveyors' Institution, and has passed the examination of the Royal Sanitary Institute in Sanitary Science.

Mr. James P. Wilkinson, M. INST. C. E., of Cathedral-street, Manchester, and Ardlin, Ley Hey Park, Marple, one of the oldest members of the Institution of Municipal and County Engineers, died last week, we regret to state, at the age of sixty-two. Mr. Wilkinson had been engineer to the Rivers Committee of the Manchester Corporation until recently, and designed and helped to carry out the great sewage disposal works at Davyhulme. The designing and planning of this famous undertaking had occupied practically the whole of his time and energy since his appointment as engineer to the Rivers Committee in 1900, and they will stand as a lasting monument to his engineering skill. Mr. Wilkinson, who had carried out work for the Admiralty at Harwich, was consulting engineer to the Stalybridge and Dukinfield Joint Sewerage Board and a number of local authorities. He leaves two daughters and a son, Mr. Oswald J. Wilkinson, ASSOC. M. INST. C. E., who succeeds his father as engineer to the Davyhulme works extension scheme, which is estimated to cost £200,000.

The London Highways Committee have recommended that an agreement should be entered into with Messrs. Kennedy & Donkin for Sir Alexander Kennedy to become consulting engineer to the county council tramways at a retaining fee of £500 a year.

Wexford's Garden Suburb.—Wexford, says the *Freeman's Journal*, is to have the largest "garden city" in Ireland. The Local Government Board order empowering the Gorey District Council to raise a loan for the erection of seventy cottages on a site purchased two years ago has been received. The land was obtained from Sir George Errington for £2,000, and the whole cost of the scheme, including the erection of cottages and the laying out of plots, will, it is estimated, be about £12,000. A garden of $\frac{1}{2}$ acre will be attached to each cottage, and the roads and open spaces throughout the "city" will be planted with trees.

WATERPROOFING MASONRY.

AMERICAN COMMITTEE'S RECOMMENDATIONS.

A comprehensive report of forty-eight pages on waterproofing masonry, the results of five years of investigation, was submitted at the last annual meeting of the American Railway Engineering Association by the committee on masonry. The committee discusses coatings, membranes, integrals, and watertight concrete construction, and includes five pages of diagrams showing methods of waterproofing bridge floors of various types, arches, subways, expansion joints, &c. The following conclusions are recommended for adoption:—

(1) Watertight concrete may be obtained by proper design, reinforcing the concrete against cracks due to expansion and contraction, using the proper proportions of cement and graded aggregates to secure the filling of voids and employing proper workmanship and close supervision.

(2) Membrane waterproofing, of either asphalt or pure coal-tar pitch in connection with felts and burlaps, with proper number of layers, good materials and workmanship, and good working conditions, is recommended as good practice for waterproofing masonry, concrete and bridge floors.

(3) Permanent and direct drainage of bridge floors is essential to secure good results in waterproofing.

(4) Integral methods of waterproofing concrete have given some good results. Special care is required to proportion the concrete properly, mix thoroughly and deposit properly so as to have the void-filling compounds do the required duty; if this is neglected, the value of the compounds is lost and their waterproofing effect destroyed. Careful tests should be made to ascertain the proper proportions and effectiveness of such compounds. Integral compounds should be used with caution, their chemical action on the concrete being ascertained as well as their effect on its strength. As a general rule, integral compounds are not recommended, since the same results as to watertightness can be obtained by adding a small percentage of cement and properly grading the aggregate.

(5) Surface coatings, such as cement mortar, asphalt or bituminous mastic, if properly applied to masonry reinforced against cracks produced by settlement, expansion and contraction, may be successfully used for waterproofing arches, abutments, retaining walls, reservoirs, and similar structures; for important work under high pressure of water these cannot be recommended for all conditions.

(6) Surface brush coatings, such as oil paints and varnishes, are not considered reliable or lasting for waterproofing of masonry.

FOR OTHER ADVERTISEMENTS

See End of Paper.

CITY OF WESTMINSTER.
DRAUGHTSMAN.

The Westminster City Council invite applications for the position of Engineering Draughtsman in the Works Department at a commencing salary of £120 per annum, rising by annual increments of £10 to £150 per annum.

Applicants must be associated with the Institute of Civil Engineers, and hold the rank of Student at least.

Application for the position must be made on a printed form to be obtained from and delivered to the undersigned not later than Saturday, the 25th April, 1914. Envelopes should be endorsed on the outside "Draughtsman."

Personal canvassing of members of the Council is strictly prohibited, and is held to be a disqualification.

JOHN HUNT,
Town Clerk.

Westminster City Hall,
Charing Cross-road, W.C.

April 8, 1914.

(1,512)

ENGINEERING ASSISTANTS with experience of Sewerage, Sewage Disposal and Waterworks, wanted immediately by Messrs. Willeox & Raikes, Civil Engineers, 63 Temple-row, Birmingham. Applicants must state age and salary required, with particulars of qualifications and experience. (1,509)

RHONDDA URBAN DISTRICT COUNCIL. TO CONTRACTORS.

The above Council invite Tenders for the Extension of Treorchy Cemetery, Treorchy, comprising the Clearing and Levelling of about 15 acres, the building of a Masonry Boundary Wall, the drainage by Deep Stoneware Drains, the forming of Carriage and Foot Ways, &c.

Plans and Specifications may be seen and Forms of Tender obtained at the Council Offices, Pentre, upon the production of a receipt from the accountant for the required deposit of one guinea (to be returned on receipt of a *bonâ-fide* Tender). The Contractors will be required to pay their workmen not less than the standard rate of wages paid in the district for each class of work respectively.

Sealed Tenders, endorsed "Treorchy Cemetery Extension," must be delivered by 10 o'clock on Friday morning, April 17, 1914, addressed to the Chairman of the Council, Council Offices, Pentre.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

E. TAYLOR,

Acting Engineer and Surveyor.

Council Offices,

Pentre, Rhondda.

April 7, 1914.

(L510)

WOLSTANTON UNITED URBAN DISTRICT COUNCIL.

Tenders are invited for the Supply of Materials, delivered as mentioned below:—

2-in. and 2½-in. Machine-broken Clew Hill Basalt, Leicester Granite, or Welsh Granite.

815 tons to Brampton Siding, Newcastle, N.S.R.

365 tons to Silverdale Station, N.S.R.

330 tons to Chesterton Station, N.S.R.

400 tons 1½-in. and 2-in. Tarred Granite to Brampton Siding.

Refined Tar.—Give alternate prices for Tar to be applied hot and applied cold.

9,720 gallons to Brampton Siding, Newcastle, N.S.R.

1,200 gallons to Chesterton Station, N.S.R.

2,800 gallons to Silverdale Station, N.S.R.

80 tons 1-in. to 1½-in. Tarred Limestone for Footpaths to Brampton Siding.

30 tons ¾-in. to 1-in. Tarred Limestone to Brampton Siding.

The Tenders to be endorsed, and to be in the hands of the Clerk, E. Hollinshead, Esq., Town Hall Chambers, Tunstall, not later than Tuesday, April 14th, 1914.

The Council does not bind itself to accept either the lowest or any Tender, and reserves to itself the right to increase or reduce any of the above quantities.

W. F. SLATER,

Engineer and Surveyor.

Burslem, Staffs.

April, 1914.

(L508)

BOROUGH OF HAMMERSMITH.

The Borough Council invite Tenders for the Provision, Erection and Painting, complete, of approximately 1,270 ft. run of Iron Railing, 4 ft. high, to enclose the St. Peter's-square open space, within the Borough, and also for the execution of certain Repair Works to the Dwarf Boundary Wall, in accordance with Specification, which, with Form of Tender, may be obtained on application to Mr. H. Mair, M.INST.C.E., Borough Surveyor, at whose office Plan thereof may be inspected.

Sealed Tenders, endorsed "Tender for Iron Railing," must be delivered to me not later than 10 a.m. on Wednesday, the 22nd April instant.

The Council does not bind itself to accept the lowest or any Tender.

LESLIE GORDON,

Town Clerk.

Town Hall, Hammersmith, W.

April 7, 1914.

(L511)

TO ASPHALT CONTRACTORS.

The Battersea Borough Council invite Tenders for the Supply of Materials and Works for Resurfacing Roadways with Asphalt Macadam. Specification and Form of Tender may be obtained from the undersigned. Tenders, endorsed "Asphalt," must be delivered by 9 a.m. on Saturday, April 18th, 1914.

W. MARCUS WILKINS,

Town Hall,

Battersea.

April, 1914.

Town Clerk.

(L507)

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKEILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

EASTERN DISTRICT.

A meeting of the Eastern District is to be held at Chelmsford on April 18th.

PROGRAMME.

11 a.m.—Meet at the Chelmsford Railway Station, and proceed either (a) to the Marconi wireless telegraphy works, by kind permission of the directors. Inspection will be made of the whole of these works, which are quite new and up-to-date, and the manufacture, testing, and assembling of the apparatus used in connection with wireless telegraph installations may be seen; or (b) to the engineering works of Messrs. The Hoffmann Manufacturing Company, Limited, by kind permission of the directors. Inspection of the manufacture of steel balls, rollers and bearings of all sizes, including the cutting off and converting of the raw material, turning, hardening, grinding and assembling of the parts. The plant inspection includes centrifugal oil separating installation and engines totalling over 2,000-horse power, including a 1,000-horse power Diesel engine just completed.

12.30 p.m.—Inspect corporation open-air swimming bath.

1 p.m.—Lunch at the Shire Hall, by kind invitation of the Worshipful the Mayor, Alderman G. W. Taylor, J.P.

2.15 p.m.—District business.

Paper by Mr. Percival T. Harrison, Assoc.M.INST.C.E., borough engineer, entitled "Description of Municipal Works in Chelmsford." Discussion.

3.30 p.m.—Inspection of houses in course of erection under the Housing of the Working Classes Act.

4.15 p.m.—Inspection of new suction gas plant at Mildmay Yard waterworks.

4.30 p.m.—Inspection of new stables and depot.

5 p.m.—Tea at the Shire Hall, by kind invitation of Mr. P. T. Harrison.

J. A. WEBB,

Hon. District Secretary.

Surveyor's Office,
Hendon, Great Stanmore.

H. T. WAKELAM,

District Chairman.

County Engineer,
Middlesex

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District is to be held at Sheffield on May 2nd.

DOVER MEETING.

A meeting of the institution is to be held in the South-Eastern District at Dover on May 9th.

SALISBURY MEETING.

A meeting of the institution is to be held in the Southern District at Salisbury on May 16th.

WEST MIDLAND DISTRICT.

A meeting of the West Midland District is to be held at Birmingham on May 23rd.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on Saturday, June 13th.

ANNUAL MEETING.

A town planning, housing and road conference and the forty-first annual general meeting is to be held at Cheltenham from June 24th-27th.

THOMAS COLE,

92 Victoria-street, S.W.

Secretary.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

INSTITUTION OF MUNICIPAL ENGINEERS.

President Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

NORTHERN DISTRICT.

Meetings will be held at Darlington on Saturday, April 18th, Hexham on Saturday, May 2nd, Cumberland in June, Alnwick on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

GENERAL MEETINGS.

A general meeting will be held at the Institution of Electrical Engineers, Victoria-embankment, W.C. on May 11th, for the discussion of a paper—"The Water Supply of New York," by W. T. Taylor, Fellow A.M.I.E.E., M.A.M.SOC.M.E.E., F.R.E.G.S. (member).

A general meeting will be held at Birmingham in May, when a visit will be paid to the works of the General Electric Company.

COUNCIL MEETING.

A council meeting will be held in London on Wednesday, April 29th.

EASTERN AND NORTH-EASTERN DISTRICT.

A joint Eastern and North-Eastern District meeting will be held at Finedon and Kettering on Thursday, May 7th, when a visit will be paid to the works of the Excelsior Stone Company at Finedon, and certain municipal works inspected at Kettering.

PROGRAMME.

12.20 a.m.—Meet at the works of the Excelsior Stone Company at Finedon, and inspect the manufacture of patent stone slabs, kerbs, channels, architectural dressings, &c.

Proceed thence by motor bus to Kettering for lunch at the Royal Hotel, at the kind invitation of the Excelsior Patent Stone Company, when a short paper will be read by Mr. W. B. Mortimer, managing director of the firm.

An inspection will afterwards be made of works in Excelsior stone at Kingsley-avenue, the new Co-operative Clothing factory, and the county police station.

G. BELSON CHILVERS,
Hon. District Secretary.

Council Offices,
Oundle.

A joint Eastern and North-Eastern District meeting will be held at Ilunstanton in July.

NORTHERN DISTRICT, WITH YORKSHIRE.

A Northern District meeting, in combination with Yorkshire, will be held at Hull on Saturday, May 16th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

WESTERN DISTRICT.

A Western District meeting will be held at Tisbury on Saturday, June 13th, when the municipal works of the town will be inspected and a paper, "Wiltshire Roads, Past and Present," will be read by Mr. E. Plummer Davies (member).

39 Victoria-street, S.W.
B. WYAND,
Secretary.

INSTITUTION OF MECHANICAL ENGINEERS.**PARIS MEETING: PROVISIONAL OUTLINE PROGRAMME.**

The Summer meeting of the Institution of Mechanical Engineers will be held in Paris, and will begin on Monday, July 6th. The following outline programme (which is subject to revision) has been drawn up:—

Monday, July 6th.—Arrival in Paris.

Tuesday, July 7th (Morning).—Reading and discussion of papers in the theatre of the Société des Ingénieurs Civils. Luncheon.

Afternoon.—Visits to engineering works and places of interest in Paris.

Evening.—Institution dinner.

Wednesday, July 8th (Morning).—Reading and discussion of papers in the theatre of the Société des Ingénieurs Civils. Luncheon.

Afternoon.—Visits to engineering works and places of interest in and around Paris.

Evening.—Conversation, by kind permission of the Société des Ingénieurs Civils.

Thursday, July 9th.—Visits in or from Paris.

Evening.—Proceed to Lille.

Friday, July 10th.—Visit locomotive, steel and textile works in Lille, Roubaix, Valenciennes, &c., returning to Paris in the evening, if desired. It is intended to arrange for visits to works in Le Havre, and a visit might be made after the meeting to the International Exhibition at Lyon.

EDGAR WORTHINGTON,
Secretary.

CONCRETE INSTITUTE.

A meeting of the Concrete Institute will be held at Denison House, 296 Vauxhall Bridge-road, Westminster (close to Victoria Station), on Thursday, April 16th, at 7.30 p.m., when Mr. Oscar Faber, M.Sc. A.C.E.T., ASSOC. M.A.N.S.T.C.E., &c., will read a paper entitled "The Design of Steel and Reinforced Concrete Pillars, with special reference to Secondary and Accidental Stresses," of which the following is a synopsis:—

The eccentricity on a pillar of a beam reaction with various forms of brackets and caps in the case of jointed construction—such as structural steel—and of monolithic construction—such as reinforced concrete construction.

The effect on the eccentricity of stiffening the joints of a jointed construction.

The design of brackets and cleats in structural steelwork.

The stresses in pillars due to poor workmanship frequently met in practice.

The bracing of pillars and the lesson of the Quebec Bridge failure.

The effect of continuity of pillar on eccentricity.

Worked out examples of design to compare the results of common methods of calculation frequently met, especially in competitive work, with accurate calculations.

JUNIOR MEETINGS.

The second informal meeting of junior members will be held on Friday, May 1st.

H. KEMPTON DYSON,
Secretary.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

INSPECTOR OF NUISANCES.—April 14th. Mitford and Launditch Rural District Council. £150 per annum.—Mr. W. J. Barton, clerk, Guildhall, East Dereham.

CLERK OF WORKS.—April 15th.—Corporation of Leigh. £2 10s. per week.—Mr. Tom Hunter, borough engineer.

SECOND ASSISTANT.—April 15th.—Corporation of Nuneaton. £100—£120 per annum.—Mr. F. C. Cook, borough surveyor.

INSPECTOR OF NUISANCES.—April 16th.—Coseley Urban District Council. £125—£145 per annum.—Mr. W. Lees, clerk.

TEMPORARY ASSISTANT.—April 17th. Chorley Town Council.—Mr. J. Mills, town clerk.

WATERWORKS ENGINEER.—April 18th. Diss Urban District Council.—Mr. Alfred Cooper, waterworks superintendent.

GENERAL ASSISTANT.—April 20th.—Corporation of Leigh. £97 10s. £104. Mr. Tom Hunter, borough engineer.

SANITARY INSPECTOR.—April 20th. West Riding County Council. £170 a year.—Mr. F. A. Darwin, clerk, County Hall, Wakefield.

ROAD ENGINEERING ASSISTANT.—April 20th. Corporation of Capetown.—Messrs. Davis & Soper, agents, 54 St. Mary-axe, London, E.C.

DISTRICT SUPERINTENDENT OF HIGHWAYS. — April 20th.—Corporation of Huddersfield. £120 per annum.—Mr. K. F. Campbell, borough engineer and surveyor.

SURVEYING ASSISTANTS. — April 21st.—Shanghai Municipal Council. £385 per annum.—Messrs. John Pook & Co., agents for the Shanghai Municipal Council, 63 Fenchurch-street, London, E.C.

ASSISTANT ENGINEERS AND DRAUGHTSMEN. — Public Works Department of the Sierra Leone Government. Engineers, £300—£400; draughtsmen, £300—£350, with furnished quarters or allowance.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

GLASGOW.—May 1st. Models for four groups of symbolical sculpture, for the Glasgow Corporation.—Mr. J. Lindsay, town clerk.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

HYPHE.—May 30th.—Designs for a concert hall and public shelter, for the Hythe Corporation. Premiums, 50, 25 and 10 guineas.—Mr. B. C. Drake, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

GUILDFORD. April 13th.—For the removal of the present bridge and the construction of a new ferro-concrete bridge, for the rural district council.—Mr. John Anstee, engineer.

GODMANCHESTER.—April 13th.—For building a river wall, for the corporation.—The Borough Surveyor.

FELIXSTOWE. April 14th.—For extensions to the electric lighting station, for the urban district council.—Mr. H. Glegg, Town Hall.

ST. NEOTS.—April 14th.—For alterations to Corn Exchange, for the urban district council.—The Surveyor.

WINCHESTER.—April 14th.—For the erection of two shelters in the recreation ground, for the corporation.—City Engineer.

EDMONTON.—April 14th.—For the erection of a public convenience, for the urban district council.—Mr. C. Brown, engineer and surveyor.

HASTINGS. April 14th.—For the erection of two cottages, for the corporation.—Mr. P. H. Palmer, borough engineer.

HEREFORD.—April 14th.—For the erection of sixty-two cottages, for the corporation.—Mr. J. Parker, city surveyor.

TAUNTON.—April 15th.—For the construction of an overflow weir and other works, for the corporation.—Messrs. Douglass, Lewis & Douglass, 15 Victoria-street, Westminster.

WARMINSTER.—April 17th.—For the erection of eight cottages, for the rural district council.—Mr. C. C. Hancock, surveyor.

CHESHIRE.—April 18th.—For the erection of certain new buildings and alterations, for the county council.—Mr. W. H. Lancaster, 49 Northgate-street, Chester.

BURNLEY.—April 18th.—For the completion of the construction of an impounding reservoir, with catchwaters, aqueducts, and meter-houses, for the

corporation.—Messrs. James Diggle & Son, engineers, Hind Hide-street, Heywood, Lanes.

HUNTS.—April 20th.—For the enlargement of a school, for the Education Committee. County Surveyor, Market-place, Huntingdon.

CHELMSFORD. April 20th.—For sinking a 14-in. borehole, for the corporation.—Borough Surveyor.

MARGATE. April 20th.—For the erection of a pumping engine house, for the corporation.—Mr. A. E. Borg, borough engineer.

KEIGHLEY.—April 20th.—For the erection of a two-span bridge, for the rural district council.—Messrs. R. B. Broster & Sons, engineers, Craven Bank Chambers, Keighley.

MANCHESTER. April 20th.—For the construction of main drainage work No. 2c (new outfall sewer, Chester-road, to the Chester Line Railway), for the corporation. City Surveyor.

ABERTULLERY. April 20th.—For laying out school grounds and building boundary walls, for the Board of Governors.—Mr. N. J. Lewellyn, clerk, Council Offices.

TIPPERARY. April 20th.—For the erection of twenty-four two-story stone houses, for the urban district council.—Mr. T. Dawson, town clerk.

LISBURN. April 21st.—For the erection of sixty cottages, for the rural district council.—Mr. W. Sinclair, clerk.

WALLASEY.—April 21st.—For the erection of a town hall, for the corporation.—Messrs. Briggs, Wolstenholme & Thorneley, Royal Liver Buildings, Liverpool.

GLASGOW.—April 22nd.—For the extension of the municipal buildings, for the corporation.—Messrs. Watson & Salmond, architects, 242 George-street, Glasgow.

WEST RIDING.—April 24th.—For alterations at a school, for the Education Committee. The Clerk, County Hall, Wakefield.

WARWICKSHIRE.—April 24th.—For the enlargement of the police station and the erection of a pair of cottages and works incidental thereto, for the county council.—Mr. John Wilmot, county surveyor, 6 Waterloo-street, Birmingham.

GLASGOW.—April 24th.—For works in connection with the extension of the meat market, for the corporation.—Mr. J. Lindsay, town clerk.

CUMBERLAND.—April 25th.—For the reconstruction in ferro-concrete of "Metal Bridge" across the river Esk, for the county council.—Mr. William Finch, county surveyor and bridgemaster, The Courts, Carlisle.

EAST SUSSEX.—April 25th.—For the construction of sea defences, for the county council.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

DODWORTH.—April 25th.—For the erection of council offices, for the urban district council.—Mr. Ernest W. Dyson, architect and surveyor, 10 Regent-street, Barnsley.

PONTEFRAC T.—April 27th.—For deepening a well and other incidental works, for the corporation.—Messrs. G. & F. W. Hodson, engineers, Bank Chambers, Loughborough.

EAST RIDING. April 28th.—For the erection of clerk and steward's house, six cottages, bailiff's house and dairy, for the Asylum Visiting Committee.—Mr. C. W. Hobson, clerk, 26 and 28 Laigate, Beverley.

BURTON-UPON-TRENT.—April 29th.—For the extension of the refuse destructor, Bond End, for the corporation.—Mr. George T. Lynam, borough engineer and surveyor.

ASHFORD.—April 30th.—For the erection of baths and attendant's room, for the urban district council.—Mr. W. Terrill, surveyor.

Iron and Steel.

BRIDGWATER. April 13th.—For the supply of 124 tons of 3-in. cast-iron pipes and other castings, for the rural district council.—Mr. W. A. Collins, engineer.

BRISTOL.—April 13th.—For the supply of wrought-iron and steel, for the Sanitary and Improvement Committee.—City Engineer.

TAUNTON.—April 14th.—For the supply of sluice valves, air valves, hydrants, surface boxes, cast-iron mains, carting and laying cast-iron water mains, in-

cluding fixing valves and hydrants, for the rural district council.—Mr. Sidney S. Orchard, engineer and surveyor.

ABERDARE—April 15th.—For the supply of steel tubes and cast-iron pipes, for the urban district council.—The Surveyor.

HULL—April 18th.—For the supply of 200 tons of cast-iron lining for pumping well and shaft, for the water and gas department.—Mr. C. B. Newton, city water and gas engineer.

LEEDS—April 25th.—For the supply of cast-iron pipes, retort castings and flags, for the Gas Committee.—Mr. W. B. Leech, general manager, Market Hall.

Roads.

TANGIER—April 14th.—For the supply of paving and kerbstone, for the Public Works Department.—Commercial Intelligence Department of the Board of Trade, 73 Basinghall-street, London, E.C.

BIRMINGHAM—April 14th.—For making up a road, for the corporation.—Mr. H. E. Stilgoe, city engineer and surveyor.

TORPOINT—April 14th.—For making good certain roads, for the urban district council.—The Surveyor.

OAKWORTH—April 15th.—For road improvement works, for the urban district council.—Mr. A. Bradley, clerk.

ST. NEOTS—April 16th. For the supply of broken granite, basalt, slag tar-macadam, and slag dust, for the urban district council.—Mr. J. Edey, surveyor.

GRAVESEND—April 16th.—For the supply of English basalt, English basalt chippings, granite setts, scoria setts, and ragstone chippings, for the corporation.—Mr. F. T. Grant, borough surveyor.

CROYDON—April 16th. — For the execution of private street works, for the rural district council.—Mr. R. M. Chart, surveyor.

SHIPLEY—April 16th.—For reconstruction of double tramway track, for the urban district council.—Mr. W. H. Dawson, engineer and surveyor.

UTTOXETER—April 17th.—For the supply of broken granite, limestone, and cold blast slag, for the rural district council.—Mr. W. Walker, surveyor.

MERTON AND MORDEN—April 17th.—For surfacing about 22,000 sq. yds. of the carriageway in Kingston-road, for the urban district council.—Mr. G. Jerram, engineer and surveyor.

KIDDERMINSTER—April 17th.—For the supply of broken granite, granite screenings, broken slag and slag screenings, for the rural district council.—Mr. G. J. Shepherd, surveyor.

PRESTWICH—April 17th.—For work of private street improvement, for the urban district council.—The Surveyor.

BEDWELLY—April 18th. —For the construction of an access road, for the urban district council.—Mr. D. H. Price, surveyor, Aberbargoed.

BATTERSEA—April 18th.—For the supply of materials and works for resurfacing roadways with asphalt macadam, for the borough council.—Mr. W. Marcus Wilkins, town clerk.

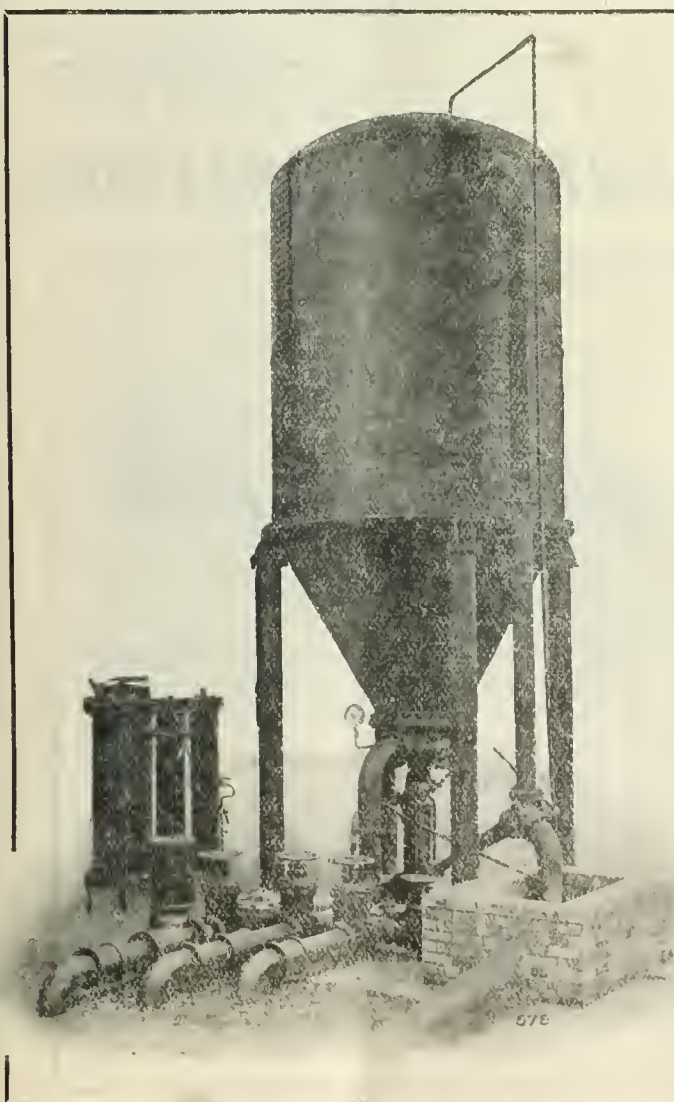
RUSKINGTON—April 18th. For the supply of granite, slag, and ironstone, for the urban district council.—Mr. E. H. Godson, clerk.

ROTHERHAM—April 18th. For the supply of broken granite, broken slag, Portland cement, tarred slag, tarred limestone, concrete flags, gritstone setts and kerbs, for the corporation. Mr. E. B. Martin, borough engineer.

MERE—April 22nd. For the supply of Mendip stone, for the rural district council. Mr. J. McKenzie, district surveyor.

EAST SUSSEX—April 27th. For the widening, improvement, and reconstruction of the Lewes-Newhaven road, for the county council. Mr. F. J. Wood, county surveyor, County Hall, Lewes.

MADRAS—May 4th.—For the supply of 400 10-gallon casks of tar, for the corporation. A copy of specification and conditions may be obtained at the office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.



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Sanitary.

KETTON.—April 11th.—For laying earthenware pipes, for the rural district council.—Mr. J. G. Bailey, surveyor.

TIVERTON.—April 13th.—For the execution of sewerage works, for the rural district council.—Mr. J. Reynolds, clerk to the Parochial Committee, Cullompton.

KENDAL.—April 11th.—For the construction of filter floors, channels, humus tanks, storm-water tanks, and alterations to septic tanks, for the corporation.—Mr. F. W. Oxberry, borough engineer.

KENDAL.—April 14th.—For the extension of sewage disposal works, for the corporation.—Mr. F. W. Oxberry, borough engineer.

ALDERSHOT.—April 14th.—For main drainage re-construction, for the urban district council.—Mr. Fred. C. Uren, surveyor.

OAKWORTH.—April 15th.—For scavenging certain districts, for the urban district council.—Mr. A. Bradley, clerk, North-street, Keighley.

KIVETON PARK.—April 15th.—For works of sewerage, for the rural district council.—Mr. F. Hewitt, engineer and surveyor.

OUNDL.—April 16th.—For supplying and laying earthenware pipes and construction of manholes, for the rural district council.—Mr. S. Broadbolt, inspector, 3 Gordon-road, Oundle.

HAWARDEN.—April 17th.—For alterations to outfall works, for the rural district council.—Mr. A. Caradoc Williams, engineer, 6 Godstall Chambers, Chester.

BOURNEMOUTH.—April 17th.—For extensions to main and outfall sewers, for the corporation.—Borough Engineer.

RHYMNEY.—May 18th.—For the construction of sewers, storage tank and discharge pipe, for the Sewerage Board.—Mr. J. S. Alford, 9 Victoria-street, Westminster; Messrs. Willcox & Raikes, 63 Temple-row, Birmingham; and Mr. T. J. Thomas, 36 High-street, Bargoed.

GOOLE.—April 20th.—For the construction of branch sewers and connections, consisting of about 6 miles of stoneware pipe sewers, with manholes and

other appurtenances, for the urban district council.—Mr. Robert Tyson, clerk.

STONE.—April 20th.—For the construction of sewers, manholes, pumping station, and rising main, for the rural district council.—Mr. H. W. Makepeace, engineer, Leek-road, Stoke-on-Trent.

WESTPORT.—April 20th.—For the construction of an outfall sewer, for the urban district council.—Mr. T. H. McCarthy, engineer, 39 Westmoreland-street, Dublin.

MANCHESTER.—April 20th.—For main drainage work, for the corporation.—The Town Clerk.

BRIGHTON.—April 21st.—For the supply of glazed drain pipes, for the corporation.—Borough Surveyor.

AXMINSTER.—April 21st.—For relaying a sewer, for the rural district council.—Mr. Cecil Forward, clerk.

CHERTSEY.—April 27th.—For the extension of the Byfleet sewerage works, comprising 643 yds. of 9-in. and 7-in. Hassall's stoneware pipes, with manholes and appurtenances, also ejector chamber, and laying 1,420 yds. of 2½-in. cast-iron compressed-air main, and 194 yds. of 5-in. cast-iron pumping main, for the rural district council.—Messrs. Elliott & Brown, engineers, Burlington Buildings, Parliament-street, Nottingham.

Stores.

GLASGOW.—April 11th.—For supplies for the water department.—Mr. J. R. Sutherland, water engineer, 15 John-street.

LANARK.—April 11th.—For the supply of road tools, implements, fencing materials, and drain pipes, for the Middle Ward Committee.—Mr. W. E. Whyte, district clerk, Hamilton.

COLWYN BAY.—April 18th.—For the supply of drain pipes, kerbs, channels, ironmongery (manhole covers), disinfectants, creosote oil, granite macadam and chippings, and limestone chippings, for the urban district council.—Mr. William Jones, engineer and surveyor.

ROTHERHAM.—April 18th.—For the supply of broken granite, broken slag, tarred slag, tarred limestone, concrete flags, Portland cement, timber, pitch and creosote oil, grit-stone setts and kerbs, and granite

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sells, for the corporation.—Mr. Ernest B. Martin, borough engineer.

SUTTON (Surrey).—April 22nd.—For the supply of road materials, ironmongery, oils, paints, coal, coke, horse forage, and team labour, for the urban district council.—Mr. W. Hedley Grieves, surveyor.

INVERNESS.—April 20th.—For supplies for the Gas Commissioners.—Manager to the Gasworks.

TEES VALLEY.—For the supply of road and valve boxes, brass castings, taps, ferrules, and general stores, for the Water Board.—Mr. Hugh Wilson, clerk.

Miscellaneous.

BRIGHTON.—April 21st.—For the supply of Portland cement, for the corporation.—Borough Surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted † Recommended for acceptance.
‡ Provisionally accepted.

BINGHAM.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. C. W. Kendrick, sanitary surveyor:—

E. Tomlinson, Keyworth, Notts	£373
J. & J. Warner, Derby	340
E. Somerfeld, Nottingham	330
W. Burnett, Hickling, Notts	329
W. Wilson, Bingham, Notts	280

DARTFORD.—Accepted for laying stoneware and iron pipes, with manholes, for the rural district council.—Mr. J. E. Goreham, engineer, Dartford:—
Streeter Brothers, Croydon, £650.

EASTLEIGH.—For making up certain streets, for the urban district council.—Mr. W. Wallace Gandy, engineer and surveyor:—

Weston-road.—Douglas, Southampton, £251; Grounds & Newton, Bournemouth, £267; Osman, Southampton, £268; Free, Maidenhead, £301; Nichol, Southampton, £317; Bicknell, Yeovil, £411; surveyor's estimate, £267.
Northlands-road.—£252,* £269, £268, £300, £312, £427, £252.
Bellevue-road.—£252,* £268, £268, £299, £346, £431, £251.
The Crescent.—£370, £353,* £268, £443, £455, £695, £385.
Barton-road.—£593, £590,* £689, £703, £730, £986, £662.
Desborough-road.—£544, £454,* £623, £630, £651, £948, £585.
High-street.—£348,* £385, £417, £424, £430, £682, £438.

EGREMONT.—For the supply of cast-iron spigot and socket pipes, specials and valves, for the urban district council.—Mr. J. Cowan, engineer:—

J. & R. Ritchie, Middlesbrough.	
Cochrane & Co., Middlesbrough.	
Cochrane & Co., Dudley.	
Birtley Iron Company, Durham.	
J. Oates & Co., London.	
Stanton Iron Company, Nottingham.	
Holwell Iron Company, Melton Mowbray.	
Sheepbridge Iron Company, Chesterfield.	
Staveley Iron Company, Chesterfield.	
CUTTING PIPE TRENCHES.	
J. Dawson, Whitehaven.	
H. J. Dohughan, Cleator Moor.	
Brebner & Co., Glasgow.	
Waring & Sons, Huddersfield.	

FAREHAM.—For the erection of public conveniences, for the rural district council.—Mr. C. W. Hunt, sanitary surveyor:—

J. Chance, Fareham	£435
T. Draper, Fareham	295
A. Sothcott, Lee-on-the-Solent	273
C. Wright, Lee-on-the-Solent	268

LEYLAND.—For the supply of broken granite, slag, tar-macadam, limestone dust, rocmac, kerbs, and setts, for the urban district council.—Mr. M. H. Wilkinson, surveyor:—

2-in. Hand-broken Granite.—Penmaenmawr Granite Company, Limited, Penmaenmawr, 9s. 4d. per ton.
12-in. Machine-broken Granite.—Penmaenmawr Granite Company, Limited, Penmaenmawr, 8s. 9d. per ton.
2-in. Machine-broken Granite.—Shap Granite Company, Limited, Shap, Westmorland, 9s. 2d. per ton; Threlkeld Granite Company, Keswick, Cumberland, 9s. 11d. per ton.
3-in. Hand-broken Copper Slag.—W. & J. Turner, Preston, Lanes, 4s. per ton.
Tar-macadam.—Pwhelli Granite Company, Runsorn, 17s. per ton; Threlkeld Granite Company, Keswick, Cumberland, 16s. 6d. per ton; Wigan Coal and Iron Company, Fishergate, Preston (branch), 12s. 9d. per ton.
Screened Limestone Chippings.—R. Briggs & Co., Limited, Clitheroe, 6s. 10d. per ton.
Roemac.—Roemac, Limited, London (in 700-gallons lots), 9d. per gallon.
6-in. Setts.—J. & D. Crook, Chorley, 11s. 6d. per ton.
4-in. Cubes.—H. Heyes & Co., Manchester, 24s. 6d. per ton.
12 in. by 6 in. Flat Kerbs.—J. Southworth, Abbey Village, Withnell, straight, 3s. per yard; circular, 4s. 2d. per yard.
Concrete Flags.—Shap Granite Company, Shap, Westmorland, 3s. 5d. per square yard.
Earthenware Pipes and Irregulars.—J. Crankshaw & Co., Bolton.
Earthenware Gullies.—J. Plaice & Sons, Limited, Darwen, Lanes, 27 in. by 12 in. by 15 in., 10s. 3½d. each; 21 in. by 12 in. by 15 in., 8s. 3d. each.
Tar-spraying.—H. V. Smith & Co., Limited, London, spraying with Clare's Gold Medal Tarco, and spreading chippings, 2d. per super yard.



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The Surveyor

And Municipal and County Engineer.

Vol. XLV.

APRIL 17, 1914.

No. 1,161.

Minutes of Proceedings.

The Work of the Compiler. Every technical work must, to some extent, be "a compilation." We quote the expression, as it is one which is used far too frequently as a term of reproach, when discussing a technical book. Complete originality—or even anything approaching complete originality—is not to be looked for in any work. A man can write only what is in him, and by study and observation alone can he lay by the store on which he is to draw when he sits down pen in hand, with a blank sheet of paper on the desk before him. The veriest slush that is vended on the bookstalls, crammed as it may be with impossible heroes and heroines, and bespattered with the goriest of adventures, is no more entitled to be termed original than is a first-class work on mathematics or engineering. A little of what is actually "in" the author is to be found in the pages of both; but precious little. They are, for the greater part, compilations—fragments culled from reading and experience, strung together and woven finally into a more or less harmonious whole. "A dictionary," says Emerson, "is not a bad book to read. There is no cant in it, no excess of explanation, and it is full of suggestions—the raw material of possible poems and histories. Nothing is wanting but a little shuffling, sorting, ligature, and cartilage." And it is in the manner of this shuffling and sorting, this provision of ligature and cartilage, that the genius or folly of an author is made manifest.

One often reads in the review columns of a paper that a work shows startling originality. Any such work of a technical nature must at once be open to suspicion, for none but the quack and the charlatan can aspire to such a height. Medicine offers a case in point, and we take at random from our shelves a book which ranks as a classic on matters physiological. "Hence," we read, in the preface to the seventh edition, "though a record of all important and well-founded recent observations has been inserted in various sections, the chief difference in the present when compared with the previous editions will be found to consist mainly of additions and rearrangements of old facts, and, it is hoped, a plainer exposition of them." We open, again at random, the pages of a work on "Zoism," which was published some years ago in Chicago, and we read: "The body of the Zoist is spiritualised matter, formed of particles refined in process of manufacture by the fire of his thought. . . . Eventually he reaches the state in which the physical body, truly refined from all grossness, truly spiritualised in its molecules, is capable of existing eternally without other food than that which is drawn from the air." The stern, sober facts of the physiologist (in the

preface from which we have quoted) lack sadly the originality betrayed in this representation of the physiology of Zoism. The one work is what is known among the ignorant as "a mere compilation." The other has been described as "a soundly reasoned exposition of a great truth," and, again, as "a work of singular beauty, unique in conception, and of an originality truly refreshing in these workaday times."

The engineer, of all men, has reason to be grateful for the work of the compiler. The greater number of the best books may—we hope without offence—be termed compilations. Originality betrays itself more in newspaper articles and in papers read before societies. In these a man may let himself go, so to speak. He opens himself out for attack, inviting full discussion, and adverse rather than friendly criticism. But what he may say in the Press or on the platform he would be loth to commit to the comparatively imperishable pages of a book. The words of the prophet loom large in his mind, and when he does favour his adversary so far as to write a book he is going to see that every statement in it is backed by some indisputable authority; or, in other words, that it shall partake largely of the nature of a compilation. Theories more or less startling, and bearing every stamp of originality, are necessarily enunciated from time to time, but they are taken for what they are, and those that do not suffer premature decease are slowly but surely stripped of their plumage and end as the sorriest of birds. The burden of this unpleasant duty falls largely to the lot of the compiler. He is the matrix which binds together the loose material, and this material needs selecting with care and judgment, rejecting the inferior, the badly formed, the underburned, and retaining only what is clean, sharp, wholesome and lasting. Life itself is, after all, but a compilation, an adding together and building up of forces and experience. Engineers owe a debt to the compiler which is ill-discharged by aspersions cast upon his work. Is not the engineer himself—regard him in ever so favourable a light—a compiler, working upon a broad basis of facts, leavened by derived experience?

Pure Water a Manufactured Product.

Two cases of remarkable interest to the water engineer are before us at the present time. On the one hand we hear of the Coventry City Council adopting proposals for reclaiming the Whitley waterworks, which have been out of use for the last five years, owing to the water being polluted. It is now proposed to sterilise this polluted water by means of hypochlorite in the form of chloros, and it is estimated that an annual saving of £3,285 will thus be

effected. On the other hand we have the case of Nottingham, where a very serious state of affairs has arisen in connection with the Derwent Valley water supply undertaking, inaugurated only a few months ago. Almost at once there were complaints as to the colour and taste of the water, and it now appears from the report of the Water Committee of the city of Nottingham that if the supply from the Derwent Valley works is to be continued the whole of the wrought-iron pipes, cylinders and boilers at present in use for hot-water domestic supplies will have to be replaced by lead and copper piping and fittings. Thus, as an immediate safeguard, the supply of the Derwent water has been discontinued. It seems that this water in its present condition, though absolutely pure and safe from the point of view of the public health and consumption, is of such a quality that if it is used at Nottingham every wrought-iron pipe in the city will have to be replaced by pipes of some material which will not be acted upon; at least such appears to be the opinion of the Water Committee. It seems that Sheffield had the same trouble thirty years ago, and discontinued the use of iron service pipes altogether, substituting lead. Leicester and Derby have used galvanised iron pipes in anticipation of the Derwent supply, but the opinion is expressed that this will only postpone for a short time the action of the water on the iron.

It is evident from the foregoing that we are every day coming nearer to the knowledge of the fact that water which is used for domestic purposes must be regarded as a manufactured product. If the water is polluted, as in the case of Coventry, it can be purified to any required standard, and water which has been rendered absolutely pure and sterile by proper treatment is a far safer source of supply than water absolutely pure at the source, but liable to accidental contamination. Such specific accidental contamination, we have learned, is far more deadly than general known pollution for which proper safeguards have been taken, and we see in the case of Coventry how a large saving of annual expense may be avoided by sterilisation. In the case of Nottingham it is once again shown that the pure water from upland gathering grounds may need treatment quite as urgently as the water from a polluted stream. There are special troubles which may be encountered, and which can be overcome by proper treatment. But what is abundantly clear is that treatment is required, and that if waters derived from pure sources need chemical treatment, the advantage of going far afield vanishes. It seems therefore that water ought to be treated, in most cases, if the best results are to be obtained, and if this is so, the use of the supply nearest home is to be recommended.

* * *

Competitive Schemes for Engineering Works.

The council of the Institution of Civil Engineers has taken a very important step with respect to the practice of inviting engineers, by advertisement, to submit in competition with others their terms for preparing plans and proposals for engineering schemes. In a circular letter addressed to corporate members of the institution the council express the opinion that such a proceeding is very undesirable in the best interests of the public authorities themselves, and is derogatory to the engineering profession, and they state that they desire to express emphatically the repugnance with which they regard the practice in question. Further, they express their confidence that the members of the institution will support them by declining to respond in any way to such advertisements as those alluded to. The council have not left the matter here, for they have informed the Local Government Board of their action in

making this communication to the institution. It is quite possible that all the other engineering societies will support the parent institution in this matter, and as to the attitude of the Association of Consulting Engineers there can be no doubt whatever. The practice referred to is, on the lowest grounds, undesirable, since it involves much waste of time and money, and it is derogatory not only to the consulting engineer, but also to the engineering officers of the local authorities concerned, who, as professional men, are quite able to decide what assistance they require, and fully competent to suggest the names of reliable consultants whose assistance could be obtained. It would also be to the advantage of contractors that those who are able and willing to work to plans and specifications prepared by responsible officials or consultants should not be ousted by others who, answering the advertisements, attempt to combine the functions of an independent professional engineer with those of the contractor tendering for the work. When it is necessary to compare the costs of carrying out a specific work in different ways, the necessary estimates should be prepared either by the technical officers to the local authority or by independent engineers, paid for doing whatever work is necessary in preparing alternative plans and estimates. In the long run the ratepayers are likely to pay dearly for the attempt to get something for nothing. They often do. The action taken by the council of the Institution of Civil Engineers is an important step towards a better state of public opinion with regard to the status of the whole of the engineering profession. As will be seen from a paragraph in our issue of the 3rd inst., the Institution of Civil Engineers of Ireland is taking the same course.

* * *

The Development of London.

At the last meeting of the Royal Institute of British Architects, Mr. W. R. Davidge, the district surveyor of Lewisham, made a most interesting excursion into the past in a paper in which he traced the origin and development of metropolitan building legislation. The earliest regulation was in all probability that imposed by the Roman building laws, and from that time onwards apprehension of danger from fire and disease has led to the enactment of many laws and the adoption of several and diverse devices for the control of building operations. One of the earliest matters to which attention was given was the erection of party walls, for we find that in 1189 FitzAlwyne's Assize contained provisions to facilitate their erection, and "especially for appeasing contentions which sometimes arise among neighbours." Many things have changed since that day, and among them the law relating to the erection and rebuilding of party walls; but contentions still arise among neighbours, as those who have much to do with building in London are so well aware, and the provisions of the London Building Acts regarding this matter may be regarded as in direct lineal descent from the legislation of 1189. A curious episode is provided by the attempts which were made in the time of Elizabeth, and again under the Commonwealth to restrict building in the Metropolis. These attempts were due to the overcrowded and insanitary conditions of the City, but they were foredoomed to failure. It is difficult to imagine what would be the astonishment of the framers of these Acts were they able to visit the mammoth Greater London of to-day. A new chapter was begun by the Act for rebuilding the City of London after the Great Fire of 1666. This was the first attempt to make anything like a complete code of building regulations, and was a broad and statesmanlike attempt to deal with a desperate situation. Surveyors were appointed to secure its due observance. The growth of London is undoubtedly one of the

great wonders of the world, and although the administrative county is now nearly built over, the outer ring is developing at an enormous rate, and the fact that it is to all intents and purposes an integral part of the Metropolis is shown by the Greater London Bill, which is even now in embryo. The immediate problems of building in London are of great magnitude and importance, and the historical light which is thrown upon them by Mr. Davidge's paper must be of great value to those who are practically concerned in their solution.

* * *

The Engineer as Arbitrator.

In a paper which he read last night before the Society of Architects, Mr. W. Valentine Ball dealt with the position of the municipal or county engineer who is called upon pursuant to the terms of a contract to act as arbitrator between his authority and a contractor who has been executing works under his supervision or control. The fundamental thing to remember in such cases is that the appointment of such an arbitrator—whose independence is obviously open to question—is the result of free contract between the parties, and that the contractor cannot therefore object to his acting merely upon the ground that he is open to suspicion of bias. On the other hand, of course, the arbitrator is bound to act with judicial impartiality and fairness. In the words of Lord Justice Bowen in *Jackson v. Barry Railway Company*, in appointing the engineer as arbitrator the parties "rely on his professional honour, his practice, and his intelligence; and the contractor certainly has a right to demand that, whatever views the engineer may have formed, he will be ready to listen to argument, and at the last moment to determine as fairly as he can, after all has been said and heard." In certain cases, however, the Courts have held that the contractor is entitled to be relieved from the arbitration clause. For example, if the engineer himself is a necessary witness at the inquiry, or if the question in dispute involves a consideration of the engineer's own conduct, it is manifestly unfair that he should act as arbitrator. Other similar instances were given by Mr. Ball, whose paper is well worthy of perusal as a logical and orderly statement of an important branch of the law peculiarly affecting engineers.

* * *

The Roads Improvement Association.

The report of the past year's work of the Roads Improvement Association is an optimistic document, and records considerable progress in the modern movement for improved roads. There can be no doubt that the Third International Road Congress which was recently held in London served to focus public attention in this country on the problems of highway engineering arising out of the new traffic conditions. This in itself was a result of the greatest possible value, inasmuch as the formation of an intelligent public opinion is a condition precedent to the attainment of any real progress. The next thing to impress upon the public mind is that highway matters will claim great attention for many years to come. We are at present in the throes of the greatest transition in the means of locomotion that has ever been known—with the one possible exception of the advent of the railway—and the road engineer of the future must be a man of practical attainment, engineering ability, and economic foresight. It is evident that, as has been pointed out in our columns by Mr. H. Percy Boulnois, some special training is necessary to equip such a man; and the scheme which has been outlined for the establishment of a Chair of Highway Engineering at a suitable university is one which merits the most careful consideration. We observe with pleasure, there-

fore, that the president of the Institution of Municipal and County Engineers has invited Mr. Boulnois to read a paper on the subject at the forthcoming annual meeting at Cheltenham. It would be difficult to imagine a more suitable opportunity for the discussion of such an important question.

* * *

Purification of Swimming Baths.

If we have been rather insistent in pointing out the danger to health which is caused by the deposit and germination of disease-bearing bacteria in the water of a swimming bath which is used by a promiscuous number of bathers without renewal or purification, it is because we believe the danger to be both real and preventable. The comparative merits of the process of aeration and filtration, and the use of electrolytic fluid have been discussed in these columns from time to time, and we now recur to the subject for the purpose of directing the attention of our readers to an invention which has just been patented by Mr. Arthur Pollard, a member of the Baths Committee of the Nottingham City Council. Briefly stated, the scheme ensures a continual flow of water from rivers or other watercourses through swimming baths without loss or waste of water, in combination with a mode of filtering and heating the water. While the scheme is devised primarily for baths already existing, or to be built, in proximity to a watercourse, the principle is adaptable to premises not so favourably situated. Swimming baths by the riverside are not by any means uncommon, but, as Councillor Pollard points out, no attempt is made to filter or heat the water used by them. They are often objectionable, and even unsafe, owing to the muddy river bed, while people too weak or delicate to use cold water baths are necessarily compelled to forego the pleasure of a swim, except in warm weather. Councillor Pollard hopes to induce the Nottingham Corporation to adopt his invention. If they do so the result will be watched with interest.

* * *

The Institution of Municipal and County Engineers.

As will be seen from the report which appears on another page, the March council meeting of the Institution of Municipal and County Engineers was called upon to discuss several matters of importance. The Constitution Committee, in their report, recommended that the articles and by-laws should be amended so as to provide for the election into the Institution of engineers holding appointments under authorities such as the Road Board. This recommendation was adopted, and it is to be hoped that it may be possible to carry it into effect with little delay, for it is indeed anomalous that engineers whose work is so closely akin to that of the municipal engineer should be excluded from the ranks of the Institution. As regards the future, attention must be concentrated on the town planning, housing and road conference, and the forty-first annual general meeting, which are to be held at Cheltenham from June 24th to 27th. The preliminary list of papers, which will be found in another column, the visits to works, and the other arrangements which are being made for the comfort, instruction, and entertainment of the members should secure a large and representative attendance. Moreover, an important exhibition of plans, maps and models of town planning and housing schemes will be held during the four days of the meeting. A large number of local authorities, engineers, architects, and others interested in the town planning and housing movement, both in this country and abroad, have undertaken to forward exhibits, and the collection will be one of great educational and practical value.

Bygone Building Acts and the Development of London.*

By W. R. DAVIDGE, ASSOC. INST. C.E., A.R.I.B.A., F.S.I., District Surveyor, Lewisham.

Sometimes one hears suggestions as to the inconsistency of various sections and regulations. It may be so. Is it any wonder, when we consider that perhaps one section, in its essence at least, has stood the test of seven hundred years of argument between the building owner and his neighbour, another perhaps is reminiscent of the days when the only fire protection was the parish "squirt," and yet another comes white-hot from the neo-modern theories of the structural engineer?

ROMAN AND MEDIÆVAL LONDON.

The site of the first Roman city and the lines of its general lay-out have undoubtedly greatly influenced the development of London through the ages. Of the many things we may know with certainty, one is undoubtedly that the Roman building laws were enforced in Londinium Augusta as elsewhere in the empire, and some of these too may even have had their influence in shaping or modifying later ideals. The streets within the comparatively restricted area of the first settlement were apparently laid out in the regular rectangular fashion, and there is no reason to doubt that the regular rectangular arrangement of the walls and streets was extended considerably during the 400 years of the Roman occupation.

Prof. Haverfield thinks that in London no street to-day follows the course of any Roman street.

EARLY ATTEMPTS AT FIRE PREVENTION.

For seven centuries London building was at a standstill, but with the election of her first Lord Mayor, in 1189, the second chapter of London's building history begins. Like many another authority since, FitzAlwyne, the new Mayor, saw the need for regulating the buildings. The London Assize of 1189, the first year of Richard I., although it dates back before the formation of our Parliamentary system, had all the force of a modern Act of Parliament, and in its details it affords a most valuable insight into the conditions of the times. Stow tells us that it remained in force for upwards of 200 years.

FitzAlwyne's Assize of 1189, although aimed against the spread of fire, was not intended to be compulsory, but rather permissive in character, and to facilitate the erection of stone party walls to separate premises belonging to different owners, and "especially for appeasing contentions which sometimes arise among neighbours." Up to this date the greater part of the city had been built of wood, roofed with straw, reeds, and similar materials, and the great fire in the first year of King Stephen (1136), which destroyed practically the whole city, was still in painful remembrance. It appears from the opening statements that after this widespread fire the more wealthy citizens rebuilt their houses with stone party walls and covered the roofs with thick tiles, but that wood and thatch were still in general use.

When two neighbours agreed to build between themselves a stone party wall, each had to give 1½ ft. of land, and a wall 3 ft. thick and 16 ft. high was built at their joint cost, and provision was also made for a party gutter. It is somewhat remarkable that this height of 16 ft. occurs in the present-day Building Acts in connection with requirements as to open space, and is also a limit frequently imposed on projecting shops.

It is evident that "ancient lights" did not worry architects seriously in those days. The height of buildings seems to have been a matter of sentiment.

Modern methods of procedure and those of mediæval times do not greatly differ, for in the very next reign we find an Amendment Act or Further Ordinance to regulate London building (Ordinance of King John, 1212). This second series of regulations was to some extent "panic legislation," brought about in consequence of the serious fire of July 11, 1212. All alehouses, except by special licence, were forbidden unless of stone. Bakehouses and brew-houses were not to use reeds or straws, but wood fuel. Cookshops, bakehouses, and other trade pre-

misces were to be whitewashed and plastered inside and out as a preventive from fire, and all superfluous woodwork removed. Even nowadays lime-whiting of timber is a common enough requirement.

A general admonition was given to whoever wished to build "to take care as he loveth himself and his goods, that he roof not with reed nor rush, but with tile only or shingle or boards or lead." All thatched houses were to be plastered over within eight days, under pain of being demolished. All wooden houses in Cheapside were to be pulled down or amended to the satisfaction of the Mayor and Sheriffs.

REGULATIONS AS TO PROJECTIONS.

Still further regulations were made dealing with projections from buildings. All penthouses and "jetties" (a general name for projections) of houses were required to be at least 9 ft. high, so that folk on horseback might ride beneath them. Irregular structures of this description were required to be removed or altered within forty days under a penalty of 40s. The amount of the penalty has not altered during the last 700 years! No stall was to project from the house to which it belonged more than 2½ ft., a dimension which to the present day is retained to limit projecting cornices.

ATTEMPTS TO RESTRICT BUILDING.

The famous Act of Queen Elizabeth in 1592 (35 Eliz., cap. 6), forbidding any new building within 3 miles of the City of London is, of course, well known. Its opening words give a striking description of the overcrowded and insanitary state of London at a time when its outward appearance, as shown in Wyngaerde's map, was so attractive and picturesque. The effect was considerably spoilt, however, by limiting the Act to seven years, and by allowing an exemption for larger houses assessed at anything above £5 per annum.

The modern idea of the healthfulness of an open belt of country was evidently beginning to make itself felt, for we find a strong prohibition against any further enclosure or encroachment on the numerous commons and open land within 3 miles of the City, such open spaces, having been for many years "heretofore used for training and mustering of soldiers, and for recreation, comfort, and health of the people."

Elizabeth's attempt to stop the growth of London was as futile as Canute's to stop the rolling waves, but she and her successor, James I., persevered in the idea of stopping all building except on old foundations.

Under the Commonwealth Parliament, in 1656, still another Act was passed with the express intention of preventing "the multiplicity of buildings in and about the suburbs of London and within 10 miles thereof." The method of stopping unnecessary buildings was to impose a fine of one year's rent for every new dwelling-house, out-house, or other building upon a new foundation unless it had at least 4 acres of ground.

THE ACT FOR REBUILDING THE CITY.

The Act for rebuilding the City of London after the Great Fire of 1666 (18 and 19 Charles II., cap. 8) provided the first complete code of building regulations. Although, no doubt, in its inception, it had some of the vices of panic legislation, the great City being described as "now lying buried in its own ruins," it is remarkable for its statesmanlike grasp of the situation. The Act early states that "building with brick is not only more comely and durable, but also more safe against future perils of fire," and the outside walls of all buildings in and about the City were henceforth to be of brick or stone.

For the better regulation, uniformity, and gracefulness of all new buildings, they were to be divided into four classes, working upwards in quality:—

First and least sort: Fronting by-lanes.

Second sort: Fronting streets and lanes of note.

Third sort: Fronting high and principal streets.

The roofs of all these classes were required to be uniform, and this restriction seems to have applied

* From a paper read at the last meeting of the Royal Institute of British Architects.

to all buildings, except the halls of the various companies and similar buildings.

Fourth and largest sort: Mansion houses for citizens or other persons of extraordinary quality not fronting either of the three former ways.

The object of the first three classes was to provide for varying thicknesses of wall and heights of story.

In the fourth class, which consisted of mansion-houses "of the greatest bigness," the number and height of stories were left to the discretion of the builder, but not in any case to exceed four stories (in addition to cellar and garret).

The Lord Mayor, Aldermen, and Common Council were empowered to appoint "one or more discreet and intelligent person or persons in the art of building to be surveyors to see the said rules and scantlings well and truly observed," and the surveyors or supervisors were "to take oath upon the Holy Evangelists for the true and impartial execution of their office" within their several precincts or districts.

The setting out of the party walls equally on each owner's land appears to have been one of the first duties of the newly appointed surveyors.

The raising of prices of building materials by means of "rings" or combinations was evidently not unknown, for we find a provision enabling two Judges of the King's Bench to fix the prices of brick, tiles, and lime. A similar method was to be adopted in case of combinations or exactions by workmen.

The streets as a general rule were to be 24 ft. wide, and the Act of 1670 states that many builders advanced their foundations further than formerly to secure regularity for the new streets. Payment was to be made for land taken, the price to be assessed by a jury. A "betterment" clause also existed giving power to charge the owners of houses improved by the opening out of streets.

QUEEN ANNE, 1707-1708.

Fires still continued frequent, and further attempts at fire prevention were felt to be useless without proper appliances. In the reign of Queen Anne two Acts (6 Anne, cap. 58 [1707] and 7 Anne, cap. 17 [1708]) were passed, making it compulsory on each parish to provide two fire engines—viz., one large engine and also a hand engine, and the prompt attendance of the fire engines was secured by offering rewards of 30s., 20s., and 10s., for the first, second, and third parish engines to reach the scene of a fire, "provided they arrived complete and in good order."

Party walls were required by the Act of 1708 to be of the following thickness, somewhat simplifying the code previously in force: Two bricks thick in cellar (half on each man's ground); one and a half bricks thick up to garret floor; one brick thick in gable ends (under penalty of £50).

Parapets to gable ends to be 18 in. above the roof. Front and rear parapets to be 2 ft. 6 in. above the garret floor and coped with stone or brick (1707 Act). This is the first introduction of the idea of carrying the party wall above the roof, which has been one of the bugbears of architects ever since.

For the first time a right was given to the building owner to pull down and rebuild a party wall, charging the adjoining owner at the rate of £5 per rod.

Dangerous trades, such as turpentine distilling, were to be at least 50 ft. away from any other building. The distance laid down in the present-day Act has therefore lasted over 200 years. An important point, too, is the setting back of all door frames and window frames in all houses, which were now for the first time to be set in reveals 4 in. deep—not for a protection from fire, but as a shelter from the weather.

GEORGIAN PERIOD.

Discontent and dissatisfaction seem to have been felt by many with the previous Act of Queen Anne's reign, and an attempt was made to set things right. In 1724 a new Building Act (11 Geo. I., cap. 28) came in, which introduced the necessity for three months' notice to be given to the adjoining owner where it was desired to rebuild a party wall in connection with any new building. Brickwork was to be paid for at £5 per rod. No timber was to be allowed in party walls. Party wall openings uniting buildings were only allowed so long as the premises were used as one house only, and provision was made for party pipes to take off water from roofs.

The Act goes on to show us what was wrong with the Act of Queen Anne. "A very great increase of buildings" had taken place, and many of the houses so built were admittedly not in accordance with the

Act. The owners and head builders were accordingly liable to the heavy statutory penalty of £50, but there was no means of making them put the work right.

WINDOW TAX.

Windows were first taxed in this country by 6 and 7 William III., cap. 18 (1695).

Typical examples of the tax at different dates are given below:—

In 1762.—Eight windows, 11s.; eleven windows, 14s.; twelve windows, £1 1s.; sixteen windows, £1 7s.; eighteen windows, £1 10s.; nineteen windows, £1 11s. 6d.; twenty windows and upwards the same as before—viz., 1s. 6d. per window and 3s. the house.

In 1833.—Eight windows, 16s. 6d.; eleven windows, £1 16s. 3d.; twelve windows, £2 4s. 9d.; sixteen windows, £3 18s. 6d.; eighteen windows, £4 15s. 3d.; nineteen windows, £5 3s. 9d.

TAX ON BRICKS.

Bricks were first taxed in 1784, at the rate of 2s. 6d. per 1,000. This duty was several times increased, until by 1839 it was fixed at 5s. 10d. per 1,000 for ordinary-sized bricks, and 10s. for the larger size. It was repealed in 1850.

LAWS AS TO BRICKS AND TILE MAKING AND SIZE OF BRICKS.

In the time of Edward IV. directions were given for the proper making of plain tiles, roof tiles and gutter tiles.

The Tilers and Bricklayers Company, incorporated in the reign of Queen Elizabeth, had been given power to supervise brick and tile making within fifteen miles of London, but it was found necessary in 1725 to again legislate on the subject.

In 1730 it was found necessary to forbid combinations of manufacturers to advance the price of these materials, and in 1769 the statutory size of bricks within 15 miles of London was reduced to 8½ in. by 4 in. by 2½ in., another clue to the date in buildings of this period.

Concluding his remarks, Mr. Davidge observed that the growth of London had through all the centuries been a source of wonderment and pride to successive generations, and it bid fair to continue at an even accelerated pace. True, statisticians averred that the actual county of London showed an actual decline in the last ten years, but London itself knew nothing of county borders or administrative areas. The state of London's narrow streets, the lecturer continued, was steadily growing from bad to worse, and with the erection of newer and higher buildings in place of the old, the future could not be regarded with equanimity. A right to re-erect old buildings to the old height might be reasonable, but any increased height should be under regulation. Power was also needed, in the interest of wise town extension, to fix building lines both for new and old streets, and to regulate the height of the buildings in relation to the width of the streets on which they abutted. He predicted that in less than 50 years the population would be double what it is to-day, and pointed out that the present generation must prepare not only to improve modern London, but to build an immense city as large again, encircling it north, south, east and west. They must prepare, and prepare at once, for so gigantic a task. They could see ahead but a little way, but that little way was lighted by the illumination which came to them from the past.

Waterproofing of Cement.—The Australian States have combined to build a mutual bank at Sydney. British made materials are naturally being specified where possible, and we understand that 2 tons of Pudlo are being used to cement waterproof the basements, &c., the shippers' agents being Messrs. A. G. Kidston & Co., of Fenchurch-street.

Crystal Palace Engineering Society.—The "Wilson Premium" for the best paper read before the society (affiliated to the Society of Engineers) during the present session has been awarded by the council to Mr. A. E. B. Graham, for his paper on "The Construction of the Uganda Railway." Other papers read during the session were: "Pioneer Engineering," by Mr. R. H. Steed, and "Engineering Progress in Egypt," by Mr. E. H. Sharteni. The premium was presented to Mr. Graham by Mr. Cyril S. Cobb, M.V.O., chairman of the London County Council, on the occasion of the 124th distribution of certificates of the above school on Wednesday of last week.

NEWBURN COUNCIL OFFICES.

This work was won in open competition, and has been carried out by Mr. Edward Cratney, M.S.A., Station-road, Wallsend.

The general contractor was Mr. Thos. Clements, Newcastle-on-Tyne.

The heating, wrought-iron work and electric light

PUBLIC OFFICIALS AS ARBITRATORS.*

By W. VALENTINE BALL, M.A.,
Barrister-at-Law.

In contracts with local authorities it not infrequently happens that disputes are all referred to the county or borough surveyor, and the builder or contractor may very well take exception to his acting



NEWBURN-ON-TYNE COUNCIL OFFICES.

(Mr. Edward Cratney, M.S.A., L.R.I.B.A., Wallsend-on-Tyne, Architect.)

fittings were carried out by Messrs. Emley & Sons, Limited, Newcastle-on-Tyne; the carving was executed by Mr. G. Hughes, of Newcastle-on-Tyne; the oak panelling, council chamber seats and furnishings were executed by Messrs. Robson & Sons, Newcastle-on-Tyne; lead rain-water heads by Messrs. Allinson &



NEWBURN-ON-TYNE COUNCIL OFFICES: COUNCIL CHAMBER.

Sons, Gateshead-on-Tyne; electric installation by Messrs. Robson & Coleman, Newcastle-on-Tyne; and sandstock bricks by Messrs. Wray & Sons, York. The ornamental plaster work to the hall, staircase and council chamber was carried out to the architect's design by Messrs. John Ferguson & Co., Newcastle-on-Tyne.

when the time comes. I need hardly point out that he cannot be objected to merely because he is in the employment of and is paid by one party.

It has long been settled law that this does not disqualify him; but the cases go further. They show that even where a man may possibly be biased, or has expressly declared himself on a matter he is not necessarily disqualified. In *Jackson v. Barry Railway Company* (1893, 1 Ch., 238) objection was taken to an engineer of a railway company acting in the capacity of arbitrator, because in a preliminary correspondence he had expressed a view adverse to the interests of the contractor. This fact did not induce the Court of Appeal to say that he was unfit to act. Lord Justice Bowen said: "To an adjudication in such a peculiar reference the engineer cannot be expected nor was it intended that he should come with a mind free from the human weakness of a preconceived opinion. The perfectly open judgment, the absence of all previously formed or pronounced views—which in an ordinary arbitrator are natural and to be looked for—neither party to the contract proposed to exact from the arbitrator of their choice. They knew well that he possibly or probably must be committed to the prior view of his own, and that he might not be impartial in the ordinary sense of the word. What they relied on was his professional honour, his practice, his intelligence, and the contractor certainly had a right to demand that whatever views the engineer might have formed, he would be ready to listen to argument, and at the last moment to determine as fairly as he could, after all had been said and heard."

The doctrine above enunciated has been considerably modified by certain recent decisions. Thus, it has been held by various judges that a reference to the surveyor or architect of one party will not be

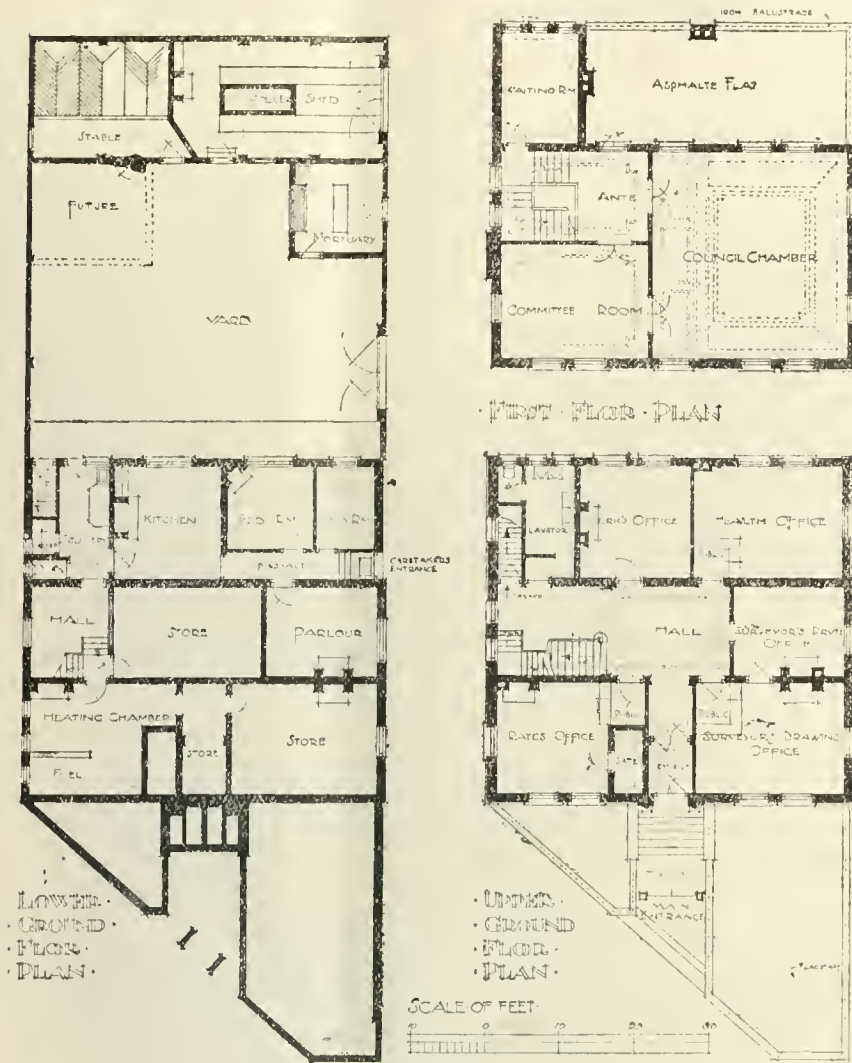
* Extract from paper read last night before the Society of Architects.

enforced (c) if the question to be decided is one which cannot be properly determined without the cross-examination of the surveyor (*Freeman v. Chester Rural District Council*, 1911, 1 K.B., 783); (b) if the dispute

Corporation, 1909, 75 J.P., 129); (d) if, although acting honestly, the surveyor has lost his independence by conferring with and accepting advice from one party to the contract (*Roberts v. Hickman*, 2 H.B.C., 3rd Supplement, p. 10); (e) the contractor will not be compelled to submit if the matter in issue is an unseemly personal dispute raising a vindictive feeling between the engineer and the contractor, and the engineer has so strongly expressed his view that it amounts to a prejudgment (*Nuttall v. Manchester Corporation*, 1893, 8 T.L.R., 513).

I think it may be said that in the above cases the Courts have gone as far as they are likely to go in the direction of relieving contractors from the arbitration clause. I heard of the following attempt to extend the doctrine: A dispute was on foot between a contractor for the erection of a county hospital and the local authority. The contractor had made a large claim for extras, and the architect had quoted the county surveyor, who was named as arbitrator in the contract as having said that in allowing for extras he had already taken the contractor's claim into account. In these circumstances the contractor sought to have the reference to the surveyor set aside on the ground that the surveyor had already committed himself to a view of the matter. He failed in his attempt.

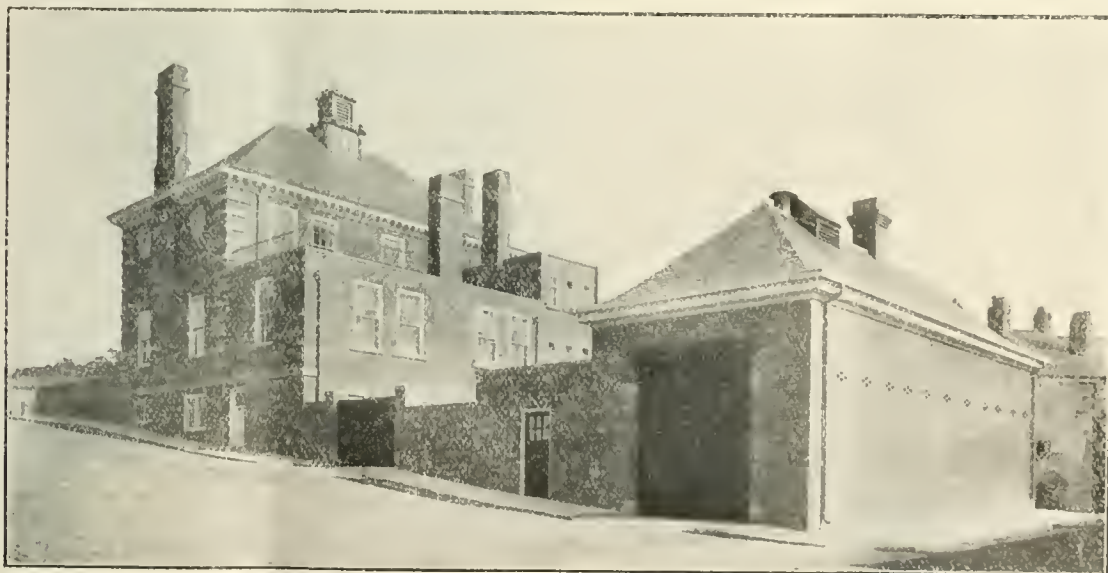
It may seem odd that a reference should in any case be ordered to proceed when one party takes serious objection to the arbitrator, but when considering this class of case it is well to remember that the parties have voluntarily bound themselves to submit disputes to a certain person. In the stress of competition your builder or contractor makes a tender, and rushes blindly in without considering



NEWBURN-ON-TYNE COUNCIL OFFICES.

be as to the existence and terms of an agreement made between the surveyor (acting for the building owner) and the contractor (*Gird v. Bristol Corporation*, 1912, 28 T.L.R., 278); (c) if the question is whether

they have voluntarily bound themselves to submit disputes to a certain person. In the stress of competition your builder or contractor makes a tender, and rushes blindly in without considering



NEWBURN-ON-TYNE COUNCIL OFFICES: SOUTH ELEVATION.

the surveyor did or did not act unreasonably—e.g., by making alterations and amendments in drawings, by delaying the delivery of drawings and materials, and by rejecting suitable material (*Blackwell v. Derby*

the arbitration or any other clause. He has only himself to blame if, when disputes arise, the judge who is to consider them is not altogether to his liking.

Relation between the Disposal of Sewage and the Death-rate.

This forms the subject of one of the recently issued reports of the Metropolitan Sewerage Commission of New York, in which the benefits that are likely to accrue from the system of main drainage proposed by that body are presented.

The commission observe at the outset that the most important benefit would be to health. The argument upon this head, although circumstantial and incapable of mathematical demonstration, was nevertheless conclusive. It rested upon the known relations which now existed between the polluted condition of the harbour and the public health, as, for example, bathing, shellfish, driftwood, flies and odours, and the possibility of materially reducing the death-rate through a systematic treatment of the sewage.

On comparing the death-rates of New York with those of London, Paris and Berlin for the last year for which the statistics of all four of these cities are available, it appears that New York's rate was exceeded only by that of Paris. For the ten years ending in 1909, New York stood at the bottom of the list. London and Berlin were well in the lead. These facts referred both to the crude and corrected death-rates.

"For the purpose of studying the relative healthfulness of cities," the commission state, "corrected death-rates are indispensable, since they have for their object the elimination of differences in the population which considerably affect the results. When the corrected death-rates of the four cities here mentioned are compared, it is seen that the death-rate of New York is higher than the crude rate indicates, whereas the corrected rate for London is lower than the crude rate for that city. Consequently, the difference in healthfulness between London and New York is seen to be greater than the crude death-rates indicate. London's crude rate of 14 is 12½ per cent less than New York's crude rate of 16, and London's corrected rate of 13.7 is over 2½ per cent less than New York's corrected rate of 17.5. Comparing New York with the other cities in the group . . . Berlin's corrected rate of 16.4 is 6.3 per cent lower than the corrected rate for New York. New York's corrected rate is exceeded by that of Paris by 2.8 per cent."

The commission can see no reason why New York should not have as low a death-rate as London or Berlin; on the contrary, it could, apparently, have the lowest rate of any city of its class, and the attainment of this result, it is suggested, should be the aim.

"New York is a good example of a city of the largest class wherein the highest requirements of sanitation are demanded, and are, at the same time, capable of being satisfied. Occupying an unrivalled situation, a favourable climate, good and abundant water supply and an efficient health administration, it should be the aim of every citizen to make New York's death-rate the lowest to be found among the municipalities of the class to which this city belongs. New York should be the cleanest city in the world if for no other reason than to afford a barrier against the danger which results from the immense influx of immigrants from all parts of the world who, not infrequently, bring epidemic diseases to this port, a danger which is intensified by the highly congested conditions under which most of the population lives and works.

"Owing to the congestion of population, practically all the conditions necessary to maintain life in a wholesome way must be secured through a careful and skilful observance of sanitary rules and principles. This relates not only to the food, clothing and habitations of the people, but, in a peculiar degree, to the care of their wastes. Upon the prompt and complete disposal of these wastes largely depends the comfort, convenience and healthfulness of the city."

UNSATISFACTORY CONDITIONS OF SEWAGE DISPOSAL.

The commission remark that the most important sanitary provisions which a modern city can possess are the public water supply and sewerage system. "The relation between these two public services is very close. Aside from a small proportion of the water which is used for drinking purposes and for the extinguishment of fires, nearly the whole of the public

water supply is used for cleansing that is, for the removal of bodily, household and street wastes.

"The sanitary function of water is to act as a vehicle in removing the waste materials from their source. To be satisfactory, this removal should be prompt, complete, and unattended by injury to health or offence to the senses. Removal to a certain distance from its points of origin usually can be accomplished satisfactorily up to a certain point by modern sewerage systems, but the disposal of the sewage at the outlets of these systems often presents a problem of great difficulty.

"Until recently there has been no question as to the efficiency of the custom of sewage disposal pursued by New York and its neighbouring municipalities. House sewage and street washings have been discharged without regulation or purification of any kind into the nearest tide waters. Investigation has shown that it is unwise longer to count blindly upon the purifying action of dangerous and offensive wastes which are discharged every day into the arms of the harbour which intersect the city in every direction. Only a part of the sewage is flushed out to sea; some is turned into gas; some is liquefied by the bacteria in the water, and some is stored in pockets and sludge banks. All of these processes are attended with more or less nuisance. Gradually the harbour as a whole is becoming over-polluted."

POSSIBILITY OF REDUCING THE DEATH-RATE.

"That a material reduction can be made in the death-rate seems assured by the reduction which has been made in it during recent years, from the fact that this city does not now possess a large death-rate as compared with London or Berlin, and from the fact that such a reduction always follows the introduction of a great sanitary improvement.

"New York stands third among the four great cities in regard to its death-rate, the crude or uncorrected rates for which are commonly but erroneously assumed to give a correct basis for comparing the relative health of the populations. The crude death-rate, which is obtained by multiplying the number of deaths per year by 1,000 and dividing by the population, gives an imperfect knowledge of the healthfulness of a city, since it fails to take account of well-recognized differences in susceptibility to disease which exist among different elements in the population. Females have lower death-rates than males, in consequence of which a city which has an unusually large proportion of males is healthier than it appears to be. Young children and old persons have a higher death-rate than the average, from which it follows that a city in which there is an unusually large proportion of persons in middle age is less healthy than it seems.

"Among the most important causes of these differences in susceptibility in the greatest cities are those which are due to sex and age. A proper comparison of the healthfulness of cities cannot be made until their crude death-rates have been corrected.

"In 1913 the commission requested Prof. Walter F. Willcox, the eminent statistical expert of Cornell University, to report on the corrected death-rate of New York City, comparing the age and sex distribution of New York, London, Paris and Berlin with each other through some standard population. Prof. Willcox found that in London, Paris, Berlin and New York the females outnumber the males. The difference is least in New York—4 in 10,000—and greatest in Paris—638 in 10,000. The effect of the correction to be made on this account is to raise the rate for New York. New York has a larger proportion of persons in the healthy ages than any of the other cities with which it can be compared. Among every 10,000 persons in New York, there are 249 more than there are in London who belong to the healthy ages. The effect of the correction to be made on this account is to lower the rate for New York. The corrections for sex and age to some extent counterbalance each other. If corrected for sex, New York would have a lower death-rate than any of the other three cities; if for age, the rate would be higher. The combined effect is to make the crude death-rate lower than it should be. This influence is stronger in New York than in any of the other cities."

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2.

IS THE STREET TRAMWAY DOOMED?

To the Editor of THE SURVEYOR.

SIR,—There are several observations which, with your permission, I should like to make on the subjects brought forward and those suggested by the article in the *Commercial Motor* to which you refer in your issue of April 10th. The writer of the article is, possibly, the first municipal engineer to put forward the opinions indicated by your extracts, and it is to be hoped that he will satisfy our not unnatural curiosity by disclosing his name.

His article, I may point out, appeared shortly after a discussion which took place at the Institution of Civil Engineers on the papers by Mr. Gribble and Mr. Clarkson, abstracts of which appeared in your issue of March 27th. These papers provided recent and authoritative data for a discussion of the merits of the three systems of transport—tramways, wire 'buses and motor 'buses. At this meeting I stated that, in my opinion, the tramways should be scrapped, and that the motor vehicle provided the means of transport to replace them as well as the means of transport for the thousands of miles of road now awaiting traffic developments. I did not, of course, indicate any particular type of omnibus as *the* type for general use; it is a matter of comparing one kind of transport system with another.

As regards country roads, my own and other opinions—adverse to tramways or light railways—were expressed in my article in your issue of February 27, 1907, and I have not seen any reason to alter that opinion. It is, indeed, probable that the resistance which those interested in motor vehicles offered to the laying of tramways and light railways on country roads was made effective by the further opposition which some of us who wrote from the highway point of view were enabled to make through the medium of the then, as now, influential SURVEYOR. I think that few, if any, county and district surveyors are now at variance with our opinion. As regard towns and suburbs, matters were on a different footing, and I have possibly shared with some municipal engineers a reluctance to condemn urban and suburban tramways, which, by the body of the profession, seem to be regarded as a valuable means of transport. Closer acquaintance with the traffic conditions of to-day in the London area, and special study of important tramway and motor-omnibus routes, have, however, led me to form an opinion so definite that I felt justified in expressing it publicly before the parent institution. Whether this encouraged "A Well-known Municipal Engineer" to write his *Commercial Motor* article, or whether he had already prepared that article, I do not know. Anyhow, I got my blow in first. The opinions I expressed at the Civils' meeting on March 18th were that the thousands of miles of road awaiting transport systems would be served by motor vehicles, that even in the urban and suburban areas now served by tramways these tramways would be scrapped, and that the wire 'bus is only the last gasp of a dying tramway system.

In your issue of January 27, 1905, one of your "retrospective" articles ended with a passage (p. 92) showing a grasp of the significance of the presence in the London streets of a few dozen, or few score, motor omnibuses, and THE SURVEYOR was thus, I believe, the first engineering paper to read aright the signs of the times, though journals devoted to motor matters were naturally more sanguine as to possible developments. Possibly the invitation which you have held out to municipal engineers to express opinions as to the doom of the tramway system may lead to your adopting an official view in accordance with the opinion which I have ventured to place conspicuously before the profession at large.

A belief that the tramway is doomed involves no adverse criticism of the work of tramway engineers. The tramway system is a fine example of engineering skill; the trouble is that it is in the wrong place on public roads and streets, and prevents the application of methods of construction and maintenance proper to such highways. The authorisation of trailers on certain lines only hastens the end, being at once a challenge and an admission that the tramway is a railway. While they have been occupying the public

roads, the natural sphere of the tramways has been to some extent filled by branches and loops of steam railways intended for local traffic, and possibly less suitable for that traffic than would have been tramways of the ordinary type occupying roads of their own. The railways strangled the first-born of the motor-vehicle family and put a changeling in its cradle, and the proper place of that changeling is now occupied by the legitimate offspring of the railways, while the younger and more vigorous children of the motor vehicle family are struggling for their birthright.

Lastly, a word of caution as to the permissible development of motor transport on the public roads. In the article already referred to (February 27, 1907) I pointed out that there was a danger that main roads might be so exploited by owners of motor vehicles that a specialisation might be brought about, such as would lessen the value of the roads to the public generally, including users of ordinary motor vehicles. This attitude I have maintained, and I believe that the public owes much to THE SURVEYOR, which has defended the roads from being exploited in this manner. The motor associations have had, no doubt, the best intentions in this matter; but their view was a narrow one.

I still hold the opinion I expressed in 1907—namely, that such developments of motor traffic as cannot take place without ill-effects upon the truly highway character of public roads should be rendered possible by the making of trunk motor roads, provided with bridges over ordinary roads. I do not believe that many such need be made; but a few would be useful, especially between manufacturing districts in the North and the North Midlands. As regards local passenger transport in urban areas, a relatively slow-moving vehicle of large capacity would take the place of the present tramways, while lighter vehicles would deal with traffic to outlying areas.—Yours, &c.,

REGINALD RYVES.

April 14, 1914.

To the Editor of THE SURVEYOR.

SIR,—I read with considerable interest your article on the above subject quoted from the *Commercial Motor*. There can be no doubt, I think, that the motor 'bus has come to stay, and is the democratic vehicle of the future. There may be cases where tramways are required in order to bring people in from the suburbs of a town, but even in such cases it is doubtful if they can compete, either in speed or convenience, with a good service of motor 'buses. But if this description of traffic is to increase on our ordinary roads, how is the question of their maintenance to be met? There is no blinking the fact that the road of the future will have to carry more and more traffic, for there is no finality to mechanical traction when once it has commenced, and the road maker and mender of the future will be faced with difficult problems.

It may eventually become necessary to tax all kinds of self-propelled vehicles in such a way that the whole of the proceeds of this taxation shall be devoted to the maintenance of roads in some proportion to the amount of traffic they are called upon to bear. It is idle to think that legislation may step in and prevent certain classes of locomotion on certain roads; such restrictions could only be temporary, as the needs of commerce would very soon make itself heard.

The problem has got to be faced; money will have to be spent on our roads, and the sooner this fact is seriously grasped the better for this country.—Yours, &c.,

H. P. B.

April 13, 1914.

ROAD TERMINOLOGY.

To the Editor of THE SURVEYOR.

SIR.—No British highway engineer of to-day needs to be told that tar and bitumen are not synonymous terms. Laymen, however, not being so well informed on the subject, are liable to confuse one material with the other, and it may not be amiss to state briefly how that confusion in the lay mind may possibly have arisen from the loose manner in which engineering nomenclature has been used in the past.

The term "bituminous" as applied to a certain quality of coal is familiar, and doubtless understood by most of us. Scientists put such coal in the class of pyro-bitumens, and on this ground it might appear to be reasonable to describe an educt of such a material as bitumen. It would, however, be necessary to qualify that term by prefixing the word "artificial."

and no road maker would care to have such a word applied to anything he was using.

It will be argued that tar is recognised as a bituminous product of gasworks, and that therefore a road which has been treated with tar may be fitly described as a bituminous road. Here it is that not only the lay but the professional mind will have to seek further information, and a third term, "asphalt," with its admitted ambiguity, is sure to come up.

Can we not at once get rid of all confusion and possible misunderstanding by dropping the word "bituminous" altogether in any relation to tar in its employment on roads? Let us speak of a road which has been surface treated with tar as a "tarred road"—there is nothing new or original in this—then we have the tar-macadam road, and last, but by no means least, the "pitch-bound road." We will then have no use for the term "bituminous" in any of these three references.

The above remarks may seem to be of an academic rather than a practical character. They are not submitted with any intention to interfere with or replace any terms or definitions which may have come from a representative or authoritative source, and should be regarded merely as suggestions made with a view to clear the ground before bitumen is approached.

Those readers of THE SURVEYOR who followed the

exception could be taken to the application of the term "bituminous" to the finished road.

It is to be hoped that the approaching publication of the Bouhois Glossary will lead to greater precision and uniformity in the use of road terminology.—
Yours, &c.,

JOHN HUTCHINSON.

11 Tothill-street,
Westminster, S.W.
April 14, 1914.

MUNICIPAL ENGINEERING IN CHINA.

NEW PUBLIC OFFICES FOR SHANGHAI.

The accompanying illustration is a perspective of two sides of the new municipal buildings which it is intended to erect in Shanghai. The general design is by Mr. R. C. Turner, chief architectural assistant to Mr. Chas. H. Godfrey, M.A.S.T.C.E., chief engineer to the municipality, and the perspective view is by Mr. C. W. English, of London. The two sides shown and part of another will be commenced at once. The estimated cost of this portion is £110,000, exclusive of land, the assessed value of which is £180,000.

We reproduce also a photograph of the indoor



PROPOSED NEW MUNICIPAL BUILDINGS FOR SHANGHAI.

correspondence on the subject of what is and what is not bitumen (August, 1912—August, 1913) will have observed the intimate knowledge of the subject displayed by many of the writers in expressing their views. Is it too much to hope that the contributors to that discussion will be given an opportunity of stating their views personally as "witnesses" before the Standardisation Committee who have the nomenclature and accompanying definition of bitumens in hand? The subject being, as it were, *sub judice*, it would not be proper to offer any remarks at this stage beyond saying that the responsibility which rests with the committee is considerable, not only as regards the claims of science, but those of commerce.

With the knowledge that highway engineers have acquired by practical experiments of the comparative properties of coal-tar products and bitumens, no great difficulty will be found in selecting the material which is best adapted to the requirements of the work to be carried out. No doubt some authorities will be found to agree with de Smedt* as to the properties of adhesiveness, tensile strength, and impermeability being present to a greater degree in tar than in bitumen, while others will take the view that bitumen is less liable to be affected by atmospheric influences, and will consequently give better results under severe traffic conditions.

It may be that both binders will find a place together in the making of British roads, the more powerful (according to de Smedt) being used in the form of tar or pitch-grouted macadam as a sub-crust, and the other as a wearing surface. This would be a happy combination of the home product with the imported material, and in such a case it is probable that no

staff of Mr. Godfrey, among the group being nine who have been trained in, and recruited from, municipal offices at Home, as shown below:—

	Arrived Shanghai	Served articles with	Last office in England
C. Harpur ...	1902	Wm. Harpur, Cardiff	Willesden
C. H. Godfrey	1898	R. Godfrey, Kings Norton	Manchester
J. E. Needham	1905	J. C. Pardoe, Barry	Barry
F. G. Helsby	1907	C. H. Cooper, Wimbledon	Wimbledon
W. A. L. Pardoe	1913	J. C. Pardoe, Barry	Barry
H. E. Pollard ...	1907	W. J. Newton, Accrington	Accrington
M. H. Shorto	1912	Thomas Moulding, Exeter	Stockport
A. F. Gimson	1913	C. H. Cooper, Wimbledon	Wimbledon
L. H. W. Crockwell	1911	H. A. Garrett, Torquay	Torquay

There are thirty other members of the Public Works Department, forming an outdoor staff of clerks of works, inspectors, and so forth.

Swansea's Costly Improvement.—At the Swansea Town Council meeting on Wednesday it was stated that the price of the corporation's recent purchase of Temple-street corner for street widening purposes worked out at £58,400 per acre.

Cost of Leicestershire Roads.—In a return showing the increased cost in connection with the main roads and the necessity for the increased rates, comparing 1896 and the present time, the Highway Committee of the Leicestershire County Council inform the Loughborough Rural District Council that the increased expenditure is £12,500, due to the fact that 14,000 tons more granite are required, and owing to the extra cost of stone and labour.

* British Patent de Smedt and Twining, 1881.

ROADS IMPROVEMENT ASSOCIATION.

REPORT FOR 1913.

The report of the above association for 1913 states that the movement for improved roads and better facilities for all forms of traffic has made great progress. "The Third International Road Congress," the report proceeds, "being held in London greatly assisted in increasing the interest of the general public in road topics. Many of the association's trunk road improvement schemes have made substantial advances. There is need now for much more collaboration between the road user and the road maintainer, and the association is taking steps to organise this. If road transport is to be handled efficiently and economically it is essential that representatives of both sections of the problem—the traffic and the road—should confer freely and frequently. The road user places traffic of various types, speeds and weights upon the road, and the road maker is confronted by varying conditions in regard to supply of material.

Roads Improvement Association, and negotiations have been opened with the local authorities concerned to develop the scheme."

(5) Birmingham and Wolverhampton Road.—"The campaign for the improvement of the surface of this important Midland thoroughfare has been continued."

£100 FOR AN IMPROVED HORSESHOE.

In this competition over 850 shoes were submitted by entrants from the United States of America, Canada, South Africa, Australia, China, Germany, France, Holland, Sweden, and all parts of the United Kingdom. The judges selected shoes entered by seven competitors for special tests. These competitors have supplied five sets of shoes, which have been fitted upon representative horses in London, Leeds, Birmingham and Sheffield, and are now undergoing practical tests.

TRAINING FOR ROAD ENGINEERS.

Following the letter to THE SURVEYOR, in which Mr. H. Percy Boulnois pointed out that there appeared to be an abiding future for the road or highway engi-



SHANGHAI MUNICIPAL ENGINEER'S STAFF.

(In the front row, reading from left to right: Mr. C. Luthy, constructional engineer; Mr. R. C. Turner, chief architectural assistant; Mr. C. Harpur, son of the city engineer of Cardiff, deputy engineer, recently married and now at home on leave; Mr. C. H. Godfrey, M.I.C.E., municipal engineer, son of the late Mr. R. Godfrey, for many years engineer to the Kings Norton District Council, and a member of the council of the Institution of Municipal and County Engineers; Mr. J. E. Needham, chief assistant engineer; Mr. W. E. Sauer, chief surveying assistant; Mr. F. G. Helsby, first assistant engineer.)

financial resources, &c. It is only by close co-operation and a generous exercise of give-and-take upon both sides that the best results can be obtained for the benefit of all classes of road users."

The trunk road improvement schemes mentioned in the report are as follows:—

(1) Great West Road.—"The general outlines of a scheme have now been agreed upon by the Middlesex County Council and the Road Board. A new road, 100 ft. wide, is to be constructed from High-road, Chiswick (near Gunnersbury-lane), to the Bath road at a point about 600 yds. west of Hounslow Barracks Station, with suitable connections to existing thoroughfares. The gross cost is estimated at £560,000, of which the Road Board will contribute 75 per cent."

(2) London-Brighton road (road to by-pass High-street, Croydon).

(3) London-Portsmouth road (road to by-pass King-ton-hill).

(4) Manchester and District and Southport.—"Better road communication between these localities is badly needed; the existing route is far from satisfactory, and passes through the worst colliery districts. A suggested new line of route has been evolved by the

neer, and asked in what manner a member of this new profession should be trained, the Roads Improvement Association approached the various engineering institutions and societies, inviting their support and co-operation in the formation of a scheme for the establishment of a Chair of Highway Engineering at a suitable university. The Institutions of Mechanical Engineers, Municipal Engineers, and Automobile Engineers have already notified their support, and nominated representatives to join a small sub-committee which the association suggested should be established. The president of the Institution of Municipal and County Engineers has invited Mr. Boulnois to read a paper on the subject before the institution at its meeting at Cheltenham in July next, at which, it is understood, Sir George Gibb will be present to open the proceedings.

The president H.R.H. Prince Arthur of Connaught, K.G., G.C.V.O., has intimated that he hopes to occupy the chair at the annual general meeting of the Roads Improvement Association, which will be held in the Council Chamber of the Institution of Civil Engineers, Great George-street, Westminster, on Thursday next, the 23rd inst., at 4.30 p.m.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

COUNCIL MEETING.

At the last council meeting of the institution the following were elected as Members: Messrs. J. N. Stirling, burgh surveyor, Helensburgh; G. Cumison, burgh surveyor, Blairgowrie; A. Dunn, chief assistant engineer, Bombay Municipality; and J. Weekes, burgh surveyor, Newport, Fife. Associate Members: Messrs. R. H. Shaw, engineering assistant, Hford Urban District Council; F. A. Hilborn, deputy engineer, Lucknow, India; and R. W. N. Winstanley, chief draughtsman of the Melbourne City Council. Students: Messrs. G. I. G. Smith, articled pupil to surveyor, Hebden Bridge Urban District Council; S. A. Holman, articled pupil to surveyor, Southwick Urban District Council; R. C. Lewonski, assistant surveyor, Southwick Urban District Council; H. E. Denham, articled pupil to surveyor, Tilbury Urban District Council; H. G. McDowell, articled pupil to surveyor, Hendon Rural District Council; E. C. Seabrook, junior assistant to the Hendon Rural District Council; W. Pickstone, articled pupil to borough engineer and surveyor, Bury; G. H. Pratley, articled pupil to borough surveyor, Cheltenham; and J. D. M. Morton, articled pupil to surveyor, Lytham Urban District Council. Transferred Associate Member to Member: Mr. W. H. Johnson, assistant city engineer and surveyor, Chester. Transferred Student to Associate Member: Mr. W. H. Price, engineering assistant to sewerage engineer, Leeds.

ELECTION OF COUNCIL, 1914-15.

Upon the report of the scrutineers of the ballot lists the following were found to be elected as the council for 1914-15:—

President: Mr. J. S. Pickering.

Vice-presidents: Messrs. T. W. A. Hayward, H. T. Wakelam, and P. H. Palmer.

Ordinary Members of the Council: Messrs. J. Patten Barber, W. N. Blair, J. A. Brodie, J. S. Brodie, G. F. Carter, A. E. Collins, W. Harpur, W. T. Lancashire, H. E. Stilgoe, and C. F. Wike.

Honorary Treasurer: Sir James Lemon.

ARTICLES AND BY-LAWS.

The Constitution Committee reported that they had considered various suggestions received from members of council as to alterations to the articles and by-laws. The committee did not see their way to recommend that the examination of the institution should be made compulsory for applicants for election to associate membership, or that application for membership should be compulsory for successful candidates for the examination of the institution.

The committee, having considered the present arrangements as to the admission of visitors to meetings, recommended that the same remain in force as at present.

The committee were of opinion that the articles and by-laws as at present constituted enabled the council to take a ballot of the members (by post-card or otherwise) upon any matter concerning the institution, should occasion at any time arise.

The committee recommended that the articles and by-laws be amended upon the advice of the solicitor to provide as far as possible for the election into the institution of engineers holding appointments under authorities such as the Road Board.

The committee recommended that the articles and by-laws be amended to provide for the election of twelve ordinary members of council instead of ten as at present, and that two of the twelve gentlemen elected should be associate members of the institution.

The committee did not see their way at present to recommend the formation of a new class of associates.

The committee considered a letter received from Mr. Bryce suggesting that as the duties of the Scottish vice-president and the district chairman for Scotland were usually carried out by the vice-president, the election of a district chairman was not actually required. After careful consideration the committee recommended the council that no action was necessary in this direction at present.

The report was adopted, with an instruction to the committee to further consider the amendment of the articles and by-laws to provide for the admission to membership of members directly engaged upon the staff of municipal and county engineers and surveyors not being engineering assistants.

SUPERANNUATION.

Mr. Bramall, solicitor to the institution, advised the council that under the present Articles of Association it would not be competent for the institution to establish a superannuation fund for its members.

SPECIAL EXAMINATIONS.

Mr. Bramall advised that if the proposed special examinations came within the scope of the provisions of the clause in the Memorandum relating to examinations there was no necessity to amend the articles and by-laws in this respect.

CHARLES JONES MEMORIAL.

The secretary reported receipt of subscriptions to date amounting to £41.

EXAMINATIONS: SUGGESTED NEW SUBJECT.

A suggestion that a new subject dealing with "Gas Engineering" should be added to the syllabus was referred to the board of examiners for consideration and report.

NOMINATION OF VICE-PRESIDENTS.

Mr. W. H. Prescott gave notice that he would move the following resolution at the next meeting of the council:—

"That this council is of opinion it is not in the best interests of the institution to follow the practice of nominating the president or vice-presidents according to seniority of service, and it is hereby agreed that the practice be not observed in all future elections."

EASTERN DISTRICT MEETING.

A meeting of the Eastern District took place at the offices of the institution on the 21st ult., Mr. H. T. Wakelam presiding.

The hon. district secretary (Mr. J. A. Webb) reported that meetings at Chelmsford and Tilbury had been fixed and the arrangements were left in his hands.

A letter was read from Mr. Cole, enclosing copy of resolution passed by the North-Eastern District Committee.

It was unanimously resolved on the motion of Mr. E. Willis: "That the meeting of the Eastern District of the Municipal and County Engineers, having considered the resolution passed at the North-Eastern District meeting, is of opinion that the ordinary meetings of the council should be held in London at the offices of the institution, or at such other place as may prove most convenient to its members."

Nominations for chairman, secretary and district representative for the ensuing year were made as follows: Mr. H. T. Wakelam, chairman; Mr. W. H. Prescott and Mr. E. J. Elford, representatives on the council; Mr. J. A. Webb as hon. secretary.

The question of appointment of two assistant district secretaries, one for the district of Norfolk, Suffolk and Cambridge, and the other for the counties of Northants, Beds and Bucks, was discussed. Mr. Harrison, of Wellingborough, reported that an association of surveyors was being formed in Northampton. It was left to Mr. Harrison and the hon. secretary to call a meeting of the members at a convenient centre and arrange to appoint an assistant secretary for Northants, Beds and Bucks at that meeting.

It was left to the hon. secretary to see Mr. Julian and to call a meeting of the members at Cambridge, and appoint an assistant secretary for Norfolk, Suffolk and Cambridge that day.

The question of the "Journal" was discussed, and the following resolution, proposed by Mr. Willis, and seconded by Mr. Jenkins, was carried unanimously: "That this meeting of the Eastern District regrets the opposition to the institution's 'Journal,' and gives the council its whole-hearted support in the publication of the 'Journal,' and hopes to see it permanently continued."

IRISH DISTRICT MEETING.

At a meeting of the Irish District of the Institution of Municipal and County Engineers held at Armagh on the 21st ult., Mr. R. H. Dorman in the chair, the hon. district secretary (Mr. M. Sellars) reported that the district had increased its membership by twelve since the last meeting, and that sixteen county surveyors, in addition, had become affiliated members. Mr. Leebody proposed and Mr. Shillington seconded the following as officers for the ensuing year: Mr. W. E. L. Duffin (vice-president), Mr. R. H. Dorman (representative), Mr. J. F. Delany (chairman), Mr. M. Sellars (hon. district secretary).

A resolution was passed similar to that of the South-Western District calling for a post-card poll of the members, associate members, and students, asking definitely whether they are in favour of retaining the old volume or not.

A resolution was adopted approving of the council meetings being held in the provinces periodically instead of always in London.

The chairman referred to the idea of holding a District meeting in the South of Ireland in the summer, preferably in Cork at the end of July, and said he desired to see a provincial road congress held at the same time and place. It was agreed to take immediate action in this matter, and a committee was appointed with power to add to their number, and with full power to make whatever arrangements were considered desirable.

A discussion followed on "The best crust for Irish roads in the immediate future." Mr. Dorman afterwards entertained the members to lunch at Tullymore Park.

THE CHELMSFORD MEETING.

At to-morrow's Eastern District meeting at Chelmsford, we are asked to state, the members will be taken round on a tour of inspection in motor 'buses kindly provided by the National Steam Car Company, whose works are situated in the town.

STREET MAINTENANCE IN CAPE TOWN.

By W. J. JEFFRIES,
City Engineer.*

The cost of maintenance of the streets and footways, including the salary of the superintendent of roads, and a proportion of the votes for travelling expenses, water and establishment charges, has been £20,604, an increase of £1,800 over the previous year. Out of this sum an additional 7½ miles of streets have been made up and tar-sprayed, so that there is now a total of about 24 miles of streets with a tar-sprayed surface.

Of the 24 miles of tarred streets, about 11½ miles had been treated throughout the whole length more than one year ago, and they have therefore had a clear year's maintenance. These show a slight saving as compared with the untreated macadam road, but they do not compare anything like so favourably as they did last year. Still, there is a saving, and there is the improved surface, and the increased comfort brought about by the minimising of the dust and mud nuisance.

The paved streets, which showed up very favourably indeed in last year's comparison of cost, appear in a still more favourable light this year, the cost of maintenance having come down from £88 to £71 per mile. When this is compared with the £319 per mile for macadam streets, it will be seen that the paved streets are contributing handsomely towards their interest and sinking fund.

At the present time the 83 miles of streets in the city are classified as follows: Paved with setts, wood or asphalt, 22 miles; tarred, 24 miles; macadam, untreated, 37 miles.

The following return shows as nearly as possible the cost of maintenance in each class of street. The figures are affected to some extent by the fact that many of the streets are subject to different treatment in different sections. Some are partly tarred and

Description of streets.	Mileage.	Total cost.	Cost per mile.
Total mileage of streets (all classes)	83	£ 20,604	£ 248
Streets under macadam including 19½ miles of streets tarred or partly tarred	48½	14,765	319
Macadam streets dressed with tar throughout whole length more than one year ago	11½	3,226	287
Streets paved throughout	19½	1,372	71
Streets part paved (about 2½ miles paved)	6	1,240	207

partly paved, some partly tarred and part under untreated macadam, and some part macadam and part paved. In the case of the streets which have an uniform surface throughout it has been possible to record the cost separately. The streets which are partly paved and partly macadamised have also been

kept separate, but this has not been possible in the streets partly tarred and partly water-bound macadam, because the process of bringing new areas under tar has been in continuous operation. The streets shown as under macadam therefore compare a little less favourably than they probably would under ordinary circumstances.

SCAVENGING.

Every endeavour has been made to carry out the cleansing of the city in an effective and economical manner. The work had to be done under somewhat adverse circumstances, owing to the long spell of exceptionally dry weather which necessitated the restriction, and later on the total prohibition, of the use of fresh water. This involved the complete re-organisation of such works as the cleansing of the asphalt and other paved streets, the flushing of catchpits, and the watering of the streets.

In spite of the extension of the area of paved or tarred streets, there is again a large increase in the number of loads of sweepings removed from the streets, and there has been an increase of about 8,000 in the number of loads of house refuse removed.

During a long period of drought salt water was used for street watering, and on the macadam streets this proved more effective as a dust layer than fresh water. Among the drawbacks to its use are the extra haulage entailed through the salt water hydrants being situated at greater distances from each other than is the case with the fresh water hydrants, and the occasional delays caused by the failure of the salt water pumping system. The total consumption of water for these services was 8,500,000 gallons of fresh and 2,500,000 gallons of salt. Street watering cost £1,721, and flushing catchpits £897. There is a saving of about £800 under the heading of street watering, probably due partly to the use of salt water and partly to the extension of the area of paved or tarred streets.

DUBLIN TOWN PLANNING COMPETITION.

The Executive of the Civic Exhibition, Ireland, 1914, are inviting designs for the improvement and extension of Dublin, and the Lord Lieutenant has offered a premium of £500 to be awarded to the author or authors of the design which may be placed first in order of merit. The conditions have been very carefully compiled by the Technical and Advisory Committee of the Housing and Town Planning Association of Ireland, with the expert advice of Prof. Patrick Geddes, of Edinburgh, and Mr. John Nolen, M.A., Sc.D., of Cambridge, Mass. These two gentlemen will also, by request of the Lord Lieutenant of Ireland, act as adjudicators, and they will have as a colleague Mr. Charles McCarthy, Fellow of the Royal Institute of the Architects of Ireland, city architect of Dublin.

The committee do not feel that they are as yet in a position to foresee the requirements and future development of Dublin with sufficient definiteness to justify them in promising to recommend for execution any of the town plans which may be submitted in the competition. The object is rather to elicit plans and reports of a preliminary and suggestive character, and thus to obtain contributions and alternatives which may be of value towards the guidance of the future development of the city in its various directions.

The adjudicators will give credit in their report for suggestions of interest as well as for solutions of value.

All correspondence with regard to the competition should be addressed to Mr. E. Kaye-Parry, Civic Exhibition, Dublin.

Cremation in Great Britain.—Sir Charles Cameron presided at the annual meeting of the Cremation Society, held in London last week, and, in moving the adoption of the report, said that in 1913 there were 1,188 cremations carried out in Great Britain—an increase of fifty-four on the previous year. When this society started, over thirty years ago, it received very little support, but as time progressed the movement took practical shape throughout the country, and there are now thirteen crematoria in active operation, and many others in course of construction. The total number of cremations which had taken place in England and Scotland, he went on, up to the end of 1913 was 12,306, of which more than 25 per cent had occurred within the last three years, and the number still increased, although at a slower rate than in other countries.

* Extract from annual report for year ended June 30th last.

The Administration of Municipal Public Works, especially Relating to Highways.*

By NELSON P. LEWIS, Chief Assistant, Board of Estimate and Apportionment, New York City

Most American cities have a department of public works. The organization of such a department and the precise field covered by it vary in almost every city. Generally, such a department has control over the preparation of city maps; street surface improvements, including grading, paving, sidewalks, maintenance, repairs and renewals; street signs and house numbers; sewers and sewage treatment; water supply and distribution, including the care of watershed, filtration, &c.; street cleaning, including the collection and disposal of wastes; street lighting; public buildings; the construction and reconstruction of surface railway tracks in streets; and the elimination of railroad grade crossings.

In cities of moderate size—say 300,000 or less—this work is usually under the more or less complete control of the city engineer, although there are conspicuous exceptions. In very large cities the organization is more complex, sometimes jurisdiction over but one or several of these activities being under a single administrative head; again, a larger group or all are under one head, but under a number of different administrative units, each with limited geographical jurisdiction. An example of the first class is the organization provided by the first Greater New York Charter, under which commissions of water supply, sewers, street cleaning, bridges, public buildings, lighting and supplies, each had jurisdiction over the entire city, and together they formed the board of public improvements, the president of which, a separate officer appointed like the others, by the mayor, had control over all topographical work. This was the charter which took effect immediately after the Consolidation Act, which created the Greater City.

An example of the second class is that of Greater London, where there are thirty separate administrative units, which are practically independent cities, each administering its own local affairs, and raising the money which they feel they can afford to spend on the street and other services. The City of London comprises 673 acres, and has less than 20,000 population. Even here, however, the London County Council has jurisdiction over certain municipal functions which are essentially metropolitan—such as the water supply, the main drainage system, the surface railway lines traversing two or more boroughs, and certain street improvements which extend beyond the limits of a single borough, and which are of great importance to the entire metropolitan district.

In the present City of New York is found a combination of these two general plans. The head of each of the five boroughs has entire control of the mapping of its territory, the improvement of its streets, including the maintenance and renewal of pavements, the design, construction and maintenance of sewers, including sewage treatment plants, and of all public buildings and offices, and in two of the boroughs of street cleaning and the disposal of wastes. Other functions which necessarily relate to the entire city, and where local jurisdiction would be unsatisfactory, are under the control of department heads appointed by the mayor, and they have jurisdiction over the entire city. The chief borough officers, together with the mayor, the comptroller and the president of the legislative body, form the Board of Estimate and Apportionment, which body has a pretty general control over all city activities, so that the City of New York comes nearer having a commission form of government than is generally realised.

New York is not alone in working through special commissions. Chicago's park system is managed through a separate commission for each park, and the results appear to have been most satisfactory. The city of Baltimore has lately established a Paving Commission, entirely distinct from the Department of Public Works or the city engineer's office.

Then, there are the various forms of commission government, the commission in each city which has adopted this system having much latitude, and the

details consequently varying greatly. Perhaps the best and

MOST EFFICIENT FORM OF ADMINISTRATION

is that to be found in cities of moderate size, where one administrative head and the city engineer have virtually entire control. There is one serious defect which is the more pronounced in the smaller cities, and that is the practice, if not the right, of citizens to dictate to a certain degree what kind of improvements are to be made and their character. The town meeting method will answer very well for the village or the very small city, but as the city grows, as its organization becomes more complex, there is more and more need for technical skill in the planning and execution of its public works, and as the city grows the general interests of the community and the particular interest of the property owner are likely to grow more and more apart. In the small town the individual and the property he represents form a much greater relative part of the population and of the physical city than is the case in the larger city.

There is no field of municipal work where the engineer has the opportunity to develop greater versatility than in the moderate-sized city, corresponding, say, with cities of the second class in New York State. Here the city engineer, appointed by the mayor, is a voting member both of the Board of Estimate and Apportionment and of the Board of Contract and Supply. He is called upon to exercise control over almost every kind of public work incidental to the modern city. The work may not be of the magnitude to be found in the greater cities, but its variety is far greater than that which comes to the engineer of cities of the first class, where jurisdiction and responsibility are sub-divided. Having less of a certain kind of work to do, he takes it very seriously, and it is often exceptionally well done.

The practice of electing a city engineer by the council or other legislative body, or, as is done in some cases, by popular vote, cannot be too strongly condemned. Past experience has given good ground for the general statement that no man should be

SELECTED BY ELECTION

to do professional or highly technical work, whether that election be by the general public or by a legislative body. Those who are called upon to vote for candidates for such an office have no means of knowing their peculiar qualifications or lack of qualifications, and better results will almost invariably be obtained if responsibility for the appointment of a man to do such work is vested in the chief executive of the city.

One of the most fertile sources of inefficient administration and of unsatisfactory results is a divided responsibility. In the city of New York the president of each borough is responsible for the care and condition of the public streets, and yet the department of water supply, the fire department, or the State-created Public Service Commission has the right to open the pavement for the purpose of installing the underground structures without the consent, and often without the knowledge, of the officer who is held responsible for the condition of the streets. The surface railway companies must secure permission from the borough president to open streets, but gas companies, electric light companies, and telephone companies must also get permits from the department of water supply, gas and electricity. In all these cases we have a dual responsibility which is inimical to proper control.

An amusing instance of the lack of knowledge in one city department of what exists in city streets under the control of another department was afforded the speaker several years ago in the City of London. Application was made to the authorities of the city of Westminster for the right to examine pipe galleries in Charing Cross-road and Shaftesbury-avenue. There was apparently no knowledge of the existence of such pipe subways, and after extended inquiry the speaker was told that there was no subway large enough for a man to enter. Upon application next day to the chief engineer of the London County

* Abstract of lecture delivered on March 9th before the Graduate Students in Highway Engineering at Columbia University.

Council, a member of the engineer's staff was immediately delegated to conduct the speaker through capacious pipe galleries in these two streets, while the Westminster authorities did not seem to be aware of their existence.

The following requisites are necessary in order to secure satisfactory results in highway administration:

(1) Centralisation of authority over, and responsibility for, all work relating to highways within the administrative district.

(2) Such flexibility of organisation as will permit a concentration of force on any work of pressing importance.

(3) Administrative units sufficiently large to permit the utilisation of an entire force and equipment all of the time, reducing overhead charges to a minimum consistent with efficiency and thoroughness.

(4) Get rid of the prevalent horror of a bureaucracy. If such bureaucracy works well, it is a good thing. If it works badly, it is not because it is a bureaucracy, but because it is not well organised.

(5) Direct and undivided responsibility for every part of the work, each head of a bureau or subdivision to be made to realise, however, that his own particular work should be so done as to help and not to hinder that of other bureaus or divisions.

(6) Promotion to the headship of bureaus and departments to be made from within the organisation when possible, not necessarily according to seniority, but by reason of peculiar fitness. When it is necessary to go outside of the organisation to fill such a place, the appointee should be one who has already made good in similar work in some other place.

(7) Permanent tenure of office for those in responsible charge, so that continuity of purpose and policy may be assured.

LONDON ELECTRICITY SUPPLY.

IMPORTANT PROPOSALS.

A report of Messrs. Merz and McLellan, who in August last were commissioned by the London County Council to investigate the question of the electricity supply of the Metropolis was issued on Wednesday night.

The report points out that in the Greater London area there are at present no fewer than seventy companies and generating stations, and forty-nine systems of generation. The desirability of the unification of control is insisted on, and the engineers, after setting out the advantages and disadvantages of private and municipal ownership, put forward a scheme for municipal control combined with private operation.

If this method were adopted, the county council would own and control the system, and supply the bulk of the capital necessary to construct the new works, while the operating body—the amalgamated companies—would guarantee the interest on the capital, and work the undertaking on behalf of the controlling authority. This would bring London into line with Paris, Berlin, and Chicago and other United States cities.

It is further proposed that nearly all the seventy existing generating stations should be closed down, and all the necessary electrical energy produced in stations outside the central area, down the river. The economic advantages of this concentration of production would be very considerable.

If the council should adopt the scheme of their advisers, a private Bill would be needed to secure the necessary powers. A sum of £30,000,000 is involved in the scheme.

Motor Buses on Country Roads.—The President of the Local Government Board was asked in the House of Commons last week whether he was considering the question of the damage done to the macadamised country roads by the user of these roads by services of motor omnibuses, and if he would cause an inquiry to be made into the cost of repair and upkeep of these roads before and after such user. Mr. Herbert Samuel said the circumstances varied so greatly in different cases that he did not think it would be possible to draw any useful conclusion from such an inquiry. Asked whether a specimen road could not be taken, and the cost of repair previously to the user of the motor omnibuses, and an estimate of the present cost of repair be made, Mr. Samuel pointed out that, in the first place, it would be exceedingly difficult to distinguish between the amount of user of the road by omnibuses and other vehicles, and, in the second place, no generalisation could be drawn from a single instance, or even from half a dozen instances.

SOME RECENT PUBLICATIONS.*

A DIGEST OF THE LAW AND PRACTICE RELATING TO LOCAL GOVERNMENT IN ENGLAND AND WALES (INCLUDING LONDON). By Arthur D. Dean and F. J. Rimmer. Price 5s. nett. London: Butterworth & Co.

We may say at once that this book is like no other work on local government with which we have any acquaintance, and that, in our opinion, it supplies a real need. The aim of the authors has been to explain in outline the meaning of local government, its growth, the constitution of local government authorities and their various powers and duties. The result of their work is a "digest" in fact as well as in name, and the arrangement is such that the reader who desires a succinct account of any topic can easily find it by reference to the table of contents or index. The work has five main divisions—namely, (1) introduction, (2) local authorities, their constitution and functions, (3) Government departments having jurisdiction in local government affairs, (4) the powers and duties of local authorities, and (5) the Metropolis. The fourth of these divisions naturally occupies the greater part of the work, and under this heading the authors deal in turn with administration, procedure, public health, education and insurance, matters under local control, municipal works and undertakings, and finance. It will be seen at once that in a work of this character each matter must be dealt with very shortly, but the authors have succeeded in presenting the gist of each subject with lucidity and, so far as we have been able to test, with accuracy. If this book were in the hands of every councillor the work of local government administration would be carried on with greater intelligence than is now often the case.

CLEAN WATER AND HOW TO GET IT. By Allen Hazen. (Second Edition; Revised and Enlarged.) Price \$1.50. New York: John Wiley & Sons.

This is the second edition of a book that has become well known in America. It treats of the general subject of water in supplies from the standpoint of the city executive and the layman. Probably no other book can be found in which so many important engineering facts are set forth in such a way that the ordinary man can comprehend them. Several new chapters have been added to the book. One of these describes what are termed "Red Water Troubles." Mention is also made of the method of obviating the trouble by renewing the carbonic acid from water either chemically or by aeration. Another new chapter is that on disinfection. This takes up the general use of calcium hypochlorite, liquid chlorine, ozone, and the ultra-violet rays. The new matter covers about twenty additional pages. The various tables in the book have been brought up to date.

LOCAL LEGISLATION, 1913. By Frank Noel Keen, LL.B. Price 10s. nett. London: Walter Southwood & Co.

This book sets out in compendious form numerous provisions of general interest contained in Private Acts of Parliament dealing with such matters as sanitation, building regulations, infectious disease, water supply, lighting, tramways, railless traction superannuation, rating and local government finance. It deals with all the Acts—sixteen in number—obtained by provincial corporations and urban district councils in England and Wales in the Session of 1913 which were considered by the Local Legislation Committee of the House of Commons. About 1,400 sections from these Acts are classified under convenient headings for the purpose of easy reference, and so as to show the differences in the form of legislation applied to different districts. The work is wellnigh indispensable to officials and others advising local authorities who contemplate applying to Parliament for special legislation.

Barking Tramway Undertaking.—Owing to heavy loss on the local tramways the Barking Urban District Council are trying to lease them to neighbouring authorities, failing which the tramways will, according to the *Standard*, cease running after Midsummer Day.

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. M. INST. C. E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

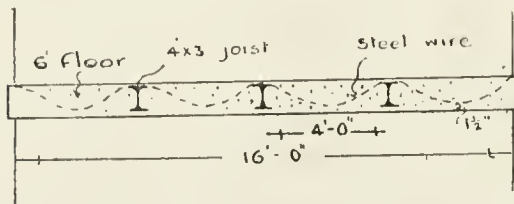
to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

390. Removal of House Refuse.—A new urban district has just been formed in the neighbourhood of London of which the following are particulars: Area, 3,500 acres; population, 9,000, increasing at rate of 700 per annum; number of houses, about 2,300; length of district, north to south 3 miles, east to west 1½ miles; mileage of roads, 17; character of district, flat in northern part, hills up to 1 in 16 in southern part; distribution of population, 2,000 at north end in £40 villas, shops, &c., 500 in north-east in large houses with long approach drives, 1,000 in south and south-west in small villas and workmen's cottages. The refuse for the present will be utilised at brickfields on the southern boundary of the district. It is desired to organise the removal of house refuse on the most up-to-date methods compatible with economy. Describe fully the methods of collection and transit, the organisation of the staff, the plant required, and give an estimate of the capital and annual charges for this work. Trade refuse is negligible, and no plant has been taken over from the rural authority who formerly had control of the area. (Togun.)

391. Concrete Floor.—A concrete floor is to be constructed as shown in the sketch, with 4-in. by 3-in.



R.S. joists, and woven mesh steel wire with a 3-in. lap. The R.S. joists have a 4½-in. wall hold, and the floor a 2-in. wall hold. The size of the room is 16 ft. by 13 ft. Calculate the safe distributed load per super. foot, also the breaking load. (Assistant.)

392. Sewage Purification.—The sewage of a college is to be treated as follows: The liquid is first admitted to a septic tank, then to a vertical upward filter filled with agricultural pipes; thence it flows through a clinker filter to the sewer of the city. The population of the college is about 300 people. (1) Give dimensions of each of the tanks, in order that the liquid effluent may be good. (2) Does the vertical upward filter act as an oxidising filter or merely as a second settling tank? (3) How often will the vertical upward filter have to be cleaned in order to keep the effluent good? (Deleatur.)

393. Surveying.—In carrying out a large survey (by triangulation) describe in full detail how you would use the centre of a tower or shaft as a station on the ground without actually setting up the theodolite inside. Give proofs of any formulae involved. (P. W. P., *Bexhill-on-Sea*.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

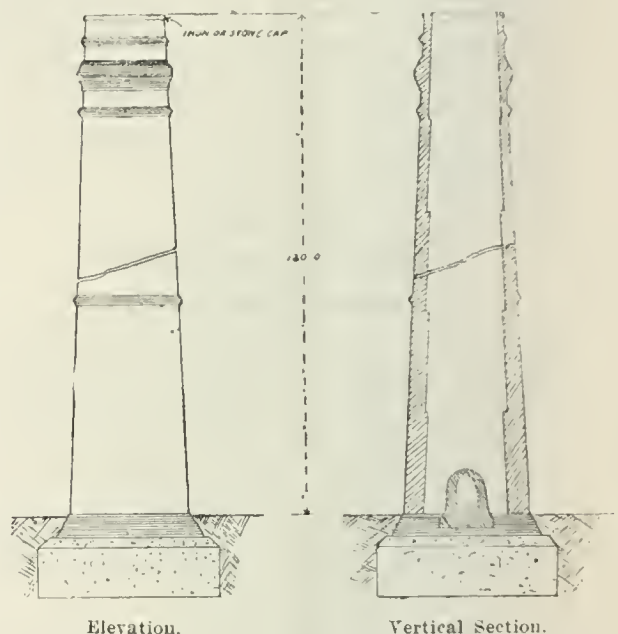
REPLIES TO QUESTIONS.

385. Chimney Design.—Design a brick chimney shaft 130 ft. in height from ground level, the internal diameter at the base being 10 ft. (F. S., *Plumstead*.)

The regulations of the London County Council re chimneys are a good guide for the construction of chimney stacks outside their area. They provide that if the stack be square it shall have a width at base equal to one-tenth the total height,

and if circular one-twelfth total height, which gives in this case $130 \text{ ft.} \div \frac{1}{12} = 19.8333 \text{ ft.}$ at base; but in the drawing I have taken 10 ft. as question. The batter should be 2½ in. in every 10 ft., or an inclination of 1—48. Brickwork to be at least 8½ in. at top, and to increase 4½ in. for every 20 ft. height, measured from top downwards. Firebrick linings to be in addition to ordinary brickwork, in thickness.

I have not adhered strictly to the regulations. In practice the weight of the brickwork, &c., would be taken, and then, having assumed a certain area of concrete, we would see whether the weight per superficial foot was more than could be allowed.



and increase the area of concrete if necessary to the required area. The question does not give the nature of the ground the stack is to be erected upon.

Clay would stand 1 ton per superficial foot.

Of course, the thickness of concrete would also depend upon the weight of building above it, and width from bottom footing to edge of concrete.

I have shown in drawing 7 ft. concrete, which is ample for chimney if fairly good ground. ("Sanitas.")

389. Design of Floors.—What loads should be allowed for in designing a floor (a) in a general warehouse, and (b) in a platform to which the public are to be admitted? What factor of safety would you adopt in each case?

Warehouse floors should be strong enough to support a load of 2½ to 4 cwt. per super. foot, and for a platform or hall where large numbers of people are moving a load of 1½ cwt. should be allowed for.

A factor of safety of one-fifth is usually allowed for dead loads, but for live loads, as in the latter case, a factor of safety of ten should be taken.

The size of joists in each case can be found by the empirical formula:—

$$W = \frac{2K \times b \times d^2}{l} \text{ for distributed loads.}$$

Where l = length in feet

b = breadth in inches

d = depth in inches

w = breaking weight in cwt.

K = constant for different woods; being the breaking weight in cwt. of a wood beam 1 ft. long.

The Surveyor

And Municipal and County Engineer.

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1 in. broad, 1 in. deep, supported at ends and loaded at centre.

Material.	VALUE OF K.	Central breaking weight in cwts.
Spruce fir		3.5
Northern pine		4.0
English oak		4.5
Canadian oak		5.0
Pitch pine		5.0

By transposing the above formula we get:—

$$b \times d^2 = \frac{W \times l \times f}{2K} \text{ or } d = \sqrt{\frac{W \times l \times f}{2K \times b}}$$

By assuming a dimension for *b*, *d* may be found. If the joists be placed at 12-in. centres, *w* will equal the load in cwts. per super. foot times the span in feet. (H. V. A., Clapton.)

WEST RIDING OF YORKSHIRE HIGHWAY SURVEYORS' ASSOCIATION.

It has been decided to form an association to be known as the West Riding of Yorkshire Highway Surveyors' Association.

Mr. A. G. Kilner, surveyor to the Wetherby Rural District Council, has been appointed hon. secretary of the new body.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times*.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

HOUSING IN SCOTLAND.

LOANS FOR BUILDING.

In the House of Commons last week inquiry was made as to what public funds were at present available to local authorities or individual applicants by way of advances for building purposes in Scotland, and under what conditions and at what rate of interest.

Mr. McKinnon Wood stated that under the Housing Acts the funds controlled by the Public Works Loan Commissioners might be lent for purposes connected with the housing of the working classes (1) to local authorities on the security of the rates and upon the recommendation of the Local Government Board for Scotland; the present rate of interest was 3½ per cent, irrespective of the period of repayment; the maximum periods of repayment recommended by the Local Government Board were sixty years for houses and eighty years for land; (2) to companies, societies and individuals, as specified in sec. 67 of the Housing of the Working Classes Act, 1890, with a maximum period of repayment of forty years, the rates of interest being 3½ per cent and 3¼ per cent respectively, according as the period of repayment does or does not exceed thirty years.* Under the Small Landholders (Scotland) Act, 1911, assistance for building purposes might be provided by way of loan to "landholders" and cottars from the Agriculture (Scotland) Fund.

THE LATE MR. JAMES P. WILKINSON.

Mr. James P. Wilkinson, M.INST.C.E., whose death was recorded in our last issue, was one of the oldest members of the Institution of Municipal and County Engineers, and as engineer to the Rivers Committee



of the Manchester Corporation designed and helped to carry out the great sewage disposal works at Davyhulme. His son, Mr. Oswald J. Wilkinson, ASSOC.M. INST.C.E., succeeds him as engineer to the extension scheme, which is estimated to cost £200,000.

Leigh and Municipal Motor 'Buses.—A proposal that the Leigh (Lancs) Corporation should take steps to promote a Bill in Parliament to secure powers to run motor 'buses within the borough was discussed by the town council on Wednesday. Twelve voted for and twelve against the proposal. The mayor said he would vote for the resolution, so that the matter might be again discussed. The opponents of the proposal said it would mean 3d. to 4d. on the rates. A discussion also took place on the question of erecting a public abattoir, but it was decided that the time was not opportune, and that the question "ought to be dealt with nationally."

* Provided the borrowers enter into covenants restricting the rents or otherwise limiting the profits to be derived from buildings to 5 per cent per annum on the capital outlay. Where such covenants are not entered into, the rates are 4 per cent for thirty years, and 4½ per cent for forty years.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

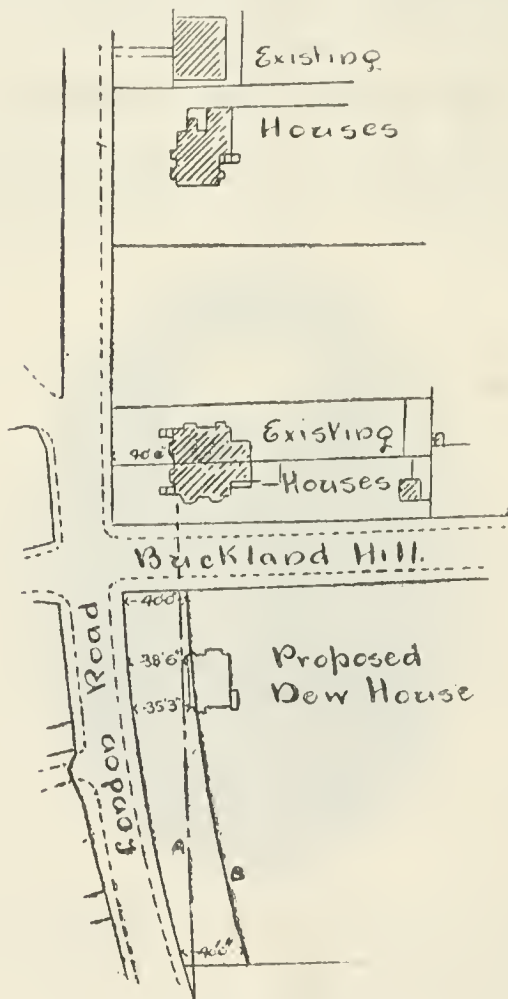
plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in BLACK INK only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words, as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

PUBLIC HEALTH (BUILDINGS IN STREETS) ACT, 1888.

"T. B." writes: A builder has commenced the erection of a house in this town, and a question has arisen as to the building line adjoining the main road. The nearest houses on the north side at the opposite corner are built 40 ft. back from the road. The proposed house will not be in front of the line of the front main wall of these houses, but it will be within 35 ft. of the road. The builder contends that he is not infringing the Buildings in Streets Act, as



he is not in front of the line on either side. If he is correct in his contention, then he could build anywhere up to the dotted line marked "A" on the accompanying sketch, and could place the last house on the line close to the road. The 40-ft. building line is marked "B" on the sketch. The corporation contend that the existing houses set out a 40-ft. building line parallel with the main road, and that this should be observed in the present case. If the builders are correct, then it seems that the Buildings in Streets Act is absolutely useless, excepting in the case of a street which is laid out in a perfectly straight line.

So far as I am aware this is a point under the Public Health (Buildings in Streets) Act, 1888, which has not been decided. In my opinion, however, if the proposed new house is erected in the position shown on the plan, part of it will be "beyond the front main wall" of the existing houses, within the meaning of the Act, and it will consequently be a contravention of the Act. Having regard to the obvious purpose of the Act, I think the term "beyond"

must be understood as used in relation to the line of the street, and as meaning, in fact, "nearer the street than." The builder's interpretation would (as my correspondent points out) defeat the intention of the Act, except in straight streets.

SCHOOL BUILDINGS AND BY-LAWS.—"Ynys" writes: An Education Committee are carrying out certain alterations and additions in connection with their higher standard schools in this town, and have declined to deposit plans thereof for the approval of this urban council, and they say it is not incumbent upon the Education Committee to do so. The alterations comprise the conversion of existing stables and outbuildings into a manual instruction room, the addition of a new porch at the rear of the schoolmaster's house, including new bedroom, bath-room, and water-closet, partly over the said porch and partly over the existing scullery, as per sketch. It is also proposed to alter and extend the existing drain situated in a public footpath repairable by the inhabitants at large, and to provide a gully thereon to receive the wastes from the bath, lavatory and sink. My council declined to allow the trapped gully referred to to be fixed in the public footpath, and the Education Committee now propose to fix it in a recess to be made in the side wall of the house, enclosed by an iron door. Will you kindly advise—(a) Whether the schoolmaster's house is exempted by sec. 3 of the Education (Administrative Provisions) Act, 1911? (b) Whether the additions and alterations amount to the erection of a new building? I submit that it is not sanitary to provide gullies in recesses made in the walls of houses, as proposed, otherwise the by-laws would not provide for their being situated 18 in. therefrom.

(a) The Act of 1911 contains no definition of "school premises." But "premises" is a very comprehensive term, and if the schoolmaster's house was erected according to plans which are under any regulations relating to the payment of grants required to be, and have been, approved by the Board of Education, I think the house would probably be held to be "school premises" within the meaning of the Act. (b) In my opinion they do. See *James v. Wyeell* (48 J.P., 725).

IMPROVEMENT OF MAIN ROADS. "Pounds" writes: I should be much obliged if you would refer me to any decisions upon, or, failing any decisions, if you would express an opinion upon, the wording of sec. 11, subsec. (2), of the Local Government Act, 1888: "... and the council shall make to such authority an annual payment towards the costs of the maintenance and repair and reasonable improvement connected with the maintenance and repair of such road." My understanding of the words italicised is that they only refer to those cases of improvement such as are covered by, say, the substitution of granite for gravel surfaces, or again, say, by wood block paving or granite setts for macadam—i.e., making a more permanent surface—and that they would not cover such improvements as widening a narrow road, improving dangerous corners, buying land for widening and other analogous works, which, although improvements in the broad meaning of the word, hardly appear to come under the heading of "improvements connected with the maintenance and repair of such road." In your opinion, is an urban authority empowered by this section to carry out such works without first obtaining the consent of the county council? The point is that, if an urban authority is empowered to carry out widenings and purchase the necessary land for such purpose without any control being exercised over their expenditure by the county council, it appears that the latter might find their credit pledged to an inconvenient extent.

I do not know of any case dealing with this precise point. In *Warminster Local Board v. Hills County Council* (25 Q.B.D., 450) it was held that if the urban authority alter the paving or flagging of the footways, as, for instance, by substituting flagging, pavement wood, or asphalt for gravel or other substance, the county council are bound to make an annual payment in respect of such alteration, in so far as it is a reasonable improvement connected with maintenance and repair, the question whether it is reasonable in any particular case being, in case of dispute, settled by arbitration under subsec. (3).

In my opinion the words "improvement connected with the maintenance and repair" would not cover widening or cutting off corners, or the purchase of land for such a purpose. But there appears to be nothing in the section prohibiting an urban authority who retain a main road from carrying out such works without the consent of the county council. The subsection says that they shall have the same powers as if the road were an ordinary road vested in them.

PURCHASE OF HOUSE AND LAND FOR OFFICES AND RECREATION GROUND: SALE OF SURPLUS LAND.—"Bogie" writes: My council have under consideration the purchase of a house with grounds and fields, comprising about 7 acres, with the intention of utilising the residence as council offices, and laying out the grounds and fields as recreation grounds, &c. As three sides of the estate abut on highways, it is contended that, in the event of a purchase being effected, the land fronting these highways should be sold off for building plots. Is it probable that the Local Government Board would sanction the purchase under such conditions? and, if so, would the council be permitted to dispose of individual plots? The council have no local Acts, nor have they adopted the Public Health Amendment Act of 1907.

The power to purchase lands for the purposes of the Public Health Act, 1875, is given by sec. 175 of that Act, which makes it compulsory to sell any lands acquired and not required for the purpose for which they were acquired, unless the Local Government Board otherwise direct. The consent of the board to the purchase is not necessary unless the council wish to purchase compulsorily. Where lands are purchased by means of borrowed money, the board practically bring pressure to bear upon the local authority to dispose speedily of the surplus lands by requiring the estimated cost to be divided, and assigning a short term (usually five years) for the repayment of so much of the loan as represents the estimated value of the surplus property (Lumley's "Public Health Acts," 7th edition, page 417). I cannot express any opinion as to the probability of the board sanctioning a compulsory purchase or loan in the present case, as so much must necessarily depend upon the local circumstances.

OVERCROWDING: "FREE-HOUSE SYSTEM."—"Midget" writes: This is a mining district, and the houses are provided by the colliery owners on what is known as the "free-house system," a reduction being made from the wages for house, coal and water. The miners have no choice of house, but must take the house offered them. Many of the houses are overcrowded. Who is responsible, and upon whom should notice be served to abate the nuisance?

Under sec. 94 of the Public Health Act, 1875, notice of a nuisance is to be served on the person by whose act default or sufferance the nuisance arises or continues, or if such person cannot be found, on the owner or occupier of the premises on which the nuisance arises. In Lumley's "Public Health Acts," 7th edition, page 177, the opinion is expressed that in general the occupier and not the owner is the person by whose act default or sufferance a nuisance consisting of overcrowding arises; and it is stated to have been so decided in a Scotch case (*Horne v. Kelso Local Authority*, 3 Cou., 239). The circumstances of the present case, however, are exceptional, inasmuch as the occupiers have no option as to the house which they are to occupy, and I think proceedings against the owners would have a very good chance of being successful.

WATER SUPPLY: "FIXED" BATH.—"Q." writes: A section in the Local Act relating to the charge for water-closets and baths shortly reads as follows: "A charge may be made for every water-closet beyond the first at a rate not exceeding 10s. per annum, and for every fixed bath capable of containing not more than 50 gallons a sum not exceeding 10s. per annum." The only point I wish to raise is with regard to the word "fixed," and I should be glad to have your opinion as to whether it means—(1) Attached to the building by means of a waste pipe, or (2) attached to the fittings, through which the water passes into the bath?

Prima facie, I should think that the term "fixed bath" means a bath which is fixed in a permanent position in any way whatever, as distinguished from a movable or portable bath which can be used anywhere.

GATES ACROSS ROAD.—"Rikkatikka" writes: A road leading to the village church and rectory, some $\frac{1}{2}$ mile from the village, runs through three fields, and consequently has three gates across it. My council would like to have the gates removed. Have they any power to do so?

The question of the legality of gates across a highway depends upon whether the highway was dedicated subject to the right to maintain the gates. If the gates have existed as far back as living memory goes, there is a presumption that the dedication was made subject to the right to maintain them, and the council cannot compel their removal, except in the cases provided for by sec. 81 of the Highway Act, 1835. That section provides that if any gate across a public cartway is less than 10 ft. wide, or any gate across a public horseway less than 5 ft. wide, notice may be given to the owner to enlarge it. If he neglects to remove or enlarge it for twenty-one days after the notice, he is liable to penalties.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bolton T.C. (March 31st. Major J. Stewart).—£5,100 for the purchase of Haacken Hall Farm for the purposes of sewage disposal.—The borough surveyor, Mr. E. L. Morgan, stated that the total area it was proposed to purchase was 44 acres. For a number of years they would leave it as an ordinary farm. They might not use it for the purposes required for twenty years, but that was an extreme view. The inspector said he presumed that it was cheap now, and they would want it one day, and they might as well take it now. The council, Mr. Morgan stated, had had the present scheme before them for some time, and it would be started at the earliest possible date, probably in the spring of 1917. The total cost of the scheme, Mr. Morgan added, was approximately £79,000.

Chorley T.C. (April 1st. Mr. A. G. Drury).—£29,783 for the purposes of the gas undertaking, and £3,100 for the purchase of property for the improvement of Market-street.—With respect to the loan for the gasworks, the gas manager, Mr. J. W. Allin, stated that the proposed vertical plant was of a nominal producing power of 1,200,000 in twenty-four hours. It was intended to dismantle five settings of the horizontal retorts in the existing retort-house. The space recovered from this would be used for covered coal storage, which would thus be increased by at least 100 per cent. The new installation, together with three horizontal settings left standing, and the water-gas plant would give an estimated total daily productive power of 1,755,000 cub. ft. In the matter of the proposed purchase of property it was explained that it was the intention to widen Market-street and Chapel-street.

Colwyn Bay U.D.C. (April 2nd. Major J. Stewart).—£7,172 for the widening and improvement of Abergele-road, Old Colwyn.—The proposed works are expected to cost £11,572, towards which contributions are expected from the county council, the Road Board and the light railway.

Devizes R.D.C. (April 9th. Mr. E. Leonard).—£1,329 for the purpose of building six houses at Potterne.—It was stated that the scheme had been prepared on the assumption that it would be necessary to charge an economic rent of 5s. 3d. per week. The surveyor had based his calculations on the payment of 5d. per cubic foot, which the inspector said was too much. The county medical officer said tenders had already been accepted in the county for building larger houses than these at £30 or £40 per house less, though the difficulties were greater, and the price of labour was 1d. or 1½d. an hour higher than in this district. It was the general opinion that the houses could be built and let at about 4s., or even less, but it was said this was more than labourers would pay at the present rate of wages.

Leigh T.C. (April 9th. Mr. F. O. Stanford).—£11,420 for the purpose of the gas undertaking, and £6,252 for improvements in Firs-lane and Plank-lane.—Mr. Gibson, gas manager, explained that the consumption of gas had largely increased of late years, and that the sum required was chiefly for vertical retorts.

Lincoln T.C. (April 7th. Mr. M. K. North).—£1,100 for the purchase of land for extending the Newport burial ground.—Mr. W. Bagshaw, town clerk, said the land was in the market, and the corporation had secured a provisional contract at what was considered a reasonable price. At present there was only a right of way into the burial ground, there being no chapel or accommodation for mourners. The land would enable a road to be provided and a cemetery chapel to be erected.

Lurgan U.D.C. (April 1st. Mr. G. B. Deane).—£12,000 for an electric lighting scheme. Mr. Walter Pleasance, Assoc. M. INST. C. E., engineer of the scheme, said he believed the sum asked for would be sufficient to provide for a plant to supply not only the compulsory area, but the rest of the urban district. His original scheme provided for the substitution of eighty gas lamps by electricity, and his second report for the substitution of 140. As to revenue, he anticipated that they would derive from public lighting £255, that the light would be better than at present, and that the

lamps could remain longer lighted. He estimated the revenue from lighting the council offices, &c., which at present costs £86, at £60, and believed that £1,260 would be obtainable from private consumers, charging at the rate of 6d. per unit, and £525 from power at 1½d. per unit.

Rochdale T.C. (April 7th. Dr. Miles B. Arnold).—£12,500 for the purchase of the Springfield estate for the purposes of a sanatorium "and other purposes as the corporation may determine."—A representative of the Rochdale Property Owners' Association read a letter which had been forwarded to the Local Government Board suggesting that the loan should be earmarked for the purposes of the sanatorium only, as they did not consider it advisable to set apart a portion of the land for playing fields, a park, or for the erection of working-class houses.

Stockport T.C. (April 9th. Mr. F. H. Tulloch).—£7,380 for the widening of Bramhall-lane; £1,087 for street improvements in Buckingham-road, Park-road and Peel Moat-road, Heaton Moor; and £3,520 for the purpose of public walks and pleasure grounds at South Reddish.—It was explained that it is proposed to widen Bramhall-lane, in the borough of Stockport, from 37 ft. to 75 ft., near Kennerley-road, and to widen the road to 50 ft. at the south side of Barnfield-road. The land for this purpose has been given by the owners, and the town council have only to bear the cost of erecting a boundary wall. The inspector asked if Bramhall-lane was to be widened on the southern side, as it was desirable that the road should be widened all the way from Stockport to Bramhall. The town clerk Mr. Robert Hyde, replied that that portion was in the Hazel Grove and Bramhall Council's district, and they were town planning their own area. An arrangement would have to be come to between that authority and the Midland Railway Company, who owned most of the land at the point of the road referred to.

APPLICATIONS FOR LOANS.

- Bournemouth T.C.**—£600 for public conveniences.
Brierfield U.D.C.—£320 for street improvement.
Buxton T.C.—£1,750 for improvements at Spring Gardens.
Cleckheaton U.D.C.—£1,307 for works of sewerage.
Clones U.D.C.—£2,400 for a sewerage scheme.
Dartford U.D.C.—£364 for fire alarms.
Erpingham R.D.C.—£720 for four cottages.
Grimshy T.C.—£1,130 for the purchase of a school site.
Hereford T.C.—£1,500 for prospective expenditure on electricity mains.
Hexham U.D.C.—£250 for road widening.
Hornsea U.D.C.—£1,450 for the erection of eight cottages.
Lowestoft T.C.—£3,800 for the purchase of a park.
Nelson T.C.—£6,344 for street improvement.
Nottingham T.C.—£1,000, additional loan for public baths.
Orsett Joint Hospital Board.—£950 for hospital extension.
Peterborough T.C.—£400 for new road construction.
Romford R.D.C.—£350 for street improvement.
Tilbury U.D.C.—£3,890 for the provision of a recreation ground.
Turton U.D.C.—£500 for the erection of a store shed.
Wantage R.D.C.—£1,500 for drainage works.
West Sussex C.C.—£1,920 for a new school at North-chapel.

LOANS SANCTIONED.

- Bexhill T.C.**—£3,710 for a recreation ground.
Chester T.C.—£1,310 for road improvement.
Darton U.D.C.—£300 for sewer extension.
Exmouth U.D.C.—£1,050 for the purchase of ground and laying out tennis courts.
Grimshy T.C.—£355 for asylum extension.
Hackney B.C.—£1,600 for street improvement.
Hendon U.D.C.—£563 for street improvement.
Hinckley U.D.C.—£2,800 for the erection of sixteen working-class houses.
Littlehampton U.D.C.—£1,000 for laying out a recreation ground.

Lowestoft T.C.—£517 for the extension of a public convenience; £950 for electricity meters.

Newport (Mon.) T.C.—£3,132 for extensions at the central fire station.

Poole T.C.—£256 for sewerage and surface-water drainage.

Scarborough T.C.—£4,350 for the provision of a shelter, public conveniences, tennis courts, and other works.

Stepney B.C.—£2,500 for street improvement (payable in ten years).

Woolwich B.C.—£15,000 for the electricity undertaking.

FORTHCOMING INQUIRIES.

	APRIL.	£
21.— Ashton-under-Lyne. For the electricity undertaking (Mr. H. R. Hooper) ...		53,476
21.— Barnoldswick. For street improvement (Mr. F. H. Tulloch) ...		2,967
21.— Carlisle. For public baths extension (Mr. A. G. Drury) ...		2,000
21.— Chesterfield. For the purposes of the burial ground (Mr. M. K. North) ...		6,039
21.— Newport Pagnell. For sewage disposal purposes (Mr. H. Shelford Bidwell) ...		3,150
21.— Portsmouth. For alterations at the pumping station (Mr. F. O. Stanford) ...		800
21.— Prestwich. For road widening (Mr. W. O. E. Meade-King) ...		1,151
22.— Accrington. For electricity works extension (Mr. H. R. Hooper) ...		33,530
22.— Finchley. For road and pleasure ground purposes (Mr. H. Shelford Bidwell) ...		1,970
22.— Henley. For road improvement (Mr. M. K. North) ...		3,000
22.— Hungerford. For a housing scheme (Mr. H. S. Stewart) ...		1,510
22.— Lewisham. For the purposes of the baths (Mr. F. O. Stanford) ...		1,300
22.— Poulton-le-Fylde. For street and sewerage works (Mr. W. O. E. Meade-King) ...		580
22.— Walton-le-Dale. For street improvement (Mr. F. H. Tulloch) ...		1,090
23.— Biddulph. For the gas undertaking (Mr. A. G. Drury) ...		10,500
23.— Cookham. For bridge reconstruction (Mr. F. O. Stanford) ...		360
23.— Halstead. For a housing scheme (Mr. H. A. Chapman) ...		1,500
23.— Hoylake. For the provision of shelters (Mr. W. O. E. Meade-King) ...		2,100
23.— Marsden. For the erection of a refuse destructor (Mr. M. K. North) ...		3,100
23.— St. Helens. For street improvement (Mr. F. H. Tulloch) ...		570
23.— Southgate. For bridge, drainage, and road works (Mr. F. Shelford Bidwell) ...		5,085
23.— Winchcomb. For a housing scheme (Mr. H. S. Stewart) ...		2,300
21.— Evesham. For a housing scheme (Mr. H. S. Stewart) ...		4,570
21.— Huddersfield. For works of paving (Mr. M. K. North) ...		58,972
21.— Lytham. For the purposes of electric lighting (Mr. H. R. Hooper) ...		23,700
21.— Manchester. For the provision of recreation grounds (Mr. F. H. Tulloch) ...		8,310
21.— Runcorn. For works of sewerage and water supply (Mr. W. O. E. Meade-King) ...		920
23.— Blackburn. For the provision of a dispensary (Dr. Miles B. Arnold) ...		—

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Dundee, Essex £4,620, Ipswich £11,700, Scarborough £8,200; housing and town planning—Irlam £36,780, Ryton £6,000, Selby; roads and materials—Bournemouth £5,600, Islington £30,597; sewerage and sewage disposal—Watford £11,000; water, gas and electricity—Burton-on-Trent. Particulars of other works projected will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Ashington U.D.C.—The surveyor, Mr. G. Beaty, has completed plans for a proposed new hospital.

Blyth U.D.C.—The council have agreed to submit to the county council and the Road Board a scheme for a bridge over the river Blyth.

Bury (Lancs) T.C.—It has been decided to apply to the Local Government Board for power to repeal a section of the Bury Corporation Act, 1909, which provides that no street shall be laid out for building purposes exceeding 100 yds. in length without at least one intersecting street in every 100 yds. of the total length of the street. It is understood that the purpose of the resolution is to reduce the cost of putting up house property, and so to contribute in some degree to the relief of the housing difficulty.

Clacton U.D.C.—It has been decided to provide a bathing pavilion on the East Cliff to accommodate eighty bathers at a time. The cost is estimated at £850.

Derbyshire C.C.—A tender of £5,114, together with an additional £450 for extra work, has been accepted for the widening of Dove bridge, an undertaking which is to be carried out in conjunction with the Staffordshire County Council, and to which the Road Board are making a grant.

Dundee T.C.—At a meeting of the council last week Lord Provost Urquhart announced a gift of £100,000 from Sir James K. Caird, a Dundee manufacturer. The money is to be spent in providing a new city hall, council chambers, and offices for various corporation departments, the foundation-stone of which will be laid by the King, on the occasion of his visit to Dundee with the Queen, on July 10th. The building, which has to be completed within three years, will open up a large area in the centre of the city, and about £40,000 will be required to purchase the property at present occupying the site. The hall will have accommodation for 3,500.

Essex C.C.—The council have agreed to extensions and alterations at the Colchester Asylum, at an estimated cost of £4,620.

Harrogate T.C.—The borough surveyor, Mr. C. E. Rivers, has received instructions to proceed with the rebuilding of the market hall, which was recently damaged by fire.

Ipswich T.C.—It has been agreed to carry out extensions at the isolation hospital, at an estimated cost of £6,000, and new offices for the health department are to be built, at an estimated cost of £5,700.

Littlehampton U.D.C.—The council have approved of plans for a new fire station.

Newport (Mon.) T.C.—The council have adopted a scheme of extensions to the Stowhill baths, the estimated cost being £2,680.

Sandwich T.C.—The borough surveyor, Mr. J. E. Turner, has completed plans of a new fire station.

Scarborough T.C.—The Parks Committee propose to erect refreshment rooms, pavilions, and public conveniences in the South Cliff Gardens, at an estimated cost of £8,200.

Sutton-in-Ashfield U.D.C.—The tender of Mr. H. Shaw, Sutton, at £289, has been accepted for the erection of the new fire station in Church-street.

HOUSING AND TOWN PLANNING.

Arundel T.C.—The borough surveyor, Mr. E. F. Farrington, has received instructions to prepare plans for ten working-class dwellings.

Ayr T.C.—The council have approved a recommendation by the Housing Committee that the committee visit towns in Scotland where houses have been erected for the working classes by the municipality, and that the committee hold a public inquiry in Ayr into the necessity of providing houses for the working classes, and whether private enterprise had failed to provide such houses.

Dunmow R.D.C.—The council are asking for sanction to the purchase of a site at Felstead for the erection of four cottages.

Feckenham R.D.C.—It has been agreed to make a start with rehousing by building six houses at Cook-hill.

Haltwhistle R.D.C.—The medical officer, Dr. Glasse, reports that extra housing accommodation for workmen is needed in the town.

Irlam U.D.C.—The surveyor, Mr. R. H. Winterbottom, has prepared plans, quantities and specifications for 154 workmen's houses to be erected in Irlam, and the Local Government Board have sanctioned the borrowing of £36,780 for the purpose.

Lichfield T.C.—The borough surveyor, Mr. W. B. Chancellor, has been instructed to prepare a scheme for the provision of twenty cottages.

Ruislip-Northwood U.D.C.—It was announced last week that the town planning scheme, which is the pioneer town planning scheme in the United Kingdom, had emerged from the Local Government Board in its final stage. The council decided to make application to the Local Government Board for sanction to prepare another scheme which will include all the land in Northwood and Ruislip left out of the original scheme, and portions of the districts of the Uxbridge Rural District Council and Watford Rural District Council.

Ryton U.D.C.—A scheme is on foot for the provision of twenty-five workmen's houses, at an estimated cost of £6,000.

Selby U.D.C.—The housing scheme adopted by the council will provide for 104 dwellings.

Stalybridge T.C.—Commenting in his annual report upon the treatment of tuberculosis, the medical officer of health, Dr. Hancock, writes: "Never before was the borough so sanitary, so well sewered, so well paved, and so well supplied with an abundance of pure water as it is to-day. Much has been done during recent years, and more remains to be done, and must be done in the near future. I am convinced that if the money which the State is now providing towards the establishment of sanatoria was devoted to the abolition of slums and overcrowded dwellings and their replacement by modern dwellings in open situations, much more permanent good would result within the next ten years than will accrue from all the treatment in sanatoria, from which the patients, too often of necessity, return to their former unhealthy surroundings."

Yarmouth T.C.—The borough surveyor, Mr. J. W. Cockrill, on Tuesday last submitted a plan showing an area in Southtown and Gorleston, comprising practically all the land now unbuilt upon, which he suggested should be included in a town planning scheme. This would enable the corporation to have some control over the manner in which such land might be developed in the future, more particularly with regard to the overcrowding of houses on certain areas. He estimated the expenses at £200. The owners of land within the area would be consulted. The council resolved to apply to the Local Government Board for authority to prepare the scheme.

PARKS AND OPEN SPACES.

Newmarket U.D.C.—Tenders are to be obtained for laying out the Memorial Hall grounds, plans for which have been prepared by the surveyor, Mr. W. H. Fley.

St. Annes-on-Sea U.D.C.—Lord Ashton, of Lancaster, has supplemented his recent gift of over £21,000 to St. Annes-on-Sea for the purchase of St. George's Gardens as a public recreation ground, by a further donation of £4,500 for additional land which it was considered advisable to add to the gardens.

REFUSE COLLECTION AND DISPOSAL.

Littlehampton U.D.C.—The tender of the Bristol Wagon Company, at £40, has been accepted for the supply of a refuse van, with tipping gear.

Sutton Coldfield T.C.—The council have accepted the tender of Messrs. Hughes & Stirling, at £5,050, for the construction and equipment of a refuse destructor.

ROADS AND MATERIALS.

Ashby-de-la-Zouch U.D.C.—The Highway Committee have recommended that, owing to repeated complaints as to the slipperiness of the streets, no tarring should be done during the summer. Consideration of the matter has been adjourned with a view to obtaining the opinion of the town-people.

Belfast R.D.C.—A scheme has been sanctioned for the improvement of Shore-road, at an estimated cost of £5,250, a moiety of the cost to be borne by the county council.

Bournemouth T.C.—It is proposed to carry out road improvements at an estimated cost of £5,600.

Buxton T.C.—Tarred slag and tarred basalt are to be used for the resurfacing of St. John's-road, the estimated cost of the work being £800.

Chelmsford T.C.—A contribution of £700 is to be made by the county council for road widenings, the total cost of which is estimated at £1,620.

Derbyshire C.C.—Expenditure aggregating over £2,000 upon road improvements has been sanctioned. The purchase of four additional steam rollers, with the necessary vans, at an estimated cost of £2,100, has been approved, it being pointed out that during the past year the amount paid for hire of rollers was £1,961. Having been informed that the Road Board intended to reduce by a half the grant of 1d. per square yard for the surface-tarring of main roads, the Roads Committee have forwarded a strongly worded protest.

Devonport T.C.—A scheme has been submitted to the council for the improvement of Swilley-road, which is estimated to cost about £5,000.

Edinburgh T.C.—The question of paving Cambridge-street with wood has been referred to the Streets and Buildings Committee for report.

Fareham R.D.C.—For main road improvement the Road Board have sanctioned a grant of £505, together with a loan of £3,000 free of interest.

Felixstowe U.D.C.—The council have agreed in principle to the construction by Mr. E. G. Pretyman of a new road between Walton and Falkenham, including a ferro-concrete bridge to span King's Fleet. The road would measure about 1,565 yds. in length, and would lead from the road near Hill House and Gulpher Farm to the road adjoining Deben Lodge premises, Falkenham. The width of the road would be 17 ft., except across the bridge, where it would be 16 ft. wide. Before agreeing to be responsible for the future maintenance of the road, the council are urging that the proposed width should be increased.

Greenock T.C.—The Road Board have given their approval to a revised scheme for works in Clyde-street and Sinclair-street, which are estimated to cost £2,500.

Isle of Wight R.D.C.—It has been agreed to accept the tenders of Messrs. Somerfeld & Lang, Limited, for 5,000 tons of basalt, and that of the Road Maintenance and Stone Supply Company, Limited, for 5,000 tons of quartzite, provided grants are obtained from the Road Board towards the cost.

Islington B.C.—Towards a scheme of road construction, estimated to cost £30,597, the Road Board have promised a grant of £10,000.

Kendal T.C.—An estimate of £2,783 for works of street improvement has been approved.

Langholm T.C.—It has been agreed to purchase the necessary property for the widening of High-street.

Newport (Mon.) T.C.—It is proposed to repair certain sections of wood paving, at an estimated cost of £1,800.

Preston R.D.C.—The council have accepted the tender of Messrs. R. S. Clare & Co. for a supply of Tareo for surface-dressing the roads.

Runcorn U.D.C.—The scheme for the completion of Sandy-lane is to be carried out, at an estimated cost of £800.

Swansea T.C.—The Highways Sub-Committee have agreed to take over Eversley-road, and make it up with tar-macadam, at the expense of the owners.

Wallsend T.C.—The borough surveyor, Mr. G. Hollings, has prepared the plan of a new road from King's-road to the Rising Sun Colliery, the estimated cost of which is £1,709.

Westhampnett R.D.C.—In reply to a councillor who asked a question with respect to the cost of road tarring, the clerk stated that two years ago the council had a considerable stretch of road tarred by contract at 2d. per square yard. The district surveyors, in accordance with the request of the Highways Committee, had submitted statements of tarring done by the council's own labour, and the cost worked out at practically 2d. per square yard.

SEWERAGE AND SEWAGE DISPOSAL.

Airdrie T.C.—Messrs. Wylie & Son, Glasgow, who were awarded first premium in the competition for the sewage disposal scheme, have been appointed engineers to carry out the work.

Irlam U.D.C.—The council have instructed the surveyor, Mr. R. H. Winterbottom, to prepare a scheme for more efficient sewage disposal.

Llandyssul R.D.C.—The sanitary surveyor, Mr. C. L. Evans, has received instructions to prepare a plan and estimate of the cost of a sewerage scheme.

Watford R.D.C.—A scheme has been approved for sewage disposal works at Radlett, the estimated cost of which is £11,000.

WATER, GAS, AND ELECTRICITY.

Burnley T.C.—Coke-breaking and screening machinery is to be installed at the gasworks, at an estimated cost of £600.

Burton-on-Trent T.C.—Extensions of the electric lighting system are to be carried out at an estimated cost of £7,000.

Cheltenham T.C.—The Water Committee propose to carry out a water main extension to Hester's Way.

Crediton R.D.C.—The Local Government Board have sanctioned the purchase by the council of Zeal Monachorum water supply.

Dover T.C.—It is proposed to instal 239 electric lamps in the place of gas lamps, at an estimated cost of £1,600.

Dumbarton C.C.—A water supply scheme which has been prepared for Clynder has been submitted to a sub-committee already appointed in connection with the matter.

Langholm T.C.—The council last week resolved to borrow an additional £1,000 (making a total of £7,000) to meet the cost of increased water supply. It was referred to the Lighting Committee to bring up a report on the question of improving the lighting of the burgh by extending public lamps to the burgh boundary south of Land's End, and as to extending the hour of lighting to 11 p.m. The question of establishing electricity works has been referred to a committee for consideration and report.

Londonderry T.C.—A letter has been received from the Local Government Board stating that they had received the report of their chief engineering inspector, Mr. P. C. Cowan, on the inquiry into the petition of the corporation for a Provisional Order to enable them to put in force the powers of the Land Clauses Act for the purpose of taking, otherwise than by agreement, certain lands at Burn Gibbagh, required for the purpose of an auxiliary water supply for the city. The board were satisfied that the evidence given at the inquiry did not show that the scheme proposed by the corporation was of a proper kind. It was clear that an urgent need existed for obtaining a pure and adequate supply of water which would meet the city's requirements at all seasons, and the anticipated increase in population must also be taken into account. The board, therefore, did not consider that it was in the interests of the ratepayers to sanction a makeshift scheme such as that contemplated, and they were not prepared to grant a Provisional Order in accordance with the prayer of the corporation. They trusted that the corporation would now press forward a comprehensive scheme for the permanent improvement of the water supply.

Longtown R.D.C.—Messrs. Taylor & Wallin recently presented a scheme for supplying portions of the parishes of Hethersgill and Stapleton with

water, the estimate being about £3,500. The council have now instructed Messrs. Taylor & Wallin to extend the scheme, and report fully upon supplying the north-eastern, eastern, and south-eastern portions of the rural district. By this extended scheme eleven parishes are under consideration, the scheme necessitating probably something like 30 or 40 miles of water mains.

Malvern U.D.C.—A proposal to put down additional plant at the electricity works, at an estimated cost of £1,500, has been agreed to.

Motherwell T.C.—The price of the Motherwell Gas Company, which the council propose to purchase, has been fixed by the arbitrator at £135,987, which is equivalent to about £2 8s. per share.

Ruthin T.C.—The Board of Trade have granted a Provisional Order for an installation of electric light in the borough.

Stafford T.C.—The necessary authority has been given for gasworks extensions, and land for the purpose is to be purchased at a cost of £1,050.

Tendring R.D.C.—Works of water supply for St. Osyth are to be carried out, at an estimated cost of £1,500.

Tiverton T.C.—A proposal has been submitted by the Streets Committee for water supply works which are estimated to cost £155.

Torquay T.C.—The council have adopted the scheme of the borough electrical engineer, Mr. C. W. Salt, for the extension of the boiler-house at the electricity works, at a cost of £1,440, the erection of a new engine room, at a cost of £9,517, and the erection of a new switch-control chamber, at a cost of £1,765, making a total cost of £15,722.

MISCELLANEOUS.

Ayr T.C.—The council have adopted a proposition that the minimum wage for men in the cleansing department be 25s. per week, with 2s. additional for Sunday labour.

Hove T.C.—A resolution has been adopted allowing the borough surveyor, Mr. H. H. Scott, an increase of £10 a month for office assistance. The Works Committee, from whom the recommendation emanated, reported that they had no difficulty in arriving at the decision because they knew a great deal of work had been piled on the borough surveyor's office during the last ten years.

Surbiton U.D.C.—Sanction has been received for laying out a cemetery near the sewage disposal works, at an estimated cost of £1,583.

PERSONAL.

Mr. David Hill, of Ruddersfield, has been appointed surveyor to the Golear Urban District Council.

Mr. E. Prest, of Norton, Malton, has been appointed surveyor to the Knaresborough Urban District Council.

Mr. H. E. Tresidder, Falmouth, has been appointed borough engineer of Falmouth, at a salary of £150 rising to £200.

Mr. W. A. Burton has resigned his position as engineer to the Diss municipal waterworks, having obtained an appointment in West Africa.

Mr. Percival T. Harrison, borough surveyor of Chelmsford, has received an advance of salary to £380 (not £360 as previously stated), rising to £400 a year.

Mr. Wheatley, building surveyor to the Southport Corporation, has had his salary raised from £200 to a maximum of £225, by two annual increments of £10 and one of £5.

Mr. Wm. B. Bryan, chief engineer to the Metropolitan Water Board, will take the chair on Monday evening next at the meeting of the Institute of Sanitary Engineers, at which Mr. E. A. Lees, A.I.N.S.T.C.E., will read a paper on the subject of the Birmingham waterworks.

Mr. C. H. Godfrey, municipal engineer, Shanghai, has been transferred from the class of associate-member to that of member of the Institution of Civil Engineers. Messrs. A. D. Anderson, engineer's department, Water Office, Belfast; R. H. Couzens, city engineer's office, York; S. Hall, water engineer's

office, Aberdeen; and J. B. Thomson, public offices, Southall, have been elected associate-members of the same body.

Mr. William Bell, Highland District road surveyor for Perth County Council, died on Tuesday at Aberfeldy, we regret to learn. Mr. Bell, who was in his fifty-seventh year, went to Aberfeldy in 1879, being the first surveyor appointed in the Highland district under the Roads and Bridges Act of 1879. For the past thirty-five years Mr. Bell had discharged his duties with an ability which was readily recognised and admitted. Ever since Aberfeldy became a burgh Mr. Bell had acted as its burgh surveyor.

FOR OTHER ADVERTISEMENTS

See End of Paper.

BARNET URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

PRIVATE STREET WORKS ACT, 1892.

The Council invite Tenders for the Making up, under the above Act, of the Private Streets within their District known as Byng-road and Wentworth-road.

Plans and Specification can be seen, and all information, with Form of Tender, obtained, on application to the Surveyor to the Council, at his office, No. 40 High-street, Barnet, on any day during office hours.

Tenders, on official forms only, sealed and endorsed "Tender for Roads," must be addressed to me, and delivered at the Council Offices, No. 40 High-street, Barnet, not later than noon on Tuesday, May 5th, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

H. W. POOLE,

Clerk of the Council.

April 14, 1914.

(1,529)

TO CONTRACTORS.

The Wandsworth Borough Council is prepared to receive Tenders for the construction of drainage works at Streatham Cemetery, Carratlane, Tooting, S.W.

Form of Contract, Specification and Drawings, may be seen, and Form of Tender obtained, at the office of the Borough Engineer, Mr. P. Dodd, A.I.N.S.T.C.E., 215 Balham High-road, S.W., between the hours of 10 and 4 (Saturdays 10 till 1).

Contractors will be required, in the case of all workmen employed by them in and about the execution of the Contract, to pay wages at not less, and observe hours of labour not greater than, the rates and hours recognised by the Associations of Employers and Employees, and in practice obtained in the district where the work is to be executed, and to pay to all workmen a wage of not less than 4s. 6d. per day.

Tenders, sealed and endorsed "Drainage Works, Streatham Cemetery," must be delivered at the Council House, East-hill, Wandsworth, S.W., and may be placed by the person tendering in a box provided for the purpose, not later than 12 o'clock noon on Thursday, 30th April.

The Council does not bind itself to accept the lowest or any Tender.

D. A. NICHOLL,

Town Clerk.

Council House,
Wandsworth, S.W.

April 15, 1914.

(1,530)

WELTON RURAL DISTRICT COUNCIL.

HIRE OF STEAM ROLLER.

The above Council invite Tenders for the Hire of a 12½-ton Steam Roller with Scarifier fitted. The approximate number of days' rolling required is 250 per annum, and the Tenders should include quotations for either one or two years.

The Tenders to include wages of driver, fuel, oil, &c., and also the use of a water cart.

Tenders to be sent to me on or before the 30th day of April instant.

W. B. DANBY,

Clerk.

2 Bank-street, Lincoln.
April 15, 1914.

(1,524)

CORPORATION OF MADRAS.

SPECIAL WORKS DEPARTMENT.

CONTRACT M & M No. 22.

The Corporation of Madras is prepared to receive tenders from competent persons willing to enter into a contract for the supply and delivery of Cast iron Pipes, Special Castings, Sluice Valves, Hydrants, &c. The total weight of the pipes and special castings is about 11,500 tons, the sizes varying from 2½ in. to 12 in. (2,300 tons being 4 in.).

The Specification, Bills of Quantities and Form of Tender, prepared by J. W. Madeley, Esq., M.A., M.INST.C.E., M.A.M.SOC.C.E.E., Special Engineer to the Corporation of Madras, may be obtained from the undersigned, Agents to the Corporation, on payment of 10 (Ten) shillings, which will not be returned.

Tenders, accompanied by a deposit in currency notes or a draft on a Madras Bank of Rs.500, should be sent direct to the President, Corporation of Madras, so as to reach him at or before 12 noon on the 17th day of June, 1914.

The Corporation does not bind itself to accept the lowest or any Tender.

Early application for particulars is desirable, as only a limited number will be given out.

JAMES MANSERGH & SONS,
Agents to the Corporation.

5 Victoria-street,
Westminster.
April 15, 1914. (1,525)

BOROUGH OF KENDAL.

EXTENSIONS TO SEWAGE DISPOSAL WORKS.

CONTRACT No. 3.

The Corporation invite Tenders, in whole or part, for the undermentioned Ironwork in connection with the above:—

100-ft. diameter Sprinklers, Floating Arms, Decanting and Sludge Valves, Penstocks, Sluices, Cast-iron Pipes, Specials, &c.

Plans may be seen and particulars obtained on application at the office of the undersigned on and after Monday, the 20th instant.

Tenders to be delivered on or before Friday, the 8th May, 1914, endorsed "Tender for Ironwork, Sewage Disposal Works."

The Corporation do not bind themselves to accept the lowest or any Tender.

(By order)
F. W. OXBERRY,
Borough Surveyor.

Town Hall, Kendal.
April 15, 1914. (1,526)

ALDERSHOT COUNCIL.

TO GRANITE MERCHANTS, &c.

Tenders are invited by the above-named Council for supplying, i.o.r. Aldershot Town Station, the undermentioned materials:—

700 tons (more or less) 2½-in. Basalt.
200 tons " " Slag Tar-macadam.
130 tons " " 3-in. and 1½-in. Limestone
Tar-paving.
1,750 yds. " " 2½-in. Hungry Hill Flints.

Forms of Tender may be obtained on application at the office of Mr. Fred. C. Uren, the Surveyor to the Council.

Tenders, endorsed "Basalt," "Tar-macadam," &c., as the case may be, to be sent to the undersigned not later than 5 p.m. on Tuesday, the 5th May proximo.

The Council do not bind themselves to accept the lowest or any Tender.

(By order of the Council)
W. E. FOSTER,
Clerk.

Municipal Buildings,
Aldershot.
April 15, 1914. (1,527)

SURVEYOR'S ASSISTANT (21). 3 years Articles, desires appointment in Municipal Office, or Contractor executing Municipal Contracts. Experience levelling, surveying, draughtsmanship, building construction, architectural drawing, street works, waterworks. Excellent testimonials. Moderate salary. Free immediately.—Box 1,412, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,528)

NEATH'S NEW WATER SUPPLY.

DETAILS OF WORKS.

The extensive new waterworks which the Neath Rural District Council have constructed at Ystradfellte, Breconshire, and which have taken seven years to complete, were opened recently. The works, the *South Wales Daily News* states, are situated among the Breconshire mountains, 3 miles above the village of Ystradfellte and 8 miles from Hirwain. The district is 2,000 ft. above the level of the sea. The council, in 1902, secured Parliamentary powers to borrow £150,000 to carry out the works, and the site at Ystradfellte was secured. The contract for the construction of the reservoir was let to Messrs. Morrison & Mason, Glasgow, and the works were commenced in the summer of 1907. Before proceeding with the work the contractors were compelled to construct a concrete tunnel under a portion of the Dringarth Mountain, so as to divert the river. Later the council were compelled to seek further Parliamentary powers, on two occasions, to carry out the work, and the total cost of the works now amounts to £275,000.

A dam, 1,056 ft. long, has been constructed from mountain to mountain. The reservoir, which has admirable gathering ground and a watershed of 20,000 acres, has a storage capacity of 700,000,000 gallons of water. It will supply the whole of the Neath District Council's area, which includes the Neath district, Skewen, Aberdulais, Baglan, the Dulais and Neath Valleys, Cwmavon, Aberavon, and Briton Ferry. It is estimated that the Neath District Council will derive a revenue of £6,500 a year from the scheme, and this amount will more than provide for the repayment of capital and interest, while it is stated that within ten years the works will secure a handsome sum to the relief of the rates of the district.

The work was carried out under the direction of Mr. D. M. Davies, the engineer to the district council, while the work at the reservoir was under the supervision of Mr. E. H. Hill, London, with Mr. W. S. Beecher as resident engineer.

The Cost of Motor-car Hire.—The borough surveyor of Great Yarmouth, Mr. J. W. Cockrill, has reported that hiring a car worked out at 8d. to 9d. per mile, while the total cost of running his car during the past six months had been between 3d. and 4d. a mile. A new car is, therefore, to be purchased.

ASSOCIATION OF SOMERSET SURVEYORS.

President—Mr. W. ALEX. COLLINS, Surveyor to the Bridgwater Rural District Council.

A meeting of the above association will be held in the vestry-room at Street, on the 25th inst. Previous to the meeting the members are to lunch at the Bear Hotel, by the kind invitation of the chairman and members of the Street Urban District Council. Mr. A. W. Stacey, J.P., will preside.

PROGRAMME.

- 1.15 p.m.—Lunch at the Bear Hotel.
- 2.15 p.m.—Inspection of the new houses recently erected by the council under the Housing and Town Planning Act.
- 3.15 p.m.—Meeting at the vestry-room and discussion on a paper on the "Financial and other Aspects of Housing," by Mr. W. H. Consins, F.A.S.I., surveyor to the Street Urban District Council.
- 4 p.m.—Tea at the Bear Hotel, by the kind invitation of the president (Mr. W. Alex. Collins).

A motor char-à-banc may be hired from Bridgwater to Street, providing an interesting drive over the Polden Hills, for £2 5s. If only fifteen members would join in this means of travelling the price per head would be 3s. return, and the return journey made at a time to suit the convenience of all the members.

D. EDWARDS, ASSOC. M.INST.C.E.,
Hon. Secretary.

Taunton.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKERILL, M.INST.C.E., & R.I.B.A.,
Borough Surveyor, Great Yarmouth.

EASTERN DISTRICT.

A meeting of the Eastern District is to be held at Chelmsford to-morrow (Saturday).

PROGRAMME.

- 11 a.m. Meet at the Chelmsford Railway Station, and proceed either (a) to the Marconi wireless telegraphy works, by kind permission of the directors. Inspection will be made of the whole of these works, which are quite new and up-to-date, and the manufacture, testing, and assembling of the apparatus used in connection with wireless telegraph installations may be seen; or (b) to the engineering works of Messrs. The Hoffmann Manufacturing Company, Limited, by kind permission of the directors. Inspection of the manufacture of steel balls, rollers and bearings of all sizes, including the cutting off and converting of the raw material, turning, hardening, grinding and assembling of the parts. The plant inspection includes centrifugal oil separating installation and engines totalling over 2,000-horse power, including a 1,000-horse power Diesel engine just completed.
- 12.30 p.m.—Inspect corporation open-air swimming bath.
- 1 p.m.—Lunch at the Shire Hall, by kind invitation of the Worshipful the Mayor, Alderman G. W. Taylor, J.P.
- 2.15 p.m.—District business.
Paper by Mr. Percival T. Harrison, ASSOC.M.INST.C.E., borough engineer, entitled "Description of Municipal Works in Chelmsford." Discussion.
- 3.30 p.m.—Inspection of houses in course of erection under the Housing of the Working Classes Act.
- 4.15 p.m.—Inspection of new suction gas plant at Midday Yard waterworks.
- 4.50 p.m.—Inspection of new stables and depot.
- 5 p.m.—Tea at the Shire Hall, by kind invitation of Mr. P. T. Harrison.

J. A. WEBB, H. T. WAKELAM,
Hon. District Secretary. *District Chairman,*
Surveyor's Office, County Engineer,
Hendon, Great Stanmore. Middlesex.

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District is to be held at Sheffield on May 2nd.

DOVER MEETING.

A meeting of the institution is to be held in the South-Eastern District at Dover on May 9th.

SALISBURY MEETING.

A meeting of the institution is to be held in the Southern District at Salisbury on May 16th.

WEST MIDLAND DISTRICT.

A meeting of the West Midland District is to be held at Birmingham on May 23rd.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on Saturday, June 13th.

SCOTTISH DISTRICT.

The annual Scottish meeting of the institution will be held in Edinburgh on Saturday, June 13th.

COUNCIL MEETING.

Council meetings have been arranged for the following dates: April 25th, May 23rd, June 24th.

ANNUAL MEETING.

A town planning, housing and road conference and the forty-first annual general meeting are to be held at Cheltenham from June 24th-27th.

The following is a preliminary list of the papers to be read and discussed at the conference:—

- (1) "Town Planning Large Areas," by Mr. W. A. Clarry, borough surveyor, and Mr. R. A. Reay-Nadin, town clerk, Sutton Coldfield.

- (2) "The Housing, Town Planning, &c., Act, 1909 (Part 2) as Applied to Commercial and Industrial Districts," by Mr. J. C. Midgley, deputy city surveyor, Newcastle-upon-Tyne.
- (3) "Town Planning and Architectural Issues," by Prof. S. D. Ashhead, Liverpool University.
- (4) "The Abnormal Development of Coventry and some of its Town Planning and Housing Problems," by Mr. J. E. Swindlehurst, city engineer, Coventry.
- (5) "Town Planning Amended Procedure Regulations," by Mr. H. E. Stilgoe, city engineer, Birmingham.
- (6) "Town Planning Procedure," by Mr. Fred. W. Pearce, engineer to the Twickenham Urban District Council.
- (7) "Town Planning Practice in America," by Mr. C. M. Robinson, Rochester, N.Y.
- (8) "Some Notes on Highway Law as Affecting the Municipal Engineer," by Mr. S. G. Turner, Barrister-at-Law, London.
- (9) "The Training of the Highway Engineer of the Future," by Mr. H. Percy Boulnois, London.
- (10) "The Control, Management and Maintenance of Roads," by Mr. J. Fred. Hawkins, county surveyor, Berkshire.
- (11) "The Prevention of Sub-Crust Movement in Roads," by Mr. E. S. Sinnott, county surveyor, Gloucestershire.
- (12) "The Economics of Modern Methods of Road Construction," by Mr. Francis Wood, borough engineer, Fulham.
- (13) "Some Notes on Grouting and Penetrating Methods of Road Surfaces," by Mr. Geo. Green, borough engineer, Wolverhampton.
- (14) "The Organisation of a Municipal Engineer's Department," by Mr. E. Willis, surveyor to the Chiswick Urban District Council.
- (15) "The City of Worcester Sewage Disposal Works," by Mr. T. Cank, city engineer, Worcester.
- (16) "Notes on the Protection of the Foundations of Chepstow Bridge over the river Wye in Ferro-Concrete," by Mr. E. S. Sinnott, county surveyor, Gloucestershire.

The conference will be opened on Wednesday afternoon June 24th (when the delegates will be welcomed by the Mayor and Corporation of Cheltenham), and continued during the two following days. Visits will be made on Thursday afternoon, June 25th, and Saturday morning, June 27th, to the corporation new sewage purification works, waterworks, destructor, concrete slab factory, &c.

An important exhibition of plans, maps and models of town planning and housing schemes, &c., will be held during the four days of the meeting. A large number of local authorities, engineers, architects, and others interested in the town planning and housing movement, both in this country and abroad, have kindly undertaken to forward exhibits, and it is believed that the collection will be one of great educational and practical value.

PROGRAMME.

- Wednesday, June 24th (Morning).—General business of the institution.
Presidential address and presentation of premiums.
Afternoon. Conference—Town planning and housing; conference—Roads, &c.
Evening.—Exhibition of town planning and housing schemes, &c.
- Thursday, June 25th (Morning). Conference—Town planning and housing; conference—Roads, &c.
Luncheon given by mayor to members of the institution and delegates.
Afternoon. Drive to inspect planned areas of town. Visit to refuse destructor, concrete slab factory and new sewage purification works.
Evening.—Annual dinner.
- Friday, June 26th (Morning).—Conference—Town planning and housing; conference—Roads, &c.
Afternoon.—Conference—Town planning and housing; conference—Roads, &c.
Evening.—Open-air concert—Montpellier Gardens.
- Saturday, June 27th (Morning). Visit to corporation waterworks at Tewkesbury, &c.

THOMAS COLE,
Secretary.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

NORTHERN DISTRICT.

Meetings will be held at Darlington to-morrow (Saturday), Hexham on Saturday, May 2nd, Cumberland in June, Alnwick on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Hull on Saturday, May 16th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

The programme of the Northern District meeting to be held at Darlington to-morrow is as follows:—

11 a.m.—Meet at Bank Top Station.

11.20 a.m.—Special tramcar leaves Parkgate Station entrance for the Forge and Darlington Corporation gasworks.

Light refreshments provided by the Slag and Tar-macadam Company, Limited.

2 p.m.—Visit to view the North-Eastern Railway Company's new offices, Brinkburn-road, and their new boiler shops.

4 p.m.—Short business meeting at the hon. secretary's office, Crown-street.

5 p.m.—Dinner at Boot and Shoe Hotel (2s. 6d. per head).

JOHN ROBINSON,
Hon. District Secretary

Darlington.

GENERAL MEETINGS.

A meeting in conjunction with the Society of Engineers will be held at the Institution of Electrical Engineers, Victoria-embankment, W.C., on Monday, May 11th, at 7.30, for the purpose of discussing a paper—"The Greater New York Water Supply Scheme," by Wm. T. Taylor, Fellow A.M.I.E.E., M.A.M.S.O.C.M.E.E., F.R.G.S., and a member of the Institution of Municipal Engineers. Full programme will be issued later.

A general meeting will be held at Birmingham in May, when a visit will be paid to the works of the General Electric Company.

COUNCIL MEETING.

A council meeting will be held in London on Wednesday, April 29th.

EASTERN AND NORTH-EASTERN DISTRICTS.

A joint Eastern and North-Eastern District meeting will be held at Finedon and Kettering on Thursday, May 7th, when a visit will be paid to the works of the Excelsior Stone Company at Finedon, and certain municipal works inspected at Kettering.

PROGRAMME.

12.20 a.m.—Meet at the works of the Excelsior Stone Company at Finedon, and inspect the manufacture of patent stone slabs, kerbs, channels, architectural dressings, &c.

Proceed thence by motor bus to Kettering for lunch at the Royal Hotel, at the kind invitation of the Excelsior Patent Stone Company, when a short paper will be read by Mr. W. B. Mortimer, managing director of the firm.

An inspection will afterwards be made of works in Excelsior stone at Kingsley-avenue, the new Co-operative Clothing factory, and the county police station.

G. BELSON CULVERS,
Hon. District Secretary.

Council Offices,
Oundle.

A joint Eastern and North-Eastern District meeting will be held at Hunstanton in July.

WESTERN DISTRICT.

A Western District meeting will be held at Tisbury on Saturday, June 13th, when the municipal works of the town will be inspected and a paper, "Wiltshire Roads, Past and Present," will be read by Mr. E. Plummer Davies (member).

B. WYAND,
Secretary.
39 Victoria-street, S.W.

INSTITUTION OF MECHANICAL ENGINEERS.

PARIS MEETING: PROVISIONAL OUTLINE PROGRAMME.

The Summer meeting of the Institution of Mechanical Engineers will be held in Paris, and will begin on Monday, July 6th. The following outline programme (which is subject to revision) has been drawn up:—

Monday, July 6th.—Arrival in Paris.

Tuesday, July 7th (Morning).—Reading and discussion of papers in the theatre of the Société des Ingénieurs Civils. Luncheon.

Afternoon.—Visits to engineering works and places of interest in Paris.

Evening.—Institution dinner.

Wednesday, July 8th (Morning).—Reading and discussion of papers in the theatre of the Société des Ingénieurs Civils. Luncheon.

Afternoon.—Visits to engineering works and places of interest in and around Paris.

Evening.—Conversation, by kind permission of the Société des Ingénieurs Civils.

Thursday, July 9th.—Visits in or from Paris.

Evening proceed to Lille.

Friday, July 10th.—Visit locomotive, steel and textile works in Lille, Roubaix, Valenciennes, &c., returning to Paris in the evening, if desired. It is intended to arrange for visits to works in Le Havre, and a visit might be made after the meeting to the International Exhibition at Lyon.

EDGAR WORTHINGTON,
Secretary.

SEA-COAST EROSION.—For a very complete and expensive library on the cause, prevention and repair of coast erosion the following three works are recommended: "Coast Erosion and Foreshore Protection," by John S. Owens, M.D., Assoc.M.Inst.C.E., F.R.C.S., and Gerald O. Case (price 7s. 6d., post free 7s. 10d.), with numerous illustrations and diagrams; "Sea-Coast Erosion and Remedial Works," by R. C. Allanson-Winn, M.Inst.C.E.I. (price 1s., post free 1s. 1d.); and "Erosion of the Coast and its Prevention," by F. W. S. Stanton, Assoc.M.Inst.C.E., F.S.I. (price 3s., post free 3s. 2d.), with numerous maps and other illustrations. The publishers are the St. Bride's Press, Limited, 24 Bride-lane, Fleet-street, London, E.C.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

CLERK OF WORKS.—April 18th.—Abercarn Urban District Council. 32s. 6d. weekly.—Mr. T. Wilkinson, gas manager and engineer.

ROAD FOREMAN.—April 20th.—Tiverton Town Council. £100 per annum.—Mr. J. Siddalls, borough surveyor.

GENERAL ASSISTANT.—April 20th.—Corporation of Leigh. £97 10s.—£104.—Mr. Tom Hunter, borough engineer.

SANITARY INSPECTOR.—April 20th.—West Riding County Council. £170 a year.—Mr. F. A. Darwin, clerk, County Hall, Wakefield.

ROAD ENGINEERING ASSISTANT.—April 20th.—Corporation of Capetown. Messrs. Davis & Soper, agents, 54 St. Mary-axe, London, E.C.

DISTRICT SUPERINTENDENT OF HIGHWAYS.—April 20th.—Corporation of Huddersfield. £120 per annum.—Mr. K. F. Campbell, borough engineer and surveyor.

SURVEYING ASSISTANTS.—April 21st.—Shanghai Municipal Council. £385 per annum.—Messrs. John Pook & Co., agents for the Shanghai Municipal Council, 68 Fenchurch-street, London, E.C.

CLERK OF WORKS.—April 24th.—Pembroke (co. Dublin) Urban District Council. £3 3s. per week.—Mr. J. C. Manly, clerk, Town Hall, Ballsbridge, co. Dublin.

DRAUGHTSMAN.—April 25th.—Westminster City Council. £120—£150 per annum.—Mr. J. Hunt, town clerk.

SANITARY INSPECTOR.—April 25th.—Fulham Borough Council. £120 per annum.—Mr. J. P. Shuter, town clerk.

SURVEYOR.—April 25th.—Sidmouth Urban District Council.—Mr. J. A. Orchard, clerk.

GENERAL ASSISTANT.—April 25th.—Corporation of Hove. £104 per annum.—Mr. H. H. Scott, borough surveyor.

JUNIOR ASSISTANT.—April 28th.—Ilford Urban District Council. £80—£100 per annum.—Mr. H. Shaw, engineer and surveyor.

ASSISTANT ENGINEERS.—Public Works Department of the Government of Nigeria. £300—£400, with free quarters.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

CHIEF DRAUGHTSMAN.—Federated Malay States. £300—£400.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

DRAUGHTSMAN.—Nigerian Government Railway. £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

WILLESDEN.—April 21st.—For the erection of a rustic bandstand, for the urban district council.—Mr. O. C. Robson, engineer.

ST. HELENS.—April 21st.—For the erection of a school, for the Education Committee.—Messrs. Biram & Fletcher, architects, George-street, St. Helens.

MANCHESTER.—April 25th.—For the erection of a school, for the Education Committee.—Education Offices, Deansgate.

MENBOROUGH.—April 27th.—For the erection of public baths, for the urban district council.—Mr. H. Burgess, architect, Queen Anne's Chambers, Westminster.

GLASGOW.—May 1st.—Models for four groups of symbolical sculpture, for the Glasgow Corporation.—Mr. J. Lindsay, town clerk.

LONDON.—May 4th.—Designs from British architects for the architectural treatment of the new St. Paul's Bridge, for the City Corporation. Premiums, £300, £200, and £100.—Town Clerk, Guildhall, E.C.

HYTHE.—May 30th.—Designs for a concert hall and public shelter, for the Hythe Corporation. Premiums, 50, 25 and 10 guineas.—Mr. B. C. Drake, town clerk.

CHESTER.—Designs for working-class dwellings, for the Corporation of Chester. Premiums, £50, £25, and £10. Mr. Patrick Abercrombie, M.A., Liverpool University School of Civic Design, has been appointed assessor.—Mr. J. H. Dickson, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

HUNTS.—April 20th.—For the enlargement of a school, for the Education Committee.—County Surveyor, Market-place, Huntingdon.

CHELMSFORD.—April 20th.—For sinking a 14-in. borehole, for the corporation.—Borough Surveyor.

MARGATE.—April 20th.—For the erection of a pumping engine house, for the corporation.—Mr. A. E. Borg, borough engineer.

KEIGHLEY.—April 20th.—For the erection of a two-span bridge, for the rural district council.—Messrs. R. B. Broster & Sons, engineers, Craven Bank Chambers, Keighley.

MANCHESTER.—April 20th.—For the construction of main drainage work No. 2c (new outfall sewer, Chester-road, to the Chester Lines Railway), for the corporation.—City Surveyor.

ABERTILLERY.—April 20th.—For laying out school grounds and building boundary walls, for the Board of Governors.—Mr. N. J. Llewellyn, clerk, Council Offices.

MONMOUTHSHIRE.—April 20th.—For additions and alterations to schools, for the Education Committee.—Mr. J. Bain, county council offices, Newport.

TIPPERARY.—April 20th.—For the erection of twenty-four two-story stone houses, for the urban district council.—Mr. T. Dawson, town clerk.

LISBURN.—April 21st.—For the erection of sixty cottages, for the rural district council.—Mr. W. Sinclair, clerk.

WALLASEY.—April 21st.—For the erection of a town hall, for the corporation.—Messrs. Briggs, Wolstenholme & Thorneley, Royal Liver Buildings, Liverpool.

WAREHAM AND PURBECK.—April 22nd.—For the erection of six cottages, for the rural district council.—Mr. W. W. Fookes, surveyor.

LEICESTER.—April 22nd.—For the extension of the generating station and other works, for the corporation.—Borough Surveyor.

EDINBURGH.—April 22nd.—For taking down old house, constructing new rubble walls, and laying cement pavement, for the corporation.—Mr. A. H. Campbell, borough engineer.

GLAMORGAN.—April 22nd.—For alterations and additions to schools, for the county council.—County Hall, Cardiff.

GLASGOW.—April 22nd.—For the extension of the municipal buildings, for the corporation.—Messrs. Watson & Salmund, architects, 242 George-street, Glasgow.

BLACKROCK.—April 23rd.—For the erection of a power station and machinery, for the urban district council.—Mr. J. P. Tierney, engineer, 15 College-green, Dublin.

WEST RIDING.—April 24th.—For alterations at a school, for the Education Committee.—The Clerk, County Hall, Wakefield.

DUBLIN.—April 24th.—For the extension of the technical schools, for the Technical Education Committee.—City Architect.

WARWICKSHIRE.—April 24th.—For the enlargement of the police station and the erection of a pair of cottages and works incidental thereto, for the county council.—Mr. John Wilmot, county surveyor, 6 Waterloo-street, Birmingham.

GLASGOW.—April 24th.—For works in connection with the extension of the meat market, for the corporation.—Mr. J. Lindsay, town clerk.

ECCLES.—April 25th.—For the erection of an office building, for the corporation.—Borough Surveyor.

CUMBERLAND.—April 25th.—For the reconstruction in ferro-concrete of "Metal Bridge" across the river Esk, for the county council.—Mr. William Finch, county surveyor and bridgmaster, The Courts, Carlisle.

EAST SUSSEX.—April 25th.—For the construction of sea defences, for the county council.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

DODWORTH.—April 25th.—For the erection of council offices, for the urban district council.—Mr. Ernest W. Dyson, architect and surveyor, 10 Regent-street, Barnsley.

PONTEFRACT.—April 27th.—For deepening a well and other incidental works, for the corporation.—Messrs. G. & F. W. Hodson, engineers, Bank Chambers, Loughborough.

BURY (Lancs.).—April 27th.—For the construction of concrete foundations to generator, for the corporation.—Borough Engineer.

HETTON.—April 27th.—For the erection of a public convenience, for the urban district council.—Mr. J. Harding, surveyor.

TRURO.—April 28th.—For the erection of a stone bridge, for the rural district council.—Mr. C. Hancock, clerk.

WANDSWORTH.—April 28th.—For deepening the artesian well and supplying and fixing an air-compressor engine and water and air tubes, for the borough council.—Mr. P. Dodd, borough engineer.

EAST RIDING.—April 28th.—For the erection of clerk and steward's house, six cottages, bailiff's house and dairy, for the Asylum Visiting Committee.—Mr. C. W. Hobson, clerk, 26 and 28 Lairgate, Beverley.

WESTMINSTER. April 29th.—For the execution of certain alterations and sanitary work at the Buckingham Palace-road public baths, for the city council.—City Engineer.

BURTON-UPON-TRENT. April 29th.—For the extension of the refuse destructor, Bond End, for the corporation.—Mr. George T. Lynam, borough engineer and surveyor.

ASHFORD.—April 30th.—For the erection of baths and attendant's room, for the urban district council.—Mr. W. Terrill, surveyor.

LANCASHIRE. May 1st.—For the erection of a school, for the Education Committee.—Mr. H. Littler, county architect, 46 Ribblesdale-place, Preston.

BLACKPOOL. May 2nd.—For additions to Waterloo-road school, for the corporation.—Mr. John S. Brodie, borough engineer.

FEATHERSTONE.—May 5th.—For the erection of 149 working-class dwellings and laying sewers, for the urban district council.—Mr. S. Chesney, engineer.

GUILDFORD. May 11th.—For the erection of twenty cottages, for the corporation.—Mr. C. G. Mason, borough engineer.

DURHAM. May 19th.—For the erection of a school, for the county council.—Mr. A. J. Dawson, clerk to the Education Committee, Shire Hall, Durham.

CARLISLE.—For the erection of a school and caretaker's house, for the Education Committee.—Messrs. Oliver & Dodgshun, Lowther-street, Carlisle.

Iron and Steel.

HAMMERSMITH. April 22nd.—For the provision, erection and painting of an iron railing, for the borough council.—Mr. H. Mair, borough surveyor.

LEEDS.—April 25th.—For the supply of cast-iron pipes, retort castings and flags, for the Gas Committee.—Mr. W. B. Leech, general manager, Market Hall.

DUNDEE. April 27th.—For the erection of a corrugated-iron shed, for the Water Commissioners.—Mr. G. Baxter, 93 Commercial-street.

CHELMSFORD.—April 30th.—For the provision and erection of a pumping installation, including suction-gas plant, for the corporation.—Mr. Percival T. Harrison, borough engineer.

ENFIELD.—May 6th.—For the supply of 350 lin. yds. (more or less) of wrought-iron unclimbable fencing, 5 ft. high, and one pair of gates, for the urban district council.—Mr. Richard Collins, surveyor.

Roads.

HALFAX.—April 18th.—For the execution of street works, for the corporation.—Mr. J. Lord, borough engineer.

BEDWELLY.—April 18th.—For the construction of an access road, for the urban district council.—Mr. D. H. Price, surveyor, Aberbargoed.

BATTERSEA.—April 18th.—For the supply of materials and works for resurfacing roadways with asphalt macadam, for the borough council.—Mr. W. Marcus Wilkins, town clerk.

RUSKINGTON. April 18th.—For the supply of granite, slag, and ironstone, for the urban district council.—Mr. E. H. Godson, clerk.

ROTHERHAM. April 18th.—For the supply of broken granite, broken slag, Portland cement, tarred slag, tarred limestone, concrete flags, gritstone setts and kerbs, for the corporation.—Mr. E. B. Martin, borough engineer.

GLASGOW. April 20th.—For paving works in certain streets, for the corporation.—Office of Public Works, 64 Cochrane-street.

HADLEIGH.—April 20th.—For the supply of Guernsey or Quenast granite, for the urban district council.—Mr. H. W. F. Grimwade, clerk.

WADEBRIDGE.—April 20th.—For widening main road and other works, for the urban district council.—Mr. R. W. Burr, surveyor.

EAST PRESTON.—April 20th.—For the supply of granite and flints, for the rural district council.—Mr. A. Shelley, clerk, Littlehampton.

WILLESDEN.—April 21st.—For road making and paving, for the urban district council.—Mr. O. C. Robson, engineer.

RAWMARSH.—April 21st.—For making up a certain street, for the urban district council.—Mr. J. A. Tonge, engineer and surveyor.

SALFORD.—April 21st.—For paving, flagging and sewerage, for the corporation.—Borough Engineer.

LONDON.—April 21st.—For paving works in certain streets, for the City Corporation.—Engineer to the Corporation, Guildhall, E.C.

MERE.—April 22nd.—For the supply of Mendip stone, for the rural district council.—Mr. J. McKenzie, district surveyor.

WOODHALL SPA.—April 22nd.—For the supply of granite, granite chippings and slag chippings, for the urban district council.—Mr. E. E. T. Bolton, surveyor.

NEWPORT (Mon.).—April 22nd.—For the execution of private street works, for the corporation.—Borough Engineer.

HERTS.—April 22nd.—For laying about 1,000 yds. of kerbing, for the county council.—Mr. Urban A. Smith, county surveyor, Hatfield.

DURHAM. April 23rd.—For tar-grouted whinstone surfacing work, for the county council.—Mr. J. T. Pegge, city surveyor, Durham.

NELSON. April 23rd.—For the execution of private street works, for the corporation.—Mr. W. Shackleton, borough engineer and surveyor.

LUTON.—April 23rd.—For private street works, for the corporation.—Borough Engineer.

GLOUCESTER.—April 23rd.—For the supply of stone and hauling, for the rural district council.—Mr. F. E. Weaver, district surveyor.

MIDDLEWICH.—April 24th.—For the supply of road materials, paving, steam rolling, and team labour, for the urban district council.—The Surveyor.

AIRDRIE.—April 24th.—For the supply of road metal, kerb and channel work, granolithic paving, and curbing, for the corporation.—Mr. H. Inglis, burgh surveyor.

ALTON.—April 25th.—For the supply of broken granite and steam rolling, for the rural district council.—Mr. C. W. Maudsley, surveyor.

FAIRSWORTH.—April 25th.—For laying asphalt at cemetery, for the urban district council.—Mr. W. M. Shummin, engineer and surveyor.

YORK.—April 27th.—For excavating existing material of roadway, and laying concrete foundation and tar-macadam surface on about 1½ miles of main road, for the corporation.—Mr. F. W. Spurr, city engineer.

BLAENAVON.—April 27th.—For the supply of 850 tons of broken limestone and 150 tons of limestone gravel, for the urban district council.—Mr. E. W. Edwards, surveyor.

FARNBOROUGH.—April 27th.—For the supply of broken granite, slag, or granite tar-macadam, for the urban district council.—Mr. J. E. Hargreaves, surveyor.

FINSBURY.—April 27th.—For paving work with creosoted deal on Portland cement concrete, for the borough council.—Borough Surveyor.

EAST SUSSEX.—April 27th.—For the widening, improvement, and reconstruction of the Lewes-Newhaven road, for the county council.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

BELFAST. April 29th.—For the supply of 280 tons of setts, for the Harbour Commissioners.—Mr. W. R. Kelly, harbour engineer.

ARGYLE.—April 30th.—For road maintenance, for the county council.—Mr. J. Thomson, surveyor, Strontian.

WHITWORTH (Lanes).—May 4th.—For paving various lengths of main road, for the urban district council.—District Surveyor.

MADRAS.—May 4th.—For the supply of 400 40-gallon casks of tar, for the corporation. A copy of specification and conditions may be obtained at the office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

ENFIELD.—May 6th.—For the supply of 780 yds. of granite kerbing, 780 yds. of granite channelling, and 4,100 yds. of artificial stone paving, for the urban district council.—Mr. Richard Collins, surveyor.

ST. MELONS.—May 12th.—For widening and improving part of Lighthouse-road, for the rural district council.—Mr. Gomer S. Morgan, engineer, Pontypridd.

Sanitary.

RADCLIFFE. April 18th.—For the construction of bacteria beds and other works, for the urban district council.—Mr. W. L. Rothwell, engineer.

GOOLE.—April 20th.—For the construction of branch sewers and connections, consisting of about 6 miles of stoneware pipe sewers, with manholes and other appurtenances, for the urban district council.—Mr. Robert Tyson, clerk.

STONE.—April 20th.—For the construction of sewers, manholes, pumping station, and rising main, for the rural district council.—Mr. H. W. Makepeace, engineer, Leek-road, Stoke-on-Trent.

WESTPORT.—April 20th.—For the construction of an outfall sewer, for the urban district council.—Mr. T. H. McCarthy, engineer, 39 Westmoreland-street, Dublin.

KEIGHLEY.—April 20th.—For the construction of a pot pipe drain, for the rural district council.—Mr. T. Burton, engineer and inspector.

BRADFIELD.—April 20th.—For the collection and disposal of house refuse, for the rural district council.—Mr. C. West, junr., clerk, Pangbourne, Berks.

MANCHESTER.—April 20th.—For main drainage work, for the corporation.—The Town Clerk.

BRIGHTON.—April 21st.—For the supply of glazed drain pipes, for the corporation.—Borough Surveyor.

AXMINSTER.—April 21st.—For relaying a sewer, for the rural district council.—Mr. Cecil Forward, clerk.

BEESTON.—April 21st.—For closet conversion, for the urban district council.—The Surveyor.

COSELEY.—April 21st.—For the construction of earthenware pipe sewers, for the urban district council.—The Surveyor.

STOCKPORT.—April 23rd.—For excavating and sewerage, for the corporation.—Mr. J. Atkinson, borough surveyor.

DARLINGTON.—April 24th.—For the erection of a foul main at the gasworks, for the corporation.—Mr. F. T. Tarratt, gasworks engineer.

WIGAN.—April 25th.—For the supply of 1,000 galvanised sanitary pans, for the corporation.—Mr. W. H. Tyrer, town clerk.

CHERTSEY.—April 27th.—For the extension of the Byfleet sewerage works, comprising 643 yds. of 9-in. and 7-in. Hassall's stoneware pipes, with manholes and appurtenances, also ejector chamber, and laying 1,420 yds. of 2½-in. cast-iron compressed-air main, and 194 yds. of 5-in. cast-iron pumping main, for the rural district council.—Messrs. Elliott & Brown, engineers, Burton Buildings, Parliament-street, Nottingham.

CHERITON.—April 27th.—For the collection and removal of house refuse, for the urban district council.—Mr. A. Atkinson, clerk.

HINDLEY.—April 27th.—For the construction of eight circular percolating filters, for the urban district council.—Mr. O. P. Abbott, surveyor.

CHEPPING WYCOMBE.—April 28th.—For the supply and erection of steam engines, air compressors, air lifts, ejectors, and all necessary appurtenances in the extension of the sewage outfall works at Wycombe Marsh, for the corporation.—Mr. T. J. Rushbrooke, borough engineer and surveyor.

LISKEARD.—April 30th.—For the construction of a drainage scheme, for the rural district council.—Mr. B. C. Andrew, engineer, St. Austell.

KENT.—May 1st.—For the construction of a septic tank and incidental drainage work, for the Education Committee.—Mr. W. H. Robinson, architect, Sessions House, Maidstone.

GOOLE.—May 4th.—For the construction of drainage works, for the Joint Hospital Board.—Messrs. Chambers & Son, Belgravia, Goole.

FEATHERSTONE.—May 5th.—For the construction of sewerage and other works.—Mr. S. Chesney, engineer.

Stores.

SUTTON (Surrey).—April 22nd.—For the supply of road materials, ironmongery, oils, paints, coal, coke, horse forage, and team labour, for the urban district council.—Mr. W. Hedley Grieves, surveyor.

INVERNESS.—April 20th.—For supplies for the Gas Commissioners.—Manager to the Gasworks.

TEES VALLEY.—For the supply of road and valve boxes, brass castings, taps, ferrules, and general stores, for the Water Board.—Mr. Hugh Wilson, clerk.

Miscellaneous.

BRIGHTON.—April 21st.—For the supply of Portland cement, for the corporation.—Borough Surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance. ‡ Provisionally accepted.

BLEAN.—The following tenders have been accepted by the rural district council:—

Road Materials.—Blean, Finn & Co., gravel, fine gravel, fine chalk, Chislet East, A. A. Baldoek, fine chalk, Chislet West, Finn & Co., gravel; Larkin, fine gravel, Herne East, A. A. Baldoek, fine chalk; Finn & Co., chalk flints. Herne West, A. A. Baldoek, gravel; L. Baldoek, fine gravel; A. A. Baldoek, fine chalk; Finn & Co., chalk flints. Hoath, A. A. Baldoek, fine chalk. Reculver, A. A. Baldoek, fine chalk. St. Stephens, Finn & Co., gravel, fine gravel, chalk flints; L. Baldoek, fine chalk. St. Dunstan's Without, Finn & Co., gravel and fine gravel. Sturry, L. T. Ashenden, gravel and fine gravel; L. Baldoek, fine chalk. Swalecliffe, Finn & Co., dug flints and fine gravel. Westbere, Homersham Brothers, gravel; L. T. Ashenden, fine gravel; L. Baldoek, fine chalk. Whitstable-cum-Seasalter, E. Colthup, dug flints and fine chalk; Finn & Co., fine gravel.

Team Labour.—Section 1, H. Goodsell; section 2, Terry Brothers; section 3, G. Taylor; section 4, A. Price.

Steam Rolling.—Sections 1 and 2, A. A. Baldoek; sections 3 and 4, Finn & Co.

EAST STEYNING.—For the execution of street works, for the rural district council.—Mr. G. W. Warr, surveyor:—
G. Burstow, Brighton £965
H. Farrow, Brixton 943
Parsons & Sons, Hove 918
A. Pearce, Forest Hill 914
McKellar, Westernman, Hove 875

HAYFIELD.—Accepted for works of sewerage, for the rural district council.—Messrs. John Newton, Son & Bayley, engineers, Manchester:—
T. Winter, Hayfield, £924.

NORTH BRONGROVE.—For the supply and erection of three sets of gas engines, and three throw pumps, capable of lifting in the aggregate 20,000 gallons per hour, for the urban district council.—Mr. R. Green, Birmingham:—
G. R. Mather & Son, Wellingtonborough £2,196
Crossley Brothers, Manchester 1,455
Davey, Paxman & Co., Colchester 1,410
G. Waller & Son, Stroud, Glos. 1,259
Campbell Gas Engine Company, Halifax (including sludge pump) 1,164

OSWESTEY.—For the erection of a lodge in Cae Glas Park, for the corporation.—Mr. G. William Lacey, borough engineer and surveyor:—
Jabey Higgins, Oswestry £341
W. H. Thomas & Sons, Limited, Oswestry 319
Jones & Evans, Oswestry 318

SWANSEA.—For the construction of about 2,350 yds. of roads, sewers, surface-water drains, manholes, inspection chambers, gullies, and other works, for the corporation.—Mr. G. Bell, borough surveyor, Somerset-place:—
Bennett Brothers, Swansea £14,389
T. Walker, Clydach 10,983
Hill Brothers, Swansea 10,862
F. Hayes, Liverpool 10,309

WANDSWORTH.—For constructing a sewer, for the borough council.—Mr. P. Dodd, borough surveyor:—
S. Lane, £268, and 15 per cent above schedule prices for stoneware pipes, and schedule prices for the remainder of the items in the schedule, for extras or omissions.

WANDSWORTH.—For making up Hambleton-road, Southfield, for the borough council.—Mr. P. Dodd, borough surveyor:—
E. Parry & Co., £991, and 10 per cent above schedule prices for extras or omissions.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

APRIL.

- 20.—Institute of Sanitary Engineers: Mr. E. A. Lees, A.I.S.T.C.E., on "The Birmingham Waterworks." Caxton Hall, Westminster. 8 p.m.
- 20.—Junior Institution of Engineers: Mr. James Richardson, B.S.C., ASSOC.M.I.S.T.C.E., on "Lines of Future Development in High Power Diesel Oil Engines." Institution of Electrical Engineers. 8 p.m.
- 20.—Royal Institute of British Architects: Mr. Max Clarke on "Professional Practice." 8 p.m.
- 23.—Institution of Mechanical Engineers: Anniversary Dinner, Connaught Rooms.
- 23.—Roads Improvement Association: Annual General Meeting, Institution of Civil Engineers. 4.30 p.m.
- 25.—Association of Somerset Surveyors: Meeting at Street.

MAY.

- 1.—Junior Institution of Engineers: Mr. S. T. Robson on "The Control and Organisation of the Engineering Profession." 39 Victoria-street, S.W. 8 p.m.
- 9.—Institution of Municipal and County Engineers: Meeting at Dover.
- 11.—Institute of Sanitary Engineers: Mr. Guy B. Grave on "A London Builder's Experiences with Sanitary Officials in the Metropolis." 8 p.m.
- 13.—Royal Sanitary Institute: Annual Dinner, Langham Hotel.
- 20.—Institute of Sanitary Engineers: Visit to Metropolitan Water Board's Reservoirs at Chingford.
- 23.—Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham; Mr. A. S. Parsons on "Bridge Construction."
- 24.—Institution of Civil Engineers (Students' Meeting): Mr. A. A. Hudson, K.C., on "Engineering Contracts." 8 p.m.
- 27.—Institute of Sanitary Engineers: Visit to Eton Rural District Council's sewage outfall works at Gerrard's Cross. Train from Marylebone, 2 p.m.

JUNE.

- 6.—Institution of Municipal and County Engineers: Meeting at Southend.
 13. Institution of Municipal and County Engineers: Meeting in Edinburgh.
 13. Institution of Municipal Engineers: Western District Meeting at Tisbury. Mr. E. Plummer Davies on "Wiltshire Roads, Past and Present."
 17.—Royal Institute of British Architects: Annual Dinner, Hotel Cecil.
 21.—Institute of Sanitary Engineers: Visit to Luton sewage farm. Train from St. Pancras, 2.50 p.m.
 24-27.—Institution of Municipal and County Engineers: Annual Meeting and Town Planning, Housing and Road Conference at Cheltenham.

JULY.

- 4-11. Royal Sanitary Institute: Annual Congress and Exhibition at Blackpool.
 6-10.—Institution of Mechanical Engineers: Summer Meeting in Paris.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

SHANGHAI MUNICIPAL COUNCIL.

PUBLIC WORKS DEPARTMENT.

FOUR SURVEYING ASSISTANTS.

Four thoroughly qualified Surveying Assistants, with experience in town surveys and cadastral work, are required in the Public Works Department.

Candidates should be about 25 years of age and unmarried.

Salary, taels 250 per mensem, without allowances, under a three years' agreement, with first-class passage from home, half pay on voyage, and medical attendance. There is an excellent superannuation scheme.

The value of the tael at the present rate of exchange is about 2s. 7d., but it is liable to fluctuation. Taels 250 per mensem taken at Exchange 2s. 7d. is equivalent to about £385 per annum. Particulars of the appointment may be obtained of the Council's Agents, and applications, in Candidate's own handwriting, stating qualifications, experience, &c., accompanied by copies of not more than three recent testimonials, and endorsed "Surveying Assistants," should be forwarded, on or before April 21st, to Messrs. John Pook & Co., Agents for the Shanghai Municipal Council, 68 Fenchurch-street, London, E.C.

March, 1914.

(1,412)

COUNTY BOROUGH OF HUDDERSFIELD.

The Corporation require the services of an experienced District Superintendent of Highways to take charge of a District under the Borough Engineer.

Applicants must have had practical experience in sewerage, paving and macadamising of roads, and be competent to set out and measure up work, and keep daily accounts of all labour and materials used.

The person appointed must have had previous practical experience in a similar situation, and be prepared to reside within his district.

For statement of duties apply to the Borough Engineer.

Salary £120 per annum.

Applications, in the handwriting of candidates, giving full particulars of present and previous occupation, age, &c., accompanied by copies of not more than three testimonials of recent date, endorsed "District Superintendent of Highways," must be addressed to me not later than 10 a.m. on Monday, the 20th April, 1914.

Canvassing will disqualify.

K. F. CAMPBELL, M.INST.C.E.,
Borough Engineer and Surveyor.

1 Peel-street,
Huddersfield.

April 3, 1914.

(1,506)

BOROUGH OF HOVE.

Applications are invited for the post of General Assistant in the Borough Surveyor's Office. Salary, £104 per annum.

Candidates must have had experience in the work of a Borough Surveyor's Office. Applications, stating age, experience and qualifications, with copies of three testimonials, to be sent to the undersigned not later than the 25th inst.

H. H. SCOTT,
Borough Surveyor.

April 14, 1914.

(1,521)

ILFORD URBAN DISTRICT COUNCIL.
JUNIOR ASSISTANT, SURVEYOR'S DEPARTMENT.

The Ilford Urban District Council invite applications for the position of Junior Assistant in the Engineer and Surveyor's Department.

Salary, £90 per annum, rising by £10 increments annually to £100. Applicants must have served articles to a municipal engineer or surveyor. Particulars of duties and forms of application may be obtained on application to Mr. H. Shaw, M.INST.C.E., Engineer and Surveyor, Town Hall, Ilford. Applications, accompanied by copies of two recent testimonials (which will not be returned), endorsed "Junior Assistant," must be received at the office of Mr. Adam Partington, Clerk, Town Hall, Ilford, by 12 noon on Tuesday, the 28th day of April, 1914. Canvassing will disqualify.

Clerk-Solicitor's Department,
Town Hall, Ilford.

April 7, 1914.

(1,513)

ENGINEERING ASSISTANTS with experience of Sewerage, Sewage Disposal and Waterworks, wanted immediately by Messrs. Willcox & Raikes, Civil Engineers, 63 Temple-row, Birmingham. Applicants must state age and salary required, with particulars of qualifications and experience. (1,509)

ENGINEER AND SURVEYOR to Urban District short distance from London has vacancy for Pupil. Large sewerage scheme in hand.—Apply Box 1,393, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,423)

TENDERS WANTED.

URBAN DISTRICT COUNCIL OF ENFIELD.
TO MANUFACTURERS OF IRON FENCING.

The Council invite Tenders for supplying free, and in good condition, at Ponders End Railway Station, G.E.Ry.—

350 lin. yds. (more or less) of Wrought-iron Unclimbable Fencing, 5 ft. high, and one pair of gates to match.

Drawings, Forms of Tender, and all information can be obtained on application to Mr. Richard Collins, the Council's Surveyor, at these offices, any day except Saturday, between the hours of 9 a.m. and 5 p.m.

Tenders (on the forms supplied only) to be sent in to me not later than noon on Wednesday, the 6th day of May next, endorsed "Tender for Fencing."

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

T. W. SCOTT,
Clerk.

Public Offices,
Enfield, Middlesex.

April 16, 1914.

(1,522)

URBAN DISTRICT COUNCIL OF ENFIELD.
PUBLIC STREET IMPROVEMENT WORKS.

The Council invite Tenders for providing and laying about

780 yds. run of Granite Kerbing,
780 yds. run of Granite Channelling,
4,100 yds. super. of Artificial Stone Paving,

in various Public Streets within the District of Enfield.

Specifications can be seen, Forms of Tender and all information obtained, on application to Mr. Richard Collins, the Council's Surveyor, any day, except Saturday, between the hours of 9 a.m. and 5 p.m.

The Contractor will be required to observe trade union hours of labour, and to pay wages according to the published scale of the London County Council for the time being in force.

Sealed Tenders, endorsed "Tender for Street Works," to be sent to me not later than noon on Wednesday, the 6th day of May next.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

T. W. SCOTT,
Clerk.

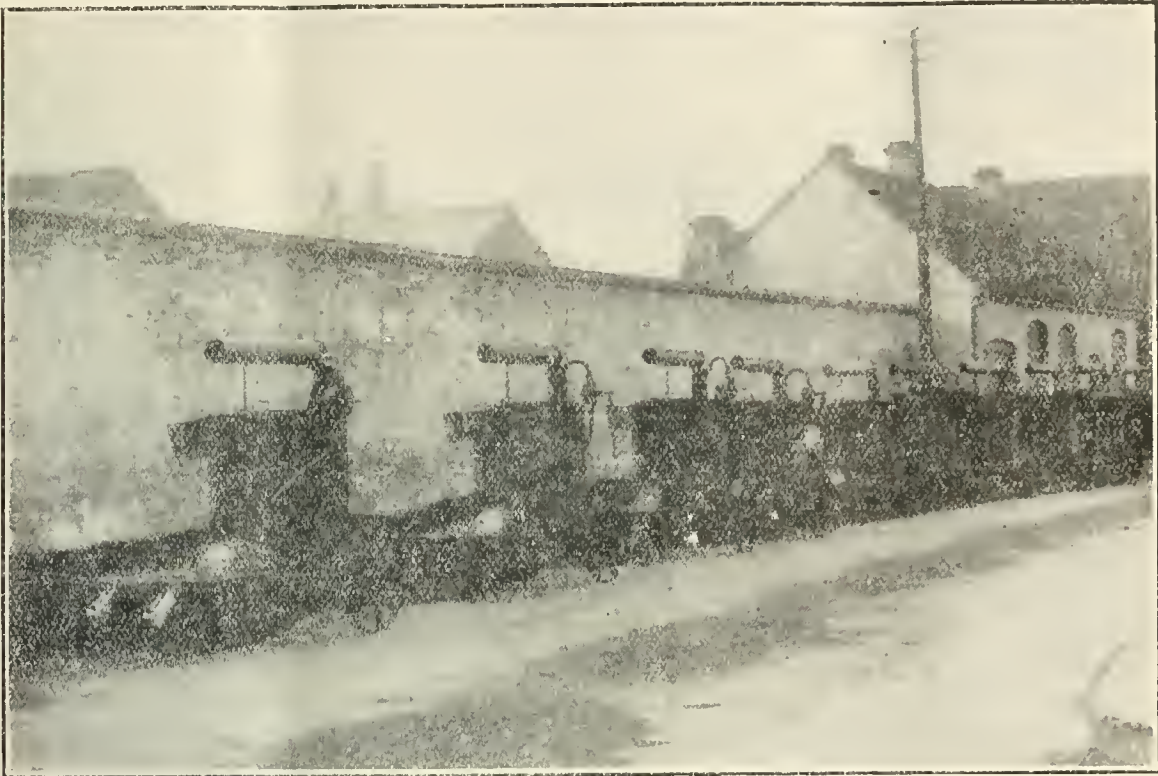
Public Offices,
Enfield, Middlesex.

April 16, 1914.

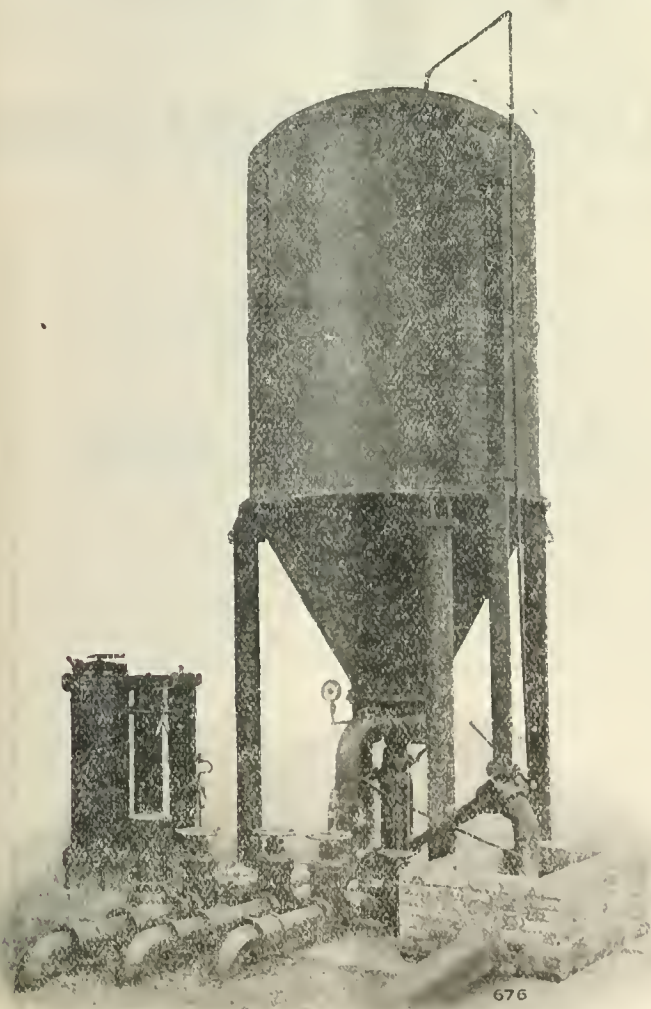
(1,523)

JOHNSTON BROTHERS, 79 MARK LANE, LONDON, E.C.

Tar Boilers, Single & Double Furnace. Waithman Apparatus. Smart's Patching Boiler.



Some of JOHNSTON'S PATENT DOUBLE FURNACE BOILERS ready for Contract Work this season.



676

RANSOME CONTINUOUS FILTERS

FOR
MUNICIPAL
INDUSTRIAL
AND DOMESTIC
SUPPLIES

WRITE FOR BOOKLET No. 130

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— LIMITED —

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WESTMINSTER, S.W.

Telephone:
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Telegrams:
Vermehrleo, London.

WOOD PAVING.

The Finsbury Borough Council invite Tenders for paving with Creosoted Deal on Portland Cement Concrete the carriageways of Cowcross-street (part) and Turnmill-street.

Specifications can be seen, and Forms of Tender obtained, at the Borough Surveyor's Office any day, except Saturday, between 10 a.m. and 4 p.m., on deposit of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.

Tenders must be delivered to me not later than 1 p.m. on Monday, 27th inst. Only those made upon the official form and properly filled in will be entertained.

GEORGE WHITEHEAD PRESTON,
Town Clerk.

Finsbury Town Hall, E.C.
April 14, 1914.

(1,518)

£ s. d. from Waste Paper.

The Sutton (Surrey) Urban District Council have, according to the *Sutton Advertiser*, through their Surveyor, discovered another source of income which promises to turn the wilderness on Balaam's plain into a little goldmine. By means of a contrivance technically known as "The 'All-Metal' Waste Paper Bin and Baler," manufactured and sold by the Patentees, The Canadian American Machinery Company, Limited, 8 Bouverie-street, Fleet-street, London, E.C., waste paper which has hitherto been dumped at the shoot with house refuse, and has been blown about by contrary winds of heaven, is now rescued, sized, baled, and found to have an appreciable market value. In an experimental stage lasting thirteen days the quantity of paper dealt with has amounted to 4 tons 17 cwt. 11 lb., with a market value estimated at £7 5s. 8d.

At the rate mentioned, the *Advertiser* goes on to state, it means that in a twelvemonth the waste paper would amount to 126 tons 1 cwt. 2 qr. 6 lb., with a face value of £189 6s. 10d., equal to the amount of a rate of 3 of a penny in the £, always presuming that 30s. a ton can be got for it!—[Advt.]

CITY OF WESTMINSTER.**ALTERATIONS AND SANITARY WORK.**

The Westminster City Council invite Tenders for certain alterations and sanitary work at the Buckingham Palace-road Public Baths.

Conditions of Contract, Specification and Form of Tender may be obtained on application on and after Monday, the 20th April, to the City Engineer, Westminster City Hall, Charing Cross-road, W.C., between the hours of 10 a.m. and 4 p.m.

The Contractor will be bound by the Contract in the case of all workmen employed by him to pay wages at rates not less, and observe hours of labour not greater, than the rates and hours recognised by the associations of employers and employees, and in practice obtained in the district where the work is to be executed.

Tenderers are prohibited from directly or indirectly canvassing Members or Officials of the Council in reference to any Tender, and the Tender of any person who does so canvass will be rejected. The Contract Deeds will be prepared at the expense of the Council, and the Contractor will be required, together with two sureties, to enter into a bond for the due fulfilment of his Contract, or, in the alternative, to agree to the retention by the Council, during the period mentioned in the Form of Tender, of certain monies.

Each Tender, on the official form supplied, is to be enclosed in a sealed cover, addressed to the Town Clerk, Westminster City Hall, Charing Cross-road, W.C., and marked "Tender for Alterations, &c., Buckingham Palace-road Baths." Tenders may be placed by, or on behalf of, Tenderers in a locked box at the City Hall, provided for the purpose.

No Tender will be received after 12 noon on Wednesday, the 29th April, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

JOHN HUNT,

Town Clerk.

Westminster City Hall,
Charing Cross-road, W.C.

April 14, 1914.

(1,519)

SURVEYORS' INSTITUTION EXAMINATIONS.

COMPLETE COURSES OF PREPARATION in all Divisions and Sub-Divisions of these EXAMINATIONS are given, either in Class, by Correspondence, or in Office, by

Messrs. PARRY, BLAKE & PARRY and B. W. ADKIN.

The TWELVE MONTHS' and TWO YEARS' COURSES for the next Two Examinations are just commencing.

These Courses have been taken by the great majority of the successful candidates in these Examinations for very many years past, including the winners of NINETY-SEVEN out of the ONE HUNDRED AND FORTY-FIVE prizes awarded during the last nineteen years.

The Beadel Prize for Agricultural Knowledge, awarded in the Land Agency Section of the Examination, has been obtained every year since its institution by Candidates prepared by MESSRS. PARRY, BLAKE AND PARRY.

For particulars of the Courses of Work or for any advice with respect to the Examinations, apply to—

Messrs. PARRY, BLAKE & PARRY, 82 VICTORIA ST., WESTMINSTER

Telephone No.: GERRARD 5680.

These Courses were established twenty-two years ago, and since that time no stone has been left unturned to raise them to, and maintain them at, the highest standard of efficiency.

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

APRIL 24, 1914.

No. 1,162.

Minutes of Proceedings.

London Electricity Supply.

The issue last week of a comprehensive report on the future supply of electricity to London, prepared for the London County Council by Messrs. Merz and McLellan, has aroused general interest in this question, which is of great and growing importance. The approach of the date at which the existing companies which supply the bulk of London's electrical needs will become subject to compulsory purchase by the county council has drawn attention to the imperative necessity for the future conduct of the supply to be clearly defined and provided for long before the year 1931—the period in question—for if this were not done, the companies would be unable to raise fresh capital and the undertakings would be starved, as happened to some extent in the case of the telephones. The uses of electricity are now so manifold and universal that it has become a necessity to the community, and its applications are constantly increasing in variety and scope, so that any restriction upon its employment—such as would result from the maintenance of an unduly high price—can only be regarded as an evil that must not on any account be suffered to occur. It is unfortunately the case that electrical energy in London costs much more than in most large cities, or even in many of the smaller ones: for example, even on the borders of the Metropolis, the Croydon Corporation charges only 3½d. per unit, and West Ham Corporation 3d. per unit for lighting purposes, while in large areas of London itself the price is 5d. Favourable exception should be made of some of the metropolitan borough councils which have established their own supply undertakings, and charge prices as low as these. It is the companies that are to blame for the high prices. The trouble is really traceable directly, as the engineers point out in their report, to the action of Parliament in parcelling out the metropolitan area between a great many authorities—there are to-day no fewer than thirty-nine authorities supplying the central area, and seventy in Greater London—whereas, in point of fact, the essence of economy in the supply of electricity is summed up in the words “concentration” and “unification,” which form the keynotes of the report. The average size of the generating sets in the existing stations is between 600 and 800 kw., but in a modern power station nothing under 5,000 kw. should be installed, and, indeed, sets of no less than 50,000 kw. each are foreshadowed, though none of more than 25,000 kw. are actually at work. The increase in size of the generating units has brought about not only a great improvement in economy of fuel and labour, but also an immense reduction in the capital cost of plant and buildings, a factor which bulks very largely in the economics of electricity supply. The diversity of ownership has led also to the adoption of something like forty-nine different systems of supply in Greater London—an astonishing fact in itself, suggesting that the designers of many of these undertakings must have thought it a virtue to be different from everybody else, but reflecting no credit upon their intelligence.

We cannot and need not follow Messrs. Merz and

McLellan through their lengthy report upon this great problem; suffice it to say that, after showing that the metropolitan area ought to be, perhaps, the finest field in the world for electricity supply, and that the enormous development of the use of electricity for cooking and heating which will take place when it is supplied at a low price will go far towards banishing combustion and smoke from the city—thus indirectly effecting a saving estimated at £5 per annum per inhabitant—the authors proceed to lay down the lines upon which the necessary reorganisation should be carried out. Technically, the scheme involves the scrapping of all the existing generating stations, and the erection of a few very large ones down the river, together with the unification of the distributing systems with a view to arriving ultimately at a uniform three-phase 50-cycle supply. The more difficult question, however, is that of control, and after reviewing alternative methods of effecting this, the authors recommend the formation of a new undertaking “to concentrate production, standardise distribution, and bring about the amalgamation of all the various undertakings”—under such safeguards as will ensure the maximum efficiency and economy, to the advantage of the general public. A similar policy has been followed with marked success by several of the greatest cities in the world, and Parliamentary opinion in the past has shown itself favourably disposed towards it in connection with this question. There is reason to hope, therefore, that steps will be taken to bring order out of the existing chaos, and to remove from our Metropolis the reproach of “dear electricity.”

The Village Dust Heap.

A local paper reports as follows a discussion which took place at a parish meeting in an English county:—

Mr. A referred to the dust heap, and said that the refuse was allowed to remain so long that the whole district around was overrun with rats. Mr. B (the contractor for refuse removal) said that the refuse was burned as quickly as possible, a man always being at work there for that purpose. There were really not many rats there, as when he had a man there he had never caught more than a dozen in a day. Mr. C said that what he objected to was allowing children to run over the dust heap, as they were very likely to pick up disease. Mr. B said that he did his best to keep the children away, but he thought he would have to prosecute in order to put a stop to it. Mr. D said people would grumble, but if Mr. B gave up the contract, the parish would be put to the expense of a dust destructor. He was sure Mr. B tried to please the people, and took away a great deal of rubbish he was not compelled to take. He should be surprised if he could please the people of “Dustham,” as he (the speaker) could not (laughter). Mr. B said that the more he tried to please them the more he got behind (laughter). Mr. E said his complaint was that the system was inadequate. One man could not possibly visit every house in the parish in a week. There should be more men and more carts. (A voice: “And more money.”)

The situation is eminently one of those which lends itself to ironical comment. We resist the temptation, however, preferring to state a few

plain facts. This village is by no means the only place in the neighbourhood where refuse is dumped in the fields and a miserable attempt made to burn it. If, however, the refuse were dumped under a roof, a Dutch barn would suffice, and if it were raked over in order to separate the more readily burnable portions, these could be burned in a small refuse destructor, the kind supplied to hospitals and similar institutions, and such burning as did take place would be a cleanly operation, and would not give rise to the stinking smoke that is sometimes produced by the present method. Refuse in heaps does not really burn, it smoulders. Failing the funds needed for a refuse destructor maker's apparatus, a simple stove with a tall steel chimney could be put up, and this would burn a considerable quantity of refuse per week. The one man could then deal with far more in two days than he could in a week by the present method, and the saving in labour would pay for the stove. It is not really, however, a question of expense so much as a matter of taking a little trouble. Householders should be educated up to the point at which they could be induced to deposit two or three classes of refuse in two or three separate bins—hard stuff and ashes in one, and paper and stuff that decays in another, at least, but preferably with a third bin for old tins. Kept separate, the materials of house refuse have their value, or, at the least, qualities which reduce the cost of their disposal. The village is the unit with which trials of such methods should be made, and the system of division would still effect economies if proper distinction were installed. Why should money be spent on separating things which need never be mixed? High rates are not so much due to lack of zeal, or of moderation, on the part of local government officers as to lack of system in the households of the ratepayers. On windy days the wages of the scavengers in certain boroughs are largely spent in hunting loose papers about the streets; and rats and children play upon the village dust heaps of the countryside.

* * *

**Programme of
the Fourth
International
Road Congress.**

We have reproduced in another part of this issue the programme of "Questions" to be discussed at the Fourth International Road Congress, which is to be held next year at Munich. We are glad to find that the number of these subjects—why they are called "Questions"—we have never been able to understand—is to be seven only, assuming that no additional series under the head of "Communications" is to be added. The first subject—the repair of macadamised roads for minor damage and, as seems to be intended, the ordinary current repairs for wear—is one of so great importance that its inclusion in the programme will be generally welcomed. In view of recent developments, the next two subjects—*asphalt roads and sett and brick paved roads*—may also be considered of first importance from the congress point of view, but the former subject should be extended so as to take into consideration the asphalt carpet as applied to main roads in rural districts. The fourth and last subject, under the head "Construction and Maintenance," is one of very live interest at the present time, and we may, perhaps, expect that by next year discussion of the effects of tramways on roads will be even more energetic and controversial than it is at the present day. It will be interesting to learn whether tramway engineers will be able to make any important proposal intended to lead to a reduction of the rolling noise of tramcars, or of the noise made by the machinery when the trams are being accelerated. In these directions there seem to be possibilities of improvement, and, generally, for profitable competition with motor vehicles.

Under the general heading "Traffic and Administration," three subjects are to be discussed. The particular effects caused by different kinds of traffic are very important, and much is still to be learned

concerning them, and we may expect that some very interesting and important papers on this subject will be sent in. The traffic census is also deserving of full discussion, and may be usefully studied from different points of view. The seventh question does not seem to be of sufficient importance, as stated, to be included in a list of seven. It may, however, be suggested that, if the effects of different kinds of vegetation upon the road were taken into consideration, a great deal of useful information could be put before the profession. It is clear that the framers of the programme consider that certain subjects of great importance have been sufficiently discussed, for the time being, at previous congresses, while, as regards certain kinds of roads—wood-paved roads, for instance—the information in the possession of the profession is precise and complete. So far, however, there has been no adequate discussion of the significance of climatic and topographical conditions upon highway systems or upon road crusts, though a knowledge of these effects is necessary to an appreciation of comparisons between practice in different countries or different parts of a country. Another subject that might have been included is that of the specialisation of roads, including consideration of the extent to which the public highway is capable of providing for the economic development of motor vehicles. But the most important element of success in discussing highway affairs at a congress is the restriction of the number of subjects and the scope of each within reasonable limits, and this element, it seems, is fully recognised in the programme.

* * *

**Enteric at
Kenilworth.**

The promptitude with which the Local Government Board undertook the investigation of the causes of the recent outbreak of enteric fever in the urban district of Kenilworth affords another illustration of the useful work accomplished by the board as the central public health authority. The outbreak in question was an "explosive" one—that is to say, one in which the bulk of the cases occurred within a short period. This in itself afforded a strong indication that the disease had not spread by infection from person to person, but that it was probably caused by the contamination of some food or drink consumed by a large section of the population. It appears from the report of Dr. Manby, the medical inspector sent by the board to inquire into the matter, that local circumstances which were brought to his notice soon placed the water supply under suspicion. This supply is afforded by a company, and part of it is derived from an adit which runs roughly parallel to a brook, and at a distance from the latter varying from 5 ft. to 30 ft. This brook was found to be liable to pollution from several sources, and in particular it formed the outlet for the storm-water overflows from three sewers. The effect of the geological evidence was that the adit was liable to receive water from the polluted stream by percolation through the sandstone, and that the distance between them was too small to admit of efficient filtration. It was further shown that the outbreak synchronised with the blocking of a sewer during a period of rain, which caused the sewage to flow freely into the brook. It is evident, however, that although a specific cause may be assigned to the explosive outbreak under investigation, the danger of pollution of the adit water supply has been an ever present one. Hitherto considerable laxity has been displayed in the matter of periodical chemical and bacteriological analyses, but the recent trouble will no doubt result in an improvement in this respect. Dr. Manby, while refraining from entering at length into the causes which have led to the danger of contamination having for so many years been ignored, expresses the view that the principal reason is that the adit had so long been in existence that it was accepted by all concerned as an established source of supply not specially open to suspicion. The experience of Kenilworth should serve

as a warning to other places where similar risks are being run. * * *

Wolverhampton and Canal Development.

The resuscitation of the national canal system upon the lines of extended utility is a subject that must appeal with powerful interest to municipal engineers, and it is obviously one that is beset with not a few difficulties. This supplies a reason why the matter should be handled with discrimination, for nothing is easier, the circumstances being such as they are, than to criticise the reform movement as being impracticable or even hopeless. The Royal Commission that inquired into the position and condition of the canal system advocated the appointment of a Waterways Board. This is a first step that may be taken with the complete assurance that it is the right and proper thing to do, for such an authority would be able, as an essential preliminary, to ascertain the facts upon which subsequent action could be based, and would be fitted by its knowledge to place the subject in such perspective that we may know just where we stand, and in what precise direction alteration and development, if desirable, are to be anticipated. This is a reason why it would appear to be inadvisable, at the present stage, to copy the example of the General Purposes Committee of the Wolverhampton Town Council in proceeding to discuss the details of a project which is as yet in a state of imperfect development, and upon such unreliable data advising the corporation that it would be unreasonable to contribute to the proposed scheme of the Waterways Association. The *Birmingham Post*, in a leading article, points out that the Wolverhampton General Purposes Committee have fallen into the error of treating as definite and settled something that is tentative and provisional, and further explains that for the moment all the Waterways Association ask is that the local authorities governing areas served by canals which are capable of development should recognise that they stand to gain by the modernisation of those canals in the interests of local industries, and should therefore give practical encouragement to the policy of modernisation by signifying their readiness to contribute something towards the cost. We cordially agree that this is a subject upon which an open or affirmative attitude is highly desirable. To bang and bolt the door at the present juncture would be unreasonable and stultifying.

* * *

The Chelmsford Meeting.

The Eastern District meeting of the Institution of Municipal and County Engineers held at Chelmsford last Saturday must be accounted a success in every way. Favoured as regards the weather, the large number of members who were present were the recipients of civic hospitality, were able to participate in an exceptionally interesting round of visits, and were privileged to hear an excellent paper on "Recent Public Works at Chelmsford," by Mr. Percival T. Harrison, assoc. M. INST. C.E., the borough engineer. This paper was chiefly concerned with the questions of water supply and housing, but the variety of other topics dealt with afforded some indication of the very large number of works undertaken by Mr. Harrison since his appointment. During the past few years the town of Chelmsford has shown remarkable development, the increase of population approaching 1,000 persons per annum being largely due to the advent of several manufacturing firms who have erected works within the borough boundaries. This increase has been responsible in the first place for a great strain upon the waterworks undertaking, necessitating the sinking of a further borehole to augment the supply—a work in the course of which exceptional difficulties had to be surmounted—and, in the second place, the demand for working-class dwelling accommodation became so acute that a housing scheme has been undertaken at the instance of the Local Government Board. In regard to the latter scheme, Mr. Harrison is to be congratulated

on being able to say that the cottages are estimated to be self-supporting, after allowing for repayment of loans (principal and interest), rates, repairs, empties and management. In the course of the discussion Mr. Harrison's work was the subject of very favourable comment, as will be noted from our report, one member pointing out the benefit which a local authority secured by appointing an engineer who makes it his business to keep his knowledge thoroughly up to date.

* * *

The Design of Pillars.

In the opening sentences of the paper on "The Design of Steel and Reinforced-concrete Pillars," which he read at the last meeting of the Concrete Institute, Mr. Oscar Faber pointed to the desire which has existed for some time for more information on such matters as the correct eccentricity on columns as justification for dealing with a subject which is necessarily one of detail. In so far, however, as it is possible to infuse life into a paper of such a nature, Mr. Faber succeeded in doing so, but his excellent contribution to the proceedings of the institute will be more appreciated by those who take the trouble to study it thoroughly for themselves. Mr. Faber dealt separately with jointed construction (such as structural steel) and monolithic construction (such as reinforced concrete). In concluding he made a special appeal to architects and others who are responsible for the conditions under which constructional work is designed, and criticised the system of competitive designs and lump-sum prices as penalising good designing, and securing work for those firms who are prepared to take the greatest risks. The only correct system is for the architect to entrust the design to an engineer in whom he has complete confidence, and to invite tenders on the design so prepared. The architect and building owner will obtain in this way—and only in this way—sound and safe design and construction, and if they exercise a good discretion in the choice of the engineer whom they employ the work will not cost more than the minimum consistent with safety. The question of competitive designs and lump-sum prices is one upon which our opinion is well known by this time, and we need say no more upon the present occasion than that we heartily endorse what Mr. Faber had to say on the subject.

* * *

Co-operation.

The recognition by Parliament of the desirability of co-operation between neighbouring authorities in regard to certain matters of local administration naturally leads to the consideration of the question whether such joint action could not advantageously be taken upon a much more extensive scale than is the case at present. Mr. Herbert G. Coales—who writes upon this subject in another column in the first of his "Engineering Jottings" which we hope to publish from time to time—recognises that a line must be drawn between those services which must be supplied by the individual authority and those in which joint action is possible. The difficulty is to know exactly where to draw this line. If it were possible to commence afresh the development of our complex system of local government, and at the same time to have the experience of the past as a guide, there is little doubt that there would be much more co-operation and co-ordination than exists at present. Keeping in view the two ends to be pursued—namely, efficiency in service and economy in cost—it will be seen that, wherever a joint undertaking would mean economy in first cost and maintenance, or a better service for the public, the principle of co-operation should be applied. Such is the short conclusion at which Mr. Coales arrives. In subsequent "Jottings" he will deal with other subjects of general interest to municipal engineers, such as "Looping or Lowering of Roads over Hills," "Subsoil Water," "Prevention of Waste by Standardisation," and "Untapped Medicinal Waters."

Design of Steel and Reinforced-Concrete Pillars.

By OSCAR FABER, B.S.C., ASSOC. INST. C.E., A.M.I.E.E., A.C.G.I., M.C.I.

"The Design of Steel and Reinforced-concrete Pillars, with Special Reference to Secondary and Accidental Stresses," was the title of a paper read by Mr. Oscar Faber at the last meeting of the Concrete Institute.

Mr. Faber divided his paper into two sections; he first dealt with jointed construction, such as structural steel, and secondly with monolithic construction, such as reinforced concrete. Taking the case of a girder resting on the end of a steel stanchion, he stated that in several drawing offices he knew as a fact that the construction in such a case would be treated as centrally loaded. He proceeded to argue that such was not the case, because when a load was applied to the beam it would deflect, and the end originally horizontal would assume a certain slope, and therefore one of two things would happen—namely, (a) the end of the girder would lift, in which case the whole load would be carried on one flange, so causing eccentric loading, or (b) the column must be constrained to adapt itself to the slope of the girder, in which case a bending moment would be introduced into the stanchion by such constraint.

In this way he showed that increases in strains of 140 and 480 per cent respectively were obtainable.

Mr. Faber then took for consideration the case of a girder resting on an angle bracket. He argued that if an ordinary bracket were used, the action would not be very far from the face of the leg of the angle since the horizontal leg of the angle would not be strong enough to resist the bending moment which would be produced in it. It followed, therefore, that, although the horizontal leg of the angle served a useful purpose in connecting the girder to the stanchion, it must not be thought capable of supporting it. In effect the construction became dangerous if the clearance between the face of the stanchion and the edge of the girder exceeded the thickness of the angle.

The author of the paper supposed there were few engineers present who would assert that this limiting clearance was never exceeded in practice, and an engineer had carefully to consider whether it was desirable to employ this type of bracket except for quite small reactions.

He next considered a stiffened bracket. Confining his attention to cases where the workmanship was good, he assumed that the stiffening angles had been machined or forged to fit the angle bracket perfectly, and that the bracket was initially horizontal. It followed that when the girder deflected there was a tendency for it to rest on the outer edge of the bracket, and for very small loads there was no doubt that this actually happened. As the load increased, the outer edge of the stiffeners yielded appreciably, and a greater area supported the load, the reaction gradually approaching the face of the column. The author's practice was to make the web of the stiffeners sufficient in area to carry the reaction under a uniform stress of $7\frac{1}{2}$ tons/in.²

In calculating the resistance he ignored a large area of steel in the flange of the stiffeners, and in the vertical leg of the angle bracket, because (a) the clearance between the face of the stanchion and the end of the girder might be sufficient to prevent bearing on this steel; (b) even if it was not, this material could not be stressed appreciably until the stiffener webs are greatly overstressed.

In any case, the difference in cost between good and bad brackets was an extremely small percentage of the cost of the steelwork, and a smaller one of the cost of the building, and he declined to endanger the "ship" for what in this case might be fairly described as a "ha-porth of tar."

It has long been recognised in good practice that the machining of the ends of stanchions was of the first importance. Yet there were at least two constructional works in London which, with a view to economy, omitted this item of workmanship, and were erecting considerable tonnages of stanchions with the ends left so that the upper tier had contact with the lower tier over the width of one plate only, the remainder of the section having varying clearances often amounting to $\frac{1}{4}$ in. The stress was still gaily calculated as uniformly distributed, and it had been explained to the author that "steel is a ductile material which would yield and flow," and perform other

convenient antics, "until the stress was uniformly distributed." The effect of loading such a stanchion was to cause the plates to slide past one another, and partly to shear through the rivets. Even where stanchions were machined a careful engineer must satisfy himself that they were machined truly square. Architects should bear in mind also that, apart from the danger involved in these practices, the yielding of stanchions and brackets before they obtained their bearing involved unknown and unintended stresses on the stonework, and to the author's knowledge many a beautiful and costly façade and interior decorative work had been badly cracked by bad steelwork details and workmanship.

From the consideration of case 1. it would appear to follow that it was desirable to make those joints somewhat flexible, and occasionally this was so. If buildings were braced with diagonal braces, he should say without question that stiffness of connections should be avoided. Unfortunately, such bracing had obvious objections, and the whole stiffness of practical buildings against wind lay in the stiffness between beams and stanchions. There was therefore no alternative but to make the joints stiff, and to make the necessary allowance for those secondary stresses in the design of stanchions. This might be onerous, both in requiring extra labour and an increase in material, but a conscientious engineer would grudge neither the one nor the other.

Mr. Faber then dealt with the design on cleats. A common method of calculating the safe reaction of a cleat was to take it as the sum of the resistance of the rivets, the effect being to neglect the very appreciable stresses due to bending.

Dealing with the bracing of pillars, Mr. Faber said that it was well known that pillars failed by buckling, and that their stress was to be determined with reference to their l/g . This phenomenon was fairly well understood, and there were sufficient experimental data available to make the design of pillars, with reference to what he might call primary buckling, a comparatively simple matter. The phenomenon to which he referred was that of secondary buckling, in which the pillar, instead of buckling as a whole, failed by the individual buckling of its component members. On this subject there appeared to be practically no experimental data, and practically no formulæ or rules for the guidance of a designer. The importance of this problem might be gathered from the fact that bad design in the matter of bracing in pillars was certainly responsible for the two greatest failures in recent years—the Quebec Bridge of 1907 and the gasholder in Hamburg.

Mr. Faber then proceeded to the second portion of his paper treating of monolithic construction and the eccentricity of beam reactions on pillars therein. Whereas in steel construction the eccentricity was very definite and easily calculated with most common types of brackets, with reinforced concrete the eccentricity could only be calculated from considerations of elastic flexure, and the problem was a much more difficult one. There was, however, no longer any excuse for claiming ambiguity since the problem had been analysed very completely in "Reinforced Concrete Design," and numerical examples fully worked out. The author took as an example the case of the outside column of the building, working it out in detail, showing very great increases in stress over the values as ordinarily calculated. If thoughts of eccentricity were banished, either from ignorance or under stress of competition, the actual maximum stress would have been 1,300 lb.-in.².

It was interesting to note that the outside pillar in good design did not suffer much reduction in size up through the last three tiers. This was in accordance with the best practice in steel-frame buildings.

In conclusion, Mr. Faber said that without suggesting for a moment that the engineering staffs of several constructional firms were not fully as efficient as many consulting engineers, he did feel that the system of competitive designs and lump sum prices penalised good designing by such firms, and secured the work to those responsible for the most risky design. The only correct system, in his opinion,

was for the architect to entrust the design to an engineer who had his confidence, and to invite tenders on the design which he prepared. The architect and building owner were then likely to obtain a sound construction, and if they used their discretion in the choice of the engineer the work would not cost more than the minimum consistent with safety.

The best constructional firm would be protected by being protected from competition with weak design and bad workmanship, and he might state that in considering tenders he considered that an engineer should give preference to those firms whose detailing and workmanship he knew he could rely upon. He urged this in the interest of the building owner, knowing as he did the importance of good details and good workmanship. The only man to suffer was the man who would take great risks and do shoddy work in order to secure a contract, and he could not say that he had much sympathy with him.

ENGINEERING JOTTINGS.

1.—CO-OPERATION BETWEEN AUTHORITIES IN THE PROVISION OF PUBLIC WORKS.

By HERBERT G. COALES, ASSOC. M. INST. C. E., F. S. I.

If Great Britain were an uninhabited land about to be discovered and colonised by a civilised race one imagines that under an "Island Planning Act" things would be arranged somewhat differently to the present lay-out.

The head of the department would assuredly be an engineer, who, from some lofty seat—possibly an anchored airship—would map out the country for colonisation. The rich land would be assigned for agriculture, and the poor barren parts for manufactories. The watersheds would be duly utilised, and made to serve sequences of towns with water by means of a joint conduit, instead of (as at present) each locality having its own little installation. Central electric power-houses, too, would be the rule instead of the exception.

But such a hypothetical situation not being within the range of practical politics, it is more to the point to consider what can be done under present circumstances for a co-operation between authorities in the provision of public works. The village pump should not be allowed to obstruct our outlook in various directions; neither should petty antagonisms nor silly pride prevent co-operation between towns where it would be advantageous to the long-suffering rate-payers.

In considering the provision of a joint scheme for public works, three questions at once present themselves:—

- (1) Would there be economy in first cost?
- (2) Would there be economy in working?
- (3) Would the service be better?

The answers entirely depend upon circumstances. It is for the engineer to go into the facts of each case, and to demonstrate the advantages or the reverse. It is evident there are certain public services—as, for instance, public baths, public abattoirs or public conveniences—which could not be used jointly with mutual advantage owing to accessibility being essential. On the other hand, there are joint installations which admirably meet the needs of separate communities—for example, lunatic asylums, secondary schools and isolation hospitals. Without this co-operation the cost of these services generally would be prohibitive. A single community would find the provision of a lunatic asylum with all its requirements out of the question. So, too, with the working expenses of an infectious diseases hospital or a secondary school. Three matrons and three headmasters, with proportionately swollen staff, would demonstrate the folly of isolated action in respect to these places. Here, at all events, union is economy.

The public works which more especially lend themselves to a co-operation between local authorities are water supply, sewage disposal, electric power and light, and so forth.

Sometimes, but not often, the question of co-operation is brought forward, and considered as a practical proposition. Unfortunately, there is often a considerable amount of jealousy or suspicion between neighbouring towns, which does not tend to mutual accommodation and help. There is also a distinct question of the civic pride of possessing public works belonging solely to one's own community.

This is a pity, for at least the question of co-ope-

ration should always be taken into account. A broad outlook is good business at all times.

Three towns, with equal populations and equal wants, may be without a public water supply. Three sources of water are available, any one of these being sufficient for the present and prospective combined wants of all. How wasteful to buy three parcels of land, pay for three sets of water rights, build three dams, three pumping stations, and three reservoirs, when one scheme would be efficient and economical in first cost! The chances, too, are that the upkeep and outgoings—certainly the interest and repayments of loan—would show a saving and economy in working.

One wonders sometimes if it would be feasible to collect, by means of a large culvert, the crude sewage of a dozen towns, and to purify it at one selected spot where suitable land could be obtained. One hears of such dreadfully unsuitable land for sewage-filtration purposes that artificial filters have to be constructed at vast expense; yet, on the other hand, excellent natural filtration areas are not unknown—so good that no effluent ever appears at the underdrain outfalls! Surely it would be worth while to locate these sites for model sewage farms, and to compare the cost of bringing the sewage along from a bunch of towns with the cost of artificial filtration for each?

Most towns have their recreation grounds and pleasure parks on a moderate scale, but a more ambitious scheme might be carried out by co-operation between two or three authorities. A few miles out it would generally be quite possible to purchase 20 acres of land for the price of 1 acre adjacent to the urban parts. An estate of considerable area might therefore be purchased for the joint use of several towns, embracing woods and water, and everything that the heart of a town dweller longs for on half-holidays and Sundays. Here the boy scout could have his camp, the piscator could fish, the golfer could golf, the oarsman could row, and everyone would have plenty of elbow room in his "own" park.

Co-operation might advantageously be practised in the provision of "kit," such as fire brigade appliances, tar-spraying machines, and steam rollers. If one steam roller or one tar-sprayer is sufficient for the needs of three districts, why buy three of each? Of course, there are some appliances which manifestly could not be used jointly—the snow-plough or the horse-brush, for instance.

If the day ever comes when each watershed is controlled by one authority, then no doubt there will be joint waterworks for groups of towns. Certainly the question of co-operation in the provision of public works might be more often considered than it is at present.

Society of Engineers.—A Bohemian concert will be held in the Council Chamber, Caxton Hall, Westminster, on Saturday, May 2nd, at 8 p.m.

Road-making Tools and Appliances.—A new catalogue of tar, road and paving tools and appliances has been issued by Messrs. John Yates & Co., Limited, Edge Tool Works, Aston Manor, Birmingham. A thumb index renders the catalogue, which is most comprehensive in its character, and contains many new lines not previously shown in the firm's lists, very convenient for use. It should be pointed out that the catalogue is not intended to supersede Messrs. Yates' general catalogue of contractors' tools and plant, but is a section devoted, as we have indicated, simply to road-making tools and plant, made up in a handy form for the use of road surveyors and contractors. As manufacturers of tools the company have behind them a record of 110 years, and their more recent innovations are in every case the result of considerable experiment and trial. They have recently extended their works, and are now in a position to cope with any ordinary demand. Their long experience, their modern and up-to-date machinery, and the situation of their works alongside a canal, by which they can receive their raw material bearing a minimum of carriage, and the fact that Birmingham is served by three of the greatest British railways, render them peculiarly fortunate as regards cost of production, which is further enhanced by the very large quantities of their specialities which they are enabled to make at a time. Uniform with the list referred to the firm issue a general catalogue of public authority and contractors' tools, a catalogue of tools and appliances for gasworks, and a catalogue of tools and appliances for tramways and railways, as well as separate illustrated catalogues of special tools to suit local requirements for all the markets of the world.

Institution of Municipal and County Engineers.

EASTERN DISTRICT MEETING AT CHELMSFORD.

A well-attended meeting of the Eastern District of the Institution of Municipal and County Engineers took place at Chelmsford on Saturday last. Mr. H. T. Wakelam (Middlesex), the district chairman, presided, and there were present the president (Mr. J. W. Cockrill, Great Yarmouth), Messrs. W. Ashbee (Hawwell), W. H. Budcott (Wood Green), J. Birch (East Ham), C. D. Bright (Colchester), S. H. Chambers (Hampton), A. E. Collins (Norwich), H. Collins (Norwich), J. Dewhurst (Chelmsford), H. E. Denham (Tilbury), L. F. Dunbar (Hemel Hempstead), W. Gornall (Great Stanmore), J. E. Hattersley (Saxmundham), S. A. Hill-Willis (Tilbury), J. Rowland Hill (Ipswich), R. E. Holding (Wood Green), L. R. Impey (Sudbury), T. Jones (Ipswich), P. G. Killick (Finsbury), J. W. Liversedge (Leigh-on-Sea), G. W. Linwood (Stowmarket), J. R. Mead (Ipswich), A. J. Meeson (Brentwood), S. Matthew (Chelmsford), R. H. Matthews (Wood Green), H. G. McDowell (Stanmore), W. Rackham (Great Stanmore), S. S. Small (Southend), Steer (Southend), L. J. Small (Woodford Green), C. Vawser (Hatfield), E. A. Slater (Colchester), E. Willis (Chiswick), T. N. W. Watts (Marlow), H. F. Wilkinson (Tottenham), S. A. Loft (Chelmsford), G. W. Shreeve (Chelmsford), W. J. Tait (Sudbury) and W. L. Jenkins (West Suffolk).

The proceedings commenced with a visit to the Marconi works, an extensive block of buildings adjoining Chelmsford Station. No fewer than 600 hands are employed here in the manufacture, assembling and testing of the complicated apparatus by which wireless telegraphy is rendered possible, and the extent of the company's operations came as a revelation to the majority of the visitors. Installations of various types, for naval, military and commercial purposes, are now being sent by the firm to all parts of the world, and the members were particularly interested in a large number of field sets which are being supplied to the order of various European Governments for army use. From the shops the visitors were conducted to the chambers in which messages are received and transmitted, and those who wished were enabled to listen to "conversations" in Morse code being carried on between ships at sea. The wonders of wireless telephony were also demonstrated, a test of this latest development of the system being, as it happened, in progress at the time of the visit.

An inspection of the corporation open-air swimming bath followed, after which the members were entertained to lunch at the Shire Hall by the Mayor. Alderman G. W. Taylor, J.P., the hospitality of his Worship being warmly acknowledged by Mr. H. T. Wakelam, the district chairman, in a short speech. The Mayor, in response, remarked that he had always felt a very great regard for the borough officials. There had been a considerable amount of work done in Chelmsford since Mr. Harrison took up the duties of borough surveyor, and he hoped that what the members would see that day would prove of interest to them.

A collection on behalf of the Orphan Fund of the institution was made, and realised £3.

At the subsequent business meeting, the following paper was submitted for discussion:-

RECENT PUBLIC WORK AT CHELMSFORD.

By PERCIVAL T. HARRISON, ASSOC. M. INST. C. E.,
Borough Engineer.

It has been said at meetings of the institution that the papers presented were so complete in themselves that little scope was afforded for discussion; whatever faults may be urged against the paper before you to-day, it is hardly possible that a similar charge can be preferred in this case.

The development of Chelmsford during the last few years has necessitated extensions and additions to practically all its municipal undertakings, and though some of the new work may not have been of that magnitude found necessary in larger towns, yet the variety of the schemes taken in hand, together with the necessity of foresight in their execution, has put a great amount of work upon the responsible departments. To minutely describe every work recently undertaken by the borough council might prove wearisome, and the author has considered it

advisable to deal somewhat fully with two or three of the more important schemes, and to be content with a brief description of the others, hoping that this decision will meet with the general approval of the members.

Chelmsford is the county town of Essex, and is situated on the river Chelmer, within 30 miles of London. The earliest mention of Chelmsford found in the old records refers to the year 1100, and 100 years later a licence for a market and a fair was granted to the town. There is, however, plenty of evidence of Roman occupation, so that Chelmsford has undoubtedly some claim to antiquity. For centuries Chelmsford could be described as a small market town, situated in an agricultural district, possessing the usual features and industries, and not showing any signs of great development. During the last few years, however, Chelmsford has assumed a new character, that of a thriving commercial town, several manufacturing firms having erected works within the borough boundaries, and thus attracted a continually increasing industrial population. The principal firms are Messrs. Crompton & Co., electrical engineers; Messrs. Hoffmann & Co., engineering works; Messrs. Marconi, Limited, wireless telegraphy works; and the works of the National Steam Car Company. Another event of some moment is the formation of the See of Essex, with Chelmsford as the cathedral town and the residence of the newly appointed Bishop.

The population of Chelmsford has increased from 12,580 in 1901 to an estimated population of 20,000 to-day, part of this being attributable to an extension of the borough boundary in 1907. An important feature is the development of the districts just outside the present boundaries, and the overcrowding which sometimes occurs there owing to lack of accommodation in Chelmsford for those whose daily occupation lies in the town. This increase, which at the present time is approaching to nearly 1,000 persons per annum, has had two effects of considerable importance to the administration of the borough—in the first place, it has caused a great strain upon the waterworks undertaking; and, secondly, it has resulted in a dearth of houses to such a degree that the Local Government Board has practically compelled the council to take action. The author will therefore deal with these two matters first, and then refer more briefly to other works carried out.

WATER SUPPLY.

The water supply belongs to the town, and the borough surveyor is the water engineer. Water is obtained from surface gravel springs and from boreholes driven through London clay into the Thanet sands.

The provision of an adequate water supply to Chelmsford has for many years been a problem of considerable difficulty at times, and would appear to be a kind of legacy of anxiety handed down from one borough engineer to another. One reason is, of course, the increasing population, and another the increased consumption per head, owing to activity in public health administration and modern requirements. The supplies are as follows:—

	Average daily quantity supplied, July, 1913.
Mildmay Yard. Borehole	125,000
Burgess Well. Gravel spring	58,000
Admirals Park. Gravel spring	87,000
Springfield. Surface springs and borehole belonging to the rural district council	71,000

The water from Burgess Well gravitates to Mildmay Yard and joins the Mildmay Yard borehole water in a service reservoir holding 145,000 gallons, and from thence is pumped up to Long Stomps reservoir, which, since its enlargement under the author's predecessor, now holds 818,000 gallons. The water from Admirals Park is pumped up to a water tower, which adjoins the springs, and has a capacity of 80,000 gallons. The Springfield water supply is obtained from the rural district council waterworks at Baddow under an agreement entered into in 1907, when the borough boundary was extended to include the portion of the rural district council area known as Springfield.

Immediately prior to the author's appointment the council had bought a piece of land at Galleywood,

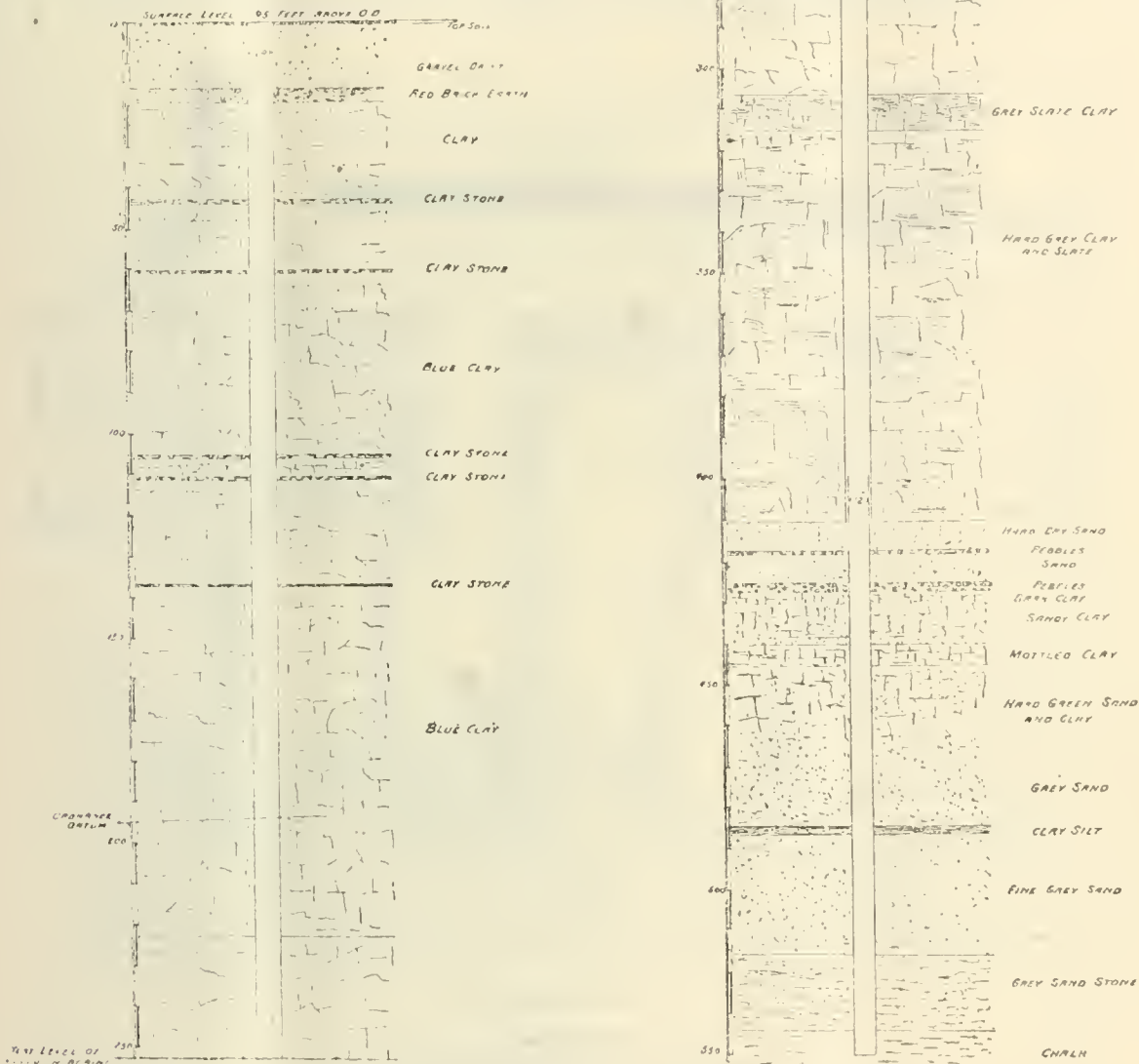
acting under the advice of Mr. Cuthbert Brown, ASSOC.M.INST.C.E., the then borough engineer, for the purpose of sinking a borehole to augment the water supply, and the author's first work upon taking up office was to push forward this scheme.

A trial borehole of 9 in. diameter was completed in May, 1912, after considerable delay, owing partly to the fact that the London clay was found to be about 200 ft. thicker than anticipated. The test pumping showed a yield of between 5,000 and 6,000 gallons an hour. This quantity is generally considered a satisfactory result from a borehole in the Thanet sands, and it was decided to sink a further borehole of larger diameter at a point 10 ft. from the trial borehole.

The second borehole is lined with steel tubes 14 in. inside diameter for 400 ft., and 12 in. diameter per-

owing to the urgent need of this additional water supply. A scheme has been prepared for a pumping station, with engineer's cottage, to cost £4,000. The application is now before the Local Government Board. Tenders have been invited, and the work will be pushed on with as soon as sanction for the loan is obtained.

The plant will be in duplicate, each unit consisting of a suction gas installation, a gas engine about 25 b.h.p., a deep well borehole pump, with Ashley patent bucket fixed at a depth of about 350 ft. below



CHELMSFORD WATER SUPPLY GALLEYWOOD BOREHOLE.

forated tubes for a further 134 ft. The strata pierced was as follows:—

	Thickness of each stratum.	Total depth from surface.
	ft. in.	ft. in.
Top soil	1 0	1 0
Gravel drift	15 0	16 0
Red brick earth	3 0	19 0
London clay: Blue, with thin beds of rock	204 0	223 0
Brownish	83 0	306 0
Grey clay slate	9 0	315 0
Hard grey clay and slate	95 0	410 0
Reading Beds and Thanets:		
Hard dry sand	7 0	417 0
Sand & water with pebbles	11 0	428 0
Dark clay	2 0	430 0
Dry sand, clay and shingle	10 6	440 6
Greenish mottled clay	4 6	445 0
Hard green sand and clay with water	39 0	484 0
Dark clayey silt	2 0	486 0
Fine grey sand & sandstone	48 0	534 0
Flints	0 6	534 6
Chalk	5 6	540 0

The second borehole was completed in May, 1913, and temporary steam pumping plant was installed

surface level, and a three-throw surface pump. The plant is so designed and arranged that either engine can be supplied with gas from either suction gas producer set, while by means of clutches either or any pump can be run by either gas engine. The water will be brought up to the surface by means of the deep well pump, and will be passed outside the building through a settling tank, which will catch any sand brought up, and thence over a weir into a suction sump, from which it will be forced up to the reservoir at Long Stomps by means of the three-throw surface pumps. The deep well pumps will be designed to pump on an average 5,000 gallons per hour, and the surface pump will be capable of pumping slightly in excess of this quantity. Everything necessary will be provided for dealing with a breakdown as expeditiously as possible, and for the lifting of the pumps and rising mains as occasion requires.

The waterworks at Mildmay Yard have had a varied history, and have been the scene of more than one disappointment. The author found the following plant in operation: Old steam boilers raising steam for a modern engine and borehole pump, and also for a new Worthington steam pump, the first pump

raising the water from the borehole to the surface reservoir, and the second forcing it up to Long Stomps reservoir. The boiler-house belonged to an earlier scheme, and was situated a good distance from the engine-house.

The average daily delivery of water raised to Long Stomps reservoir never exceeded 190,000 gallons, the total lift never exceeded 372 ft. for two-thirds of the water and 142 ft. for one-third of the water. The annual coal bill was, however, between £700 and £800.

In January, 1912, the author presented a report on the matter accompanied by comparative estimates of initial cost of new plant and running costs for pumping by electricity, steam, or suction gas, and recommended the latter. The report was adopted and the work was completed last year. The

tional supply from the borehole will be available. Tenders have been invited, and the work will be put in hand at once. The estimated cost of borehole, buildings and plant is £4,000. The new engine-house will adjoin the existing engine-house, which occupies the basement of the water tower.

HOUSING.

The town council have for many years been giving the question of scarcity of houses for the working classes their consideration, and many schemes have been prepared, but for some reason or other abandoned.

Owing to the continued rapid development of industries, the Local Government Board began putting pressure upon the council in 1910-11, and shortly after the author's appointment the council were



Block Plan.
CHELMSFORD WORKMEN'S DWELLINGS.

guarantee of the contractors as regards coal consumption is being realised, and the plant has been running long enough now to prove that the cost of fuel consumption will be reduced from nearly £800 to under £200 per annum.

The council decided to erect a permanent engine-house in place of the temporary corrugated iron structure which had done duty for some years, the new house to cover not only the new plant, but the existing borehole pump and steam plant, the latter being retained as a standby. Some idea of the difficulties which had to be overcome in the carrying out of the work may be formed from the fact that the old building had to be pulled down and the new building erected, and new plant fixed while the existing plant had to be kept running night and day, week in and week out, to maintain the water supply to the town. The cost of the new building was about £1,000, and the machinery £750.

With regard to Admirals Park water supply, the council recently decided to purchase the adjoining land with the primary object of protecting the supply, but were unable to get sanction to the loan unless they undertook to sink a borehole. This they have now decided to do, so that not only will the surface springs be to a certain extent protected, but an addi-

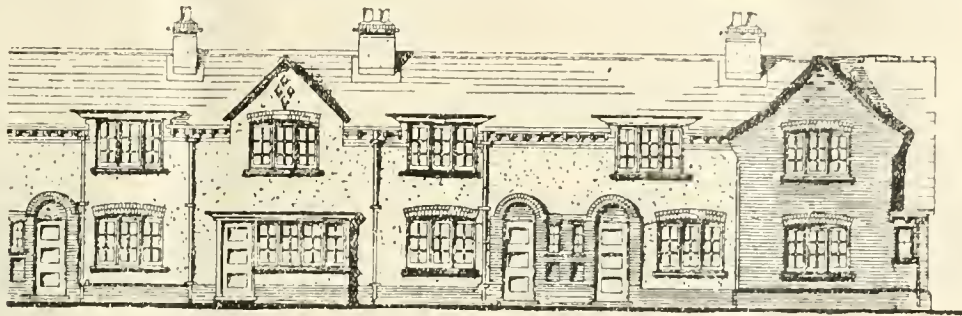
fortunate in obtaining a most suitable site of 3½ acres.

In September, 1911, the author prepared a scheme for the development of the whole of this area, but recommended the carrying out of a portion only at first, to ascertain what class of house was most likely to meet the requirements of the district. This suggestion was adopted, and thirty-eight houses were built in 1911-12. Particulars of these are given in the tables below.

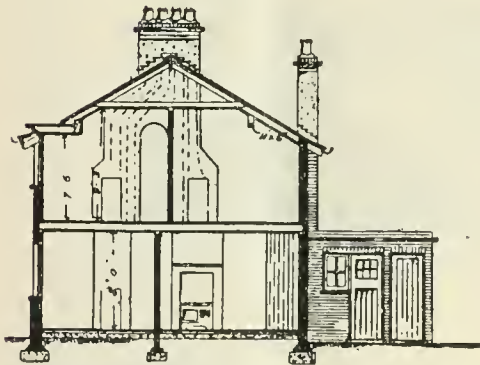
Class.	Description.	Accommodation.	Average cu. per cottage.	Cost per ft. cu.	Average cost per cottage.	Rent.	Remarks.
A	1 block of 7	Parlour, living-room, scullery, 3 bedrooms	8,147	d. 5'52	£ s. d. 188 0	s. d. 6 3 and 6 6	Baths to Class A
B	2 blocks, 7 and 8	Living-room and scullery, 3 bedrooms	6,440	5'42	145 2	5 3 and 5 6	Wood block flooring throughout on ground floor
C	2 blocks, 8 each	Living-room and scullery, 2 bedrooms	5,867	4'94	121 0	4 3 and 4 6	

Each house was provided with coals place, larder, paved yard, fencing, and about 3 rods of garden.
It should be pointed out that the first portion of the scheme had to bear the cost of the purchase of

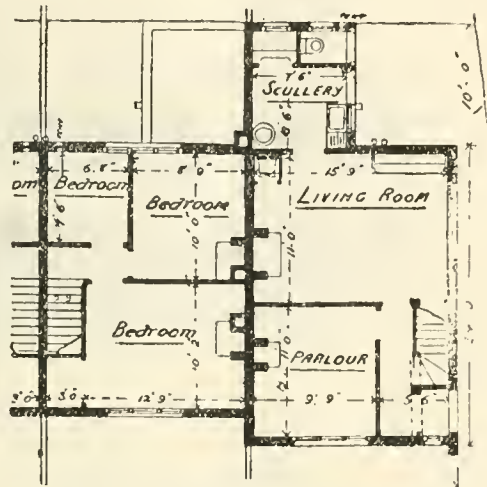
There was such a demand for these cottages, especially Class A (those possessing parlours), that the council decided, in April, 1913, to proceed with the remainder of the scheme, and eventually adopted a



Front Elevation.



Cross-section.

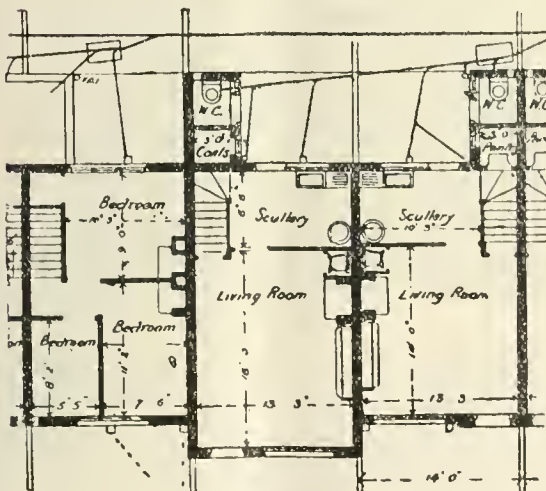


Plan.

Type A

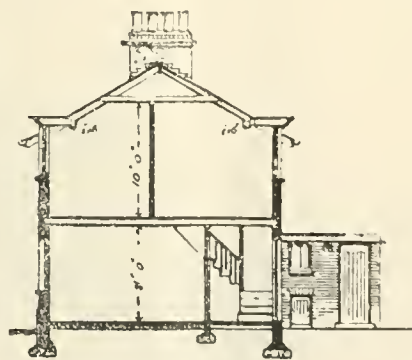


Front Elevation.



Plan.

Type B.



Section A B.

CHELMSFORD WORKMEN'S DWELLINGS.

the whole of the 6½ acres of land, otherwise the rents would have been 3d. per week less than that shown in the table.

modified arrangement of that originally proposed. The number of cottages in the second portion of the scheme is 106, making a total of 144. It was de-

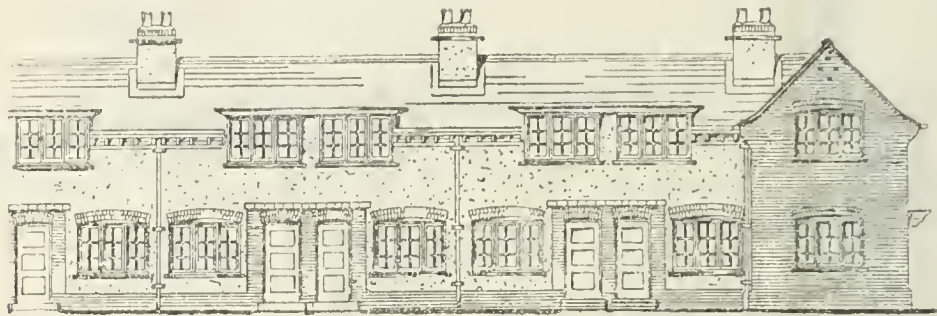
vided to build no more cottages without parlours. Particulars of the second portion of the scheme are given below.

Class.	Description.	Accommodation.	Average cost per cottage.	Cost per ft. cu.	Average cost per cottage.	Rent.	Remarks.
D	Blocks of 5 to 7 cottages each	Parlour, living room, scullery, 2 bedrooms	9,274	5 6 39	£ s. d. 217 18 0	s. d. 6 6 and 6 9	Baths to Class D.
E	Blocks of 5 and 6 cottages each	Do. slightly smaller	8,401	5 6 39	197 8 9	5 9 and 6 0	

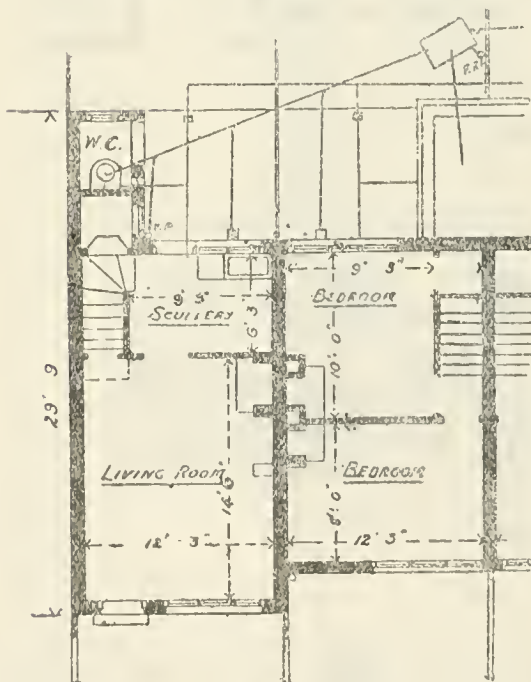
The cottages are estimated to be self-supporting, after allowing for repayment of loans (principal and interest), rates, allowances for repairs, for empties, and for management.

latter being carried out by the borough engineer's department.

The cottages are built in blocks, generally six or seven cottages to the block. Each cottage has a front and back garden and a front and back entrance, the latter being on back roads, which are arranged for the collection of house refuse, delivery of coals, &c. The cottages are brick built and slated. Red brick facings are used alternately with stucco, which treatment is continued on all elevations. The joinery is deal, twice stained, so that the painting bill is reduced almost to a minimum. The casements of the second portion of the scheme are metal. Inside walls are treated with Duresco. Tip-up baths in cabinet cupboards are provided in classes A and D. Wood block floors were laid down on ground floor in the first scheme, but not in the second. Scullery floors are cement rendered. Deal fencing, creosoted under pressure, is provided throughout, except division fencing between back gardens, which is round-bar wrought-iron fencing. The scheme involves the laying out

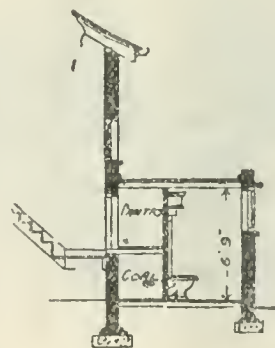


Front Elevation.



Plan.

Type C.



Section C D.

CHELMSFORD WORKMEN'S DWELLINGS.

The loans are obtained from the Public Works Loan Commissioners at 3½ per cent, the terms of years for repayment being sixty for the buildings and twenty for street works.

The rates are estimated at 8s. 6d. in the C, though for the last five years they have not exceeded 8s. 3d.

Thirty shillings per cottage per annum is allowed for repairs, and as very little will probably be required for the first three or four years, a good sum will have accumulated by the time any heavy expenditure is required. Two weeks per annum per cottage is allowed for as "empties"—i.e., loss of rent. There has, however, not been a single day's rent lost on the first thirty-eight cottages during the fifteen months they have been erected.

A sum of £30 is allowed for expenses attaching to the collection of rents and supervision. The former work is done by one of the town clerk's staff, the

and making up of three new roads, all of which have been included and allowed for in the scheme.

FIRE BRIGADE.

The borough engineer for the time being is also the chief officer of the fire brigade, but a whole-time superintendent is appointed, upon whom the upkeep of the station and the training of the men devolves. He is provided with a house adjacent to the station. The station, which has been doubled in size during the author's time, is equipped with two horse steamers, fire escape, hose cart, &c. The remainder of the brigade is volunteer, and consists of first and second officers, two engineers, and eleven firemen.

Each fireman's house is connected with the station by an electric alarm bell. The committee are considering the installing of fire alarm posts. A horse contractor is paid a retaining fee of £40 per annum,

and guarantees to keep a couple of horses always in readiness, and to bring them ready harnessed to the station within ten minutes of the alarm.

No charge is made for the services of the brigade within the borough boundaries, but the brigade attends fire calls within a 6-mile radius of the station, when charges are made according to a printed schedule which has to be signed by a responsible person before the brigade turns out.

MARKET.

The market is generally considered a good one, and is continually being brought up to date and improved, altogether a sum of £20,000 having been spent upon constructional work.

There are four sale rings, and the market provides accommodation for 400 pigs, 2,000 sheep, 1,500 cattle, 100 horses and 120 calves.

In 1909 the council erected a covered cowshed at a

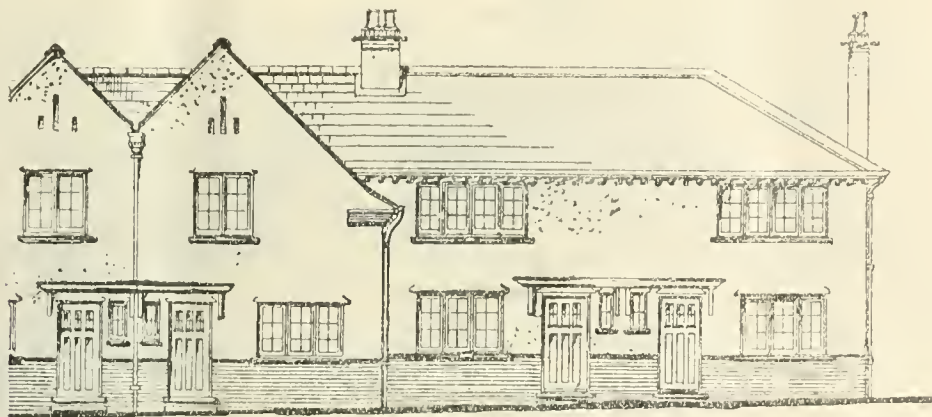
old buildings in Mildmay Yard. The council have, however, just built a new depot on some land they possessed off the Manor-road, and have erected there stabling accommodation for fourteen horses, cart-sheds, mess-room, foreman's office and store, and a horsekeeper's cottage, and have just decided to build a foreman's house on a piece of land adjoining.

The plans show that the stable block consists of two wings one story high, each comprised of six stalls and one loose box, with a harness-room and corn-store in the centre with loft over. The shedding for vehicles is open, with a brick wall at the back and a corrugated-iron roof supported by columns in front.

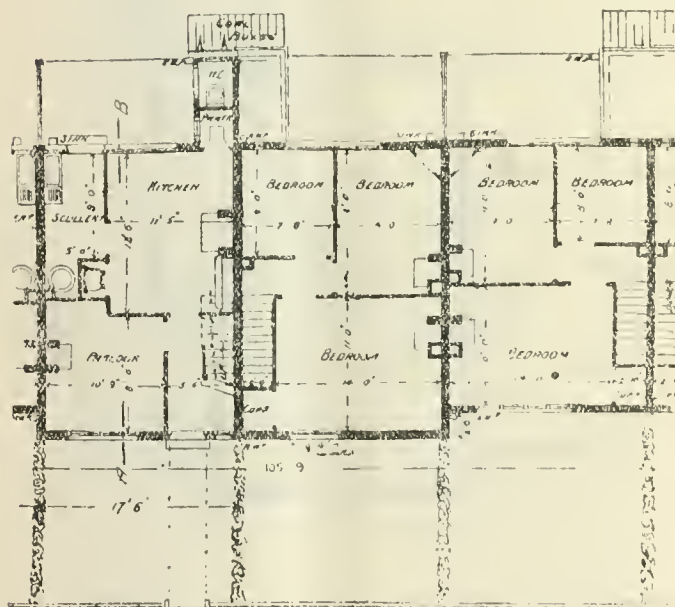
It is proposed to utilise some old shedding existing on the site as cover for a tar-macadam plant.

The horsekeeper's cottage contains parlour, large kitchen, scullery, three bedrooms, and usual offices.

The total cost of the scheme, exclusive of land, but

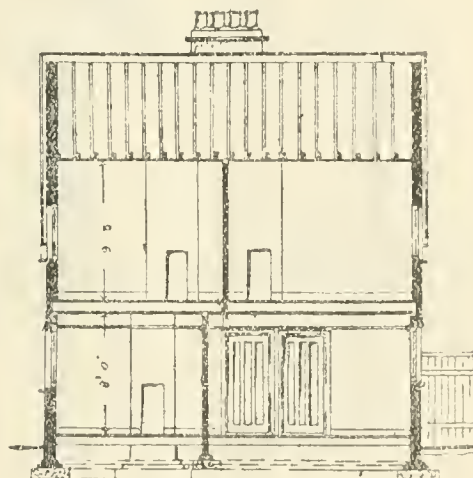


Front Elevation.



Plan.

Type D.



Cross-section A B.

CHELMSFORD WORKMEN'S DWELLINGS.

cost of £1,568, from designs prepared by Mr. Cuthbert Brown, ASSOC.M.INST.C.E., with accommodation for eighty-four cows. The market is almost entirely a cattle market, the tolls and rents amounting to about £800 per annum.

LIGHTING.

Both the electric light and gas are in the hands of private companies. Chelmsford was the first town in England to have its streets lit by arc lamps, owing, no doubt, to the enterprise of Messrs. Crompton's, Limited, whose works are in the town. The corporation pay the following sums for street lamps to cover all maintenance: Arc lamps (2,750 nom. c.p.), £25 per annum; incandescent electric (100 Heffner c.p.), £3 3s. per annum; incandescent gas (not less than 75-c.p.), £3 per annum. The street lighting costs the town nearly £2,000 per year.

STABLES.

The council keep eleven horses and a cob, which used to be housed in the market stables and some

including fencing and gates, drainage, &c., will be about £2,000.

ROADS.

There are 7½ miles of main roads, and about 14 miles of other roads, maintained by the town council.

The roads of Chelmsford, like those of many other old towns, are for the most part narrow, and the considerable building activity, combined with the heavy increase of traffic, including motor-bus and motor-traction, has caused the problem of road maintenance to assume great importance. The council are, however, alive to their responsibility in this direction, and have spent and are spending large sums of money on works of widening and surface improvement. During the author's three years of office eighteen widenings have been effected at a cost of nearly £10,000, while £9,000 have been spent on wood-block and granite-sett paving for the roads in the centre of the town within the last eighteen months.

The subsoil of Chelmsford is clay, and many of the

roads have not a foundation that will successfully withstand the heavy weights they are called upon to bear. The old system of water-bound macadam is obviously unsuitable for modern traffic requirements, and tar-macadam is being laid in increasingly large areas every year. Tar-painting is carried out fairly extensively, principally with local tar.

BATH.

The open-air swimming bath constructed from designs prepared by the late surveyor, Mr. C. Brown, was opened in May, 1903. The bath is 150 ft. long by 100 ft. wide, with a depth of water from 3 ft. to 6 ft., and contains 400,000 gallons of water. The water is obtained by gravity from the river, first being passed through sand filters. The bath is provided with over seventy dressing-boxes, and also a long dressing-shed.

into the overflow pipes situated in the corners of the bath.

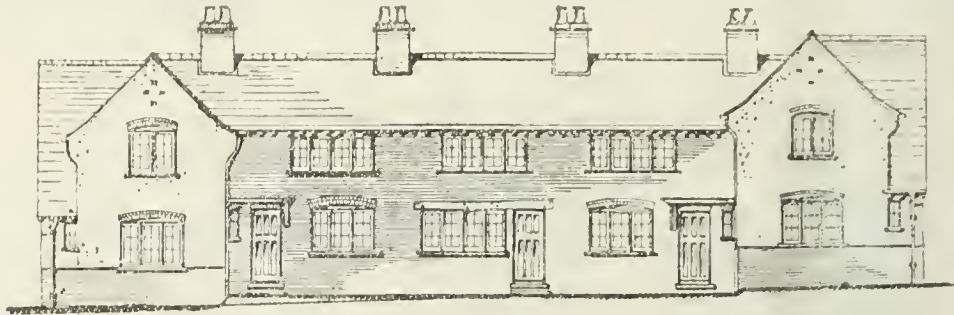
SCAVENGING AND REFUSE DISPOSAL.

This work is carried out by the council by their own staff, with the exception of the collection of house refuse from a small area, which work is let out to contract.

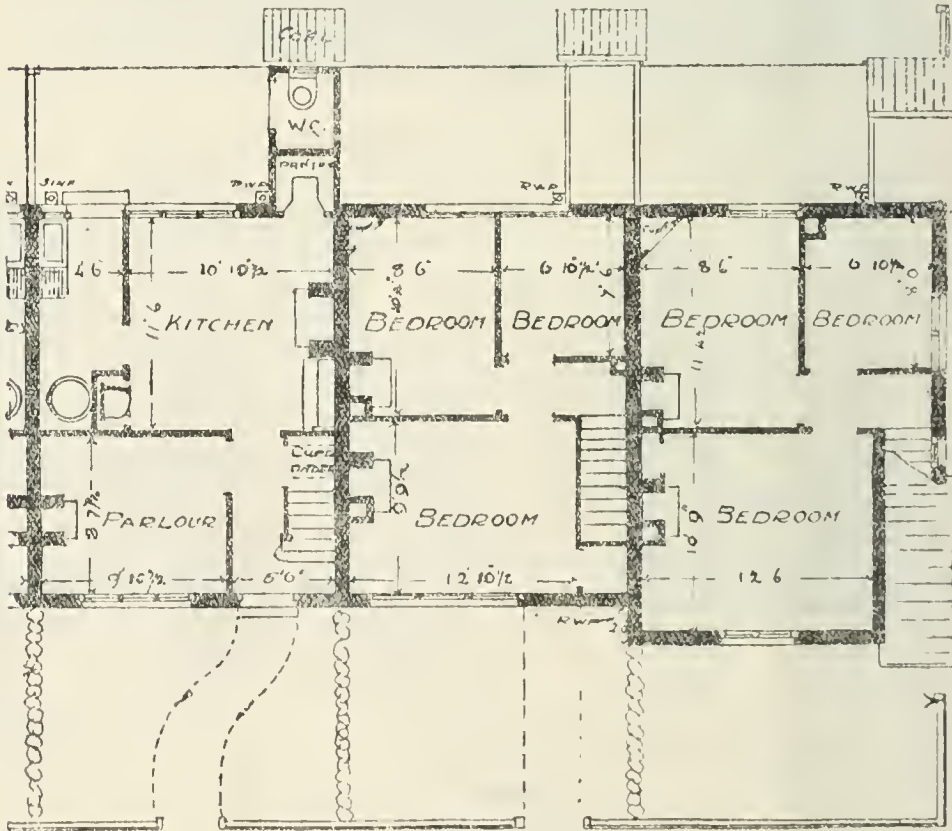
The house refuse is at the present time either taken to tips outside the borough or disposed of to brick-makers. The erection of a destructor is under consideration.

SEWERAGE.

The partially separate system of sewerage is in vogue in the borough, and increased efforts are being made to keep as much as possible of the surface water from entering the sewers. Owing to the continued rapid



Front Elevation.



Plan.

Type E.

CHELMSFORD WORKMEN'S DWELLINGS.

The initial cost of construction was £900, but certain work has been done since, including a new filter put down last year at a cost of £126, and paid for out of revenue.

The walls are of brick rendered in cement, the floor and paving around being formed of concrete slabs. The dressing-boxes are of wood with corrugated-iron roof, and a diving platform is provided at the deep end. An electric motor, with centrifugal pump, is brought into operation during the emptying of the bath, when the level of the water in the bath falls below the level of the river. By an arrangement with a mill owner a constant supply of water is allowed to enter the bath, which, while "freshening" the water, also carries away any scum which may form

development of the town, the preparation of a comprehensive scheme of re-sewerage for the whole of the borough is becoming very urgent, and the preliminary work is already in hand. The sewage is delivered to a sewage farm of 108 acres, where, after passing through settling tanks, the sewage is dealt with by broad irrigation on underdrained land. The sewage farm is under the control of a Joint Sewerage Committee composed of members of the town council and rural district council, a portion of the area of the latter council being in the joint drainage district.

The officers of the town council are the officers of the Joint Sewerage Committee. The committee have decided to purchase a further 40 acres for the purpose of constructing beds to deal with the storm water.

The effluent is discharged into the Chelmer at a point on the river about 3 miles below the centre of the town. A considerable portion of the farm is cropped, and the sale of the produce of the farm, which includes willow trees, for which Essex is famous, enables the farm to be managed without making a call upon the rates.

PUBLIC CONVENIENCES.

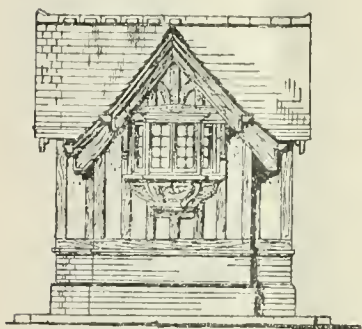
There are several public conveniences in the town, including a substantial well-appointed one for both sexes constructed in the High-street by the previous surveyor, costing, exclusive of site, about £770, and the one erected by the author in Duke-street, costing about £260, which consists of a red brick and tile structure, with oak half timber framing, and finished inside with white and coloured glazed brickwork, pitchpine woodwork and terrazzo floor. The accommodation consists of lobby, two water-closets, six stalls, and cleaner's store.

DISCUSSION OF MR. HARRISON'S PAPER.

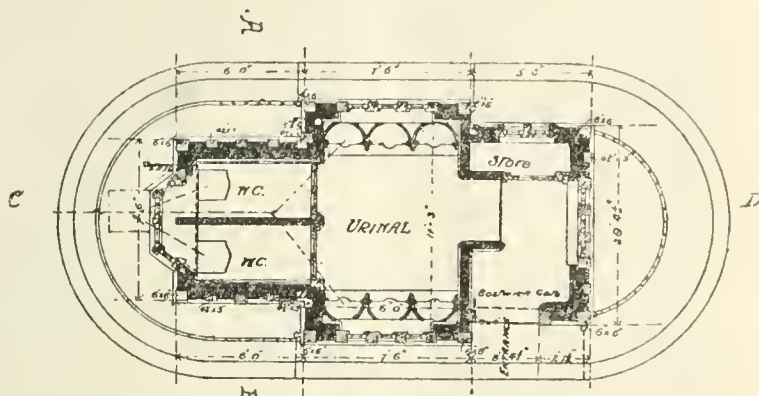
The CHAIRMAN (Mr. H. T. WAKELAM), in proposing a vote of thanks to Mr. Harrison for his paper, said he had been particularly struck with the geological section of the formation which had been passed

figures quoted being between £210 and £220. The results obtained at Chelmsford were exceedingly good. As to garden space, his own experience was that it was not desirable to provide that, for it was generally turned into chicken runs, and so on. It was therefore best to utilise the ground available for gardens as children's playgrounds in the fronts of the houses.

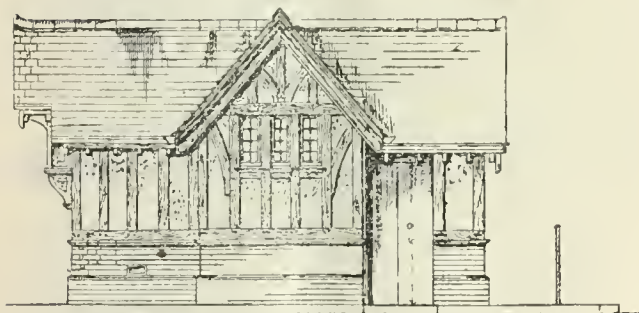
Mr. H. COLLINS (Norwich) congratulated Mr. Harrison on the efficiency of the control exercised over the water supply, which, including the new Galleywood supply, worked out at 18 gallons per head per day. That was a very low consumption, though, of course, the large manufactories had their own water supplies. He might say that at Norwich they had made some running tests in connection with their new sewage pumping station. The dry-weather flow of sewage was 3,000,000 gallons. The total head, the static and friction head, was 95 ft. They had a suction gas plant driving a Roturbo plant and one set of electric motors. They ran the suction gas plant from 6 in the morning until 10 at night, and the electric plant from 10 at night until 6 in the morning, and it also did Sunday work. The cost of pumping on this combined system worked out at £1 16s. 7d. per 1,000,000 gallons pumped.



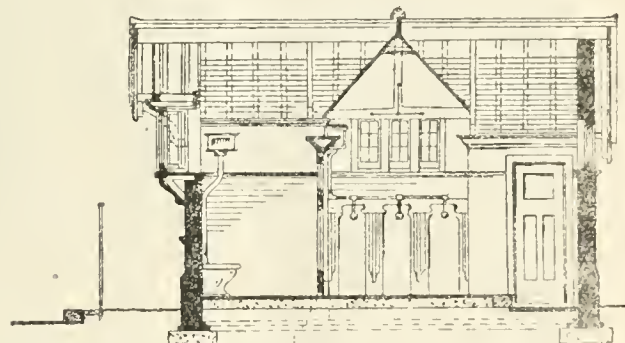
Elevation to Duke-street.



Plan.



East Elevation.



Long Section C.D.

PUBLIC CONVENIENCE, CHELMSFORD.

through in putting down the borehole; he did not think he had ever seen more strata in such a comparatively small depth as 540 ft., and many difficulties must have been encountered in the carrying out of the work. The plans for the cottages were most creditable to Mr. Harrison; they were well thought out, and were cheap in their execution. The cottages costing £187 showed that great ingenuity had been exercised in the preparation of the scheme. He noticed that the roads of Chelmsford were referred to as being on a clayey formation, but he had observed on entering the borough that morning that the roads were well formed and particularly well cleansed—which was always a great consideration and a great pleasure to members of that institution who interested themselves in such matters in the different districts they visited. He had also been much impressed with the planning of the sanitary convenience which had been described to them. Altogether, Mr. Harrison's experience in a town like Chelmsford must be very valuable, for he was a veritable Pooh Bah in the number of works which he had to carry out.

The PRESIDENT (Mr. J. W. Cockerill) said he was afraid he could not erect cottages as cheaply as Mr. Harrison had done, his nearest approach to the

If they had done the whole of the pumping with suction gas it would have worked out at £1 11s., and if with electricity at £2 4s. 1d., while if the old steam beam engines had been employed the cost would have been £2 10s. 8½d. That bore out the efficiency of suction gas. With regard to the cottages, did the average cost per cottage include the land? He presumed not. [Mr. Harrison: No.] He was surprised that it was not proposed to install baths in all the cottages, because those engaged in dirty trades needed them most. He also thought too many houses had been built on the estate. No provision had been made for children's playgrounds, which in Norwich had been found to be an advantage, as they kept the children off the streets.

Mr. E. WILLIS (Chiswick) complimented Mr. Harrison on the saving, in round figures, of £600 per year, due to modern machinery and boilers. He thought that was one of the benefits councils got by appointing men who tried to keep up to date in all these matters. With regard to the housing scheme did Mr. Harrison find that the baths were used, and was there hot water from the copper immediately in the rear? Arrangements were now made by which hot water from the copper gravitated to the bath. His own experience was that the ordinary baths were

not used except for the storage of sundry chattels and coal. He would like Mr. Harrison's opinion as to the metal casements—were they successful for cottages? Then as to wood block floors, those were used on the earlier schemes, but not on the later ones. He did not understand that, for they seemed very suitable for that class of building. With regard to the fire brigade, was Mr. Harrison, as chief officer, supposed to attend fires and take charge, or leave matters to the superintendent? He agreed with the principle that the chief officer of the council should be chief officer of the brigade. With reference to lighting, he noticed that that cost £2,000 a year. That was somewhat high, considering the comparatively small length of roads, but he attributed it to the arc lamps, and partly to the incandescent lamps. It might, however, be due to the peculiar position Chelmsford held in relation to electric lighting. Did the price of the stables include the foreman's house which was just being built on the land adjoining? In connection with the open-air bath, which had many admirable points about it, the initial cost of construction as quoted was £900, and Mr. Harrison mentioned a new filter put down at a cost of £126. Did the total sum cover the cost of the whole work as they had seen it that day? If so, it was a cheap piece of work, but the cost of maintenance was likely to be heavy in the future owing to the use that had been made of corrugated iron. He complimented Mr. Harrison on the sewage works, there were very few districts able to run their sewage works without a call upon the rates. The borough was to be complimented on their fortunate position. He had been very pleased with the design of the convenience; it seemed most suitable and exceedingly artistic, while the price of £260 appeared to be a very low one. But he would like to ask whether the rate of wages for ordinary artisans and labourers in that neighbourhood accounted for the somewhat low figure.

Mr. C. VAWSER (Herts) asked the cost of the well, which had been sunk 540 ft. With regard to the suction gas plant, which showed a saving of £600 a year. Mr. Harrison did not say what was the horse power, or the cost per horse power for running that machinery, or even the cost of pumping the water per unit of 1,000 gallons. As regarded the roads, Mr. Harrison stated that during his three years of office he had effected eighteen street widenings, at a cost of nearly £10,000, while £9,000 had been spent on wood block and granite sett paving within the last eighteen months. He would like to know the cost per yard of paving in Chelmsford. Tar painting was said to be carried out pretty extensively in Chelmsford. He would like to ask whether the tar was in any way refined or used in its crude state.

Mr. A. E. COLLINS (Norwich) said his experience supported that of Mr. Harrison with reference to wood block floors. He found that where they used wood floors of any sort on the ground they had them ruined in many cases by people covering them with linoleum. He had had endless trouble from people laying linoleum and causing dry rot to set in. It was stated that Chelmsford was the first place for its streets to be lighted by electricity. It was before his time in the Eastern Counties, but he was told that Norwich was the first town. The streets there were lighted with electricity before the Paris Exhibition, which was looked upon as the first large installation of electric lighting. With regard to the use of crude or refined tar on the roads, he had had crude tar from some gasworks which was better than refined tar from others. It was the quality of the coal and the method of carbonisation which governed what the tar would be. Of course, the tar from some gasworks would be better for refining. If they got tar from Somersetshire coal, carbonised in the old way, they got tar like varnish; but if they got tar from some other coal it was as thin as water.

Mr. S. H. CHAMBERS (Hampton) asked what period the loan was obtained for the bath, and also whether the bath was a charge upon the rates.

Mr. S. A. HILL-WILLIS (Tilbury) asked with regard to the housing scheme whether the borough engineer supplied bills of quantities to the contractors. In Tilbury they could not get within a penny of 5-32d. per cube foot. They had cement within a mile, brickworks in the district, and floated the timber, and yet they were just under 7d. per cube foot.

Mr. E. A. SLATER (Colchester) said he saw that Mr. Harrison had economised in several ways in the housing scheme, particularly by utilising the roof as much as possible, and by building in long rows.

There was a great tendency to go in for semi-detached cottages. As regarded the means of secondary access—provided, was it intended to pave these back lanes? The material which he (the speaker) advocated for that purpose was cement concrete, which could easily be made strong enough to stand horse traffic, and was more sanitary than any other method. Mr. Harrison had abandoned wood block flooring, but he (Mr. Slater) rather advocated a system which was a compromise between wood blocks and the other method. He first put down a thin layer of concrete, floated on a covering of neat cement, and then breeze concrete to take the boards. He had worked on those lines for some years, and had had no case of dry rot. He should like to have seen tile roofs to the houses; he thought that would be found to be not only an improvement, but an economy. As to cement, he considered it was rather a curious thing that in the neighbourhood of the Thames, the home of cement, contracts had been running at about 35s. per ton, whereas he had had tenders as low as 28s. from the Thames district, and 31s. from Ipswich. With regard to the tarmixing apparatus, he should like to know what type of machine it was proposed to adopt.

Mr. J. W. LIVERSEDGE (Leigh-on-Sea) said he knew the difficulties which Mr. Harrison had met with regarding the water supply. They had not been ordinary difficulties, because Chelmsford was peculiarly situated in regard to its strata. He would like to ask how far apart these various boreholes were proposed to be placed, and whether Mr. Harrison anticipated any influence of one borehole upon another. He had had some little experience of water supply in Essex, and knew something of the influences in that direction. There was no mention of the capacity of the borehole, unless 1,900,000 gallons a day was the figure.

Mr. HARRISON: That is so.

Mr. LIVERSEDGE added that he had previously seen the works, and he congratulated Mr. Harrison upon his pumping plant. He was quite sure that the corporation would be quite pleased with the arrangement when finished.

Mr. J. R. MEAD (Ipswich) said the paper proved that the municipal engineer was a jack-of-all-trades, and that Mr. Harrison was the master of them all. He thought the design of the cottages was very artistic. He was interested at the moment in the question of how to obtain power for raising sewage. Mr. Harrison stated that he had reduced the cost of pumping by the use of suction gas from £800 to £200 per annum. This was really a wonderful reduction. It was only 25 per cent of the original cost. He had worked out Mr. Collins' cost as 66 per cent only of the higher figure. He thought Mr. Harrison had adopted the best method when he adopted suction gas, but those figures did appear extraordinary.

Mr. H. COLLINS explained that his figures were not for fuel only, but covered labour and everything complete for the running of the station. The saving on fuel would be much greater than on the running cost.

Mr. J. A. WEBB (Great Stanmore) asked for statistics of the various methods of tar-surfacing in Chelmsford.

Mr. HARRISON, in replying to the discussion, said the president of the institution had raised a question as to the provision of playgrounds for the children. The Housing Committee—to whom must be given the credit of the housing scheme—desired to place the largest number of cottages possible upon the site, and although modern thought was tending towards town planning, they were not able to reduce the number of cottages to less than twenty-two to the acre. He agreed that more could have been done with the site but for that decision. With regard to Mr. Harold Collins' reference to the waterworks and the consumption of water, all the manufacturing works of any size had their own water supply. The low water consumption per head was accounted for by the fact that only the large houses had baths, and some of the smaller houses had a standpipe water supply. With regard to baths in cottages, he had reason to believe that the baths were appreciated. They had the foresight to adopt folding baths which could not be used as coal bunkers. With reference to Mr. Willis's question, the baths were filled with a tap by which a hot-water supply could be obtained from the copper. With regard to the metal casements to the windows, the cost per super. foot came considerably less than joiner's work, and as it was anticipated that the maintenance cost would be reduced, they felt justified in using them. With regard to the wood-block floors, his first idea was to have boards nailed on the con-

crete, but they had a clay subsoil, and some of the practical members felt that it would not be suitable, and it was decided to have wood blocks. With regard to his being chief officer of the fire brigade, the chief officer attended fires when his conscience would not allow him to stay away. They had a superintendent who did take control pending the arrival of the chief officer. They paid £3 3s. per lamp per annum for electric lighting other than the arc lamps, and £3 for gas. The foreman's house was not included in the figure for the depot, but the horsekeeper's cottage was. He agreed that the cost of the open-air bath was low. The painting bill would, however, be high, and quite an appreciable cost in the future. The pumping plant was 35-h.p. He was not able to give the working cost other than for fuel alone. It was an exceedingly nice thing for an engineer to come across in taking up his duties. He did not take all the credit of such an enormous saving. The engine was designed to run at high pressure, and the old boilers, which were extremely old, at low pressure, so that they would see that the saving was bound to be considerable whatever improvement was made at the waterworks. With regard to the tar-painting of the roads, whatever tar was put on the roads in the summer was destroyed during the winter. The mud formed in winter forced itself up, and the tar surface was destroyed. Until they could go in for tar-macadam he had come to the conclusion that the best thing they could do was to tar-paint the roads at the lowest cost. He used crude tar, which he boiled to get rid of the light oils and water. He did not think it worth paying another 150 per cent more for refined tar. With regard to bills of quantities, he might say that no bills of quantities were prepared as the practical men on the council were inclined to think that a bill of quantities would increase the cost. Mr. Slater referred to the pavings of the backways of the cottages. At the present time hardcore and gravel were used. He quite admitted that a concrete paving would be better, but the question of cost came in again. He was also sorry that he was not able to put tile roofs instead of slate roofs, but the question of cost, in more ways than one, came in. They had to save somewhere, otherwise they would not have got the figure they had.

In the afternoon inspections were made of the working-class dwellings described in the paper, the new suction-gas plant at Mildmay Yard waterworks, and the new stables and depot. On the termination of the visits the members returned to the Shire Hall, where they were entertained to tea by Mr. Harrison.

GOLDSMITHS' COLLEGE ENGINEERING DEPARTMENT.

SUMMER COURSES.

Summer courses of special character are being held in the engineering department of Goldsmiths' College (University of London), New Cross, S.E., during May and June, as shown in another column, and the lectures on reinforced concrete, engineering costs and works management, and wireless telegraphy should prove very attractive. All these will be treated practically, and the college installation will be used for "wireless" practice. In addition, there are to be special demonstrations in the mechanical and hydraulic laboratories, classes in drawing-office and workshop practice, and land surveying for both elementary and advanced surveyors, with plenty of actual work.

"Trinidite" and "Bitite."—We have received from the Dussek Bitumen Company, Canal Bank, Deptford, S.E., copies of two pamphlets giving particulars regarding "Trinidite," which they specially manufacture for grouting macadam, and "Bitite" for granite setts and laying wood-block paving, and surfacing all kinds of macadam roads. We are informed that these materials are giving every satisfaction in every case where laid, and, owing to the success which has attended their use, and the considerable amount of work which the firm have in hand for the present season—one item alone being 600 to 800 tons. for Mr. H. T. Wakelam, county engineer of Middlesex—they have been obliged to take new premises, and are at the present time erecting further works at Poplar. The company will be pleased to forward to any SURVEYOR readers who may not have already received one, a copy of their pamphlet describing "Trinidite."

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain,
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2.

PURIFICATION OF SWIMMING BATHS WATER.

To the Editor of THE SURVEYOR.

SIR,—Many thanks for your note of last week on my swimming bath system. I do not wish to weary you, but perhaps you would be interested to know that the cost of water supplied to the Radford baths (main water) for 1913-1914 was £265, the Victoria baths £466 10s., and the Northern baths £151. These baths are emptied twice a week.

The Radford baths, from April 1, 1913, to March 31, 1914, were used by 40,057 persons (swimmers), made up as follows: Males, 34,472; females, 5,585—an average weekly attendance for the fifty-two weeks of 770. The actual bathing season is from April to September, so I assume for that period the average attendance would be something like 900 persons. Some 450 persons are thus compelled to pass through a pond of water which stands three days before it is changed!

I am of the opinion that the structure of our town or inland baths is greatly at fault, inasmuch as the light and air appear generally to be from the roof only. Why not rearrange the thick walls, and let quite half the height be windowed, and so made to be opened for the admission of fresh air and sunlight, as in school buildings? If a boundary wall or other partition were built, the whole of the sides could be made to open.—Yours, &c.,

ARTHUR POLLARD.

Nottingham.

April 18, 1914.

To the Editor of THE SURVEYOR.

SIR,—We again see reference made by you to the question of sterilisation of water in swimming baths, but you refer only to the use of electrolytic fluid. One of the special features in our system is the use of lime water as a sterilising agent, its action in this respect having recently been proved conclusively. The enormous advantage in the use of lime water is that it has no detrimental effect whatever on the water, having neither smell nor taste.

We were the first to adopt the process of continuous chemical treatment in connection with the purification of water in swimming baths, and in particular the use of lime water, which we have now been using for the past 4½ years with excellent results.

We recently sent a copy of analysis to an eminent authority on sewage purification, and he wrote back saying that the results were astonishingly good.—Yours, &c.,

"TURN-OVER" FILTER COMPANY.

39 Chichester-street,
Belfast.

April 20, 1914.

[The "Turn-over" Filter Company forward with the above letter a copy of one of their latest pamphlets, which we recommend to the notice of all interested in the question referred to in our "Minute" of last week.—Ed. SURVEYOR.]

THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

To the Editor of THE SURVEYOR.

SIR,—With reference to the letter of "Another Member," in your issue of February 27th, I consider the suggestions put forward in the first portion of his letter worthy of serious consideration, and I feel sure that the present progressive and liberal-minded council of the institution would give them favourable consideration if approached in the right spirit. What I have seen and know of the present council has convinced me that they are anxious and willing to listen to and encourage the views of the younger members, and desirous that they should take an increasing interest in the affairs of the institution.

I, however, wholly disagree with the idea of amalgamation with the Institution of Municipal Engineers, entirely failing to see what there is to be gained by it since the junior institution can hardly be considered either a rival or representative body. I am sure the proposition, if put to the vote of members of the Institution of Municipal and County Engineers, would

receive scanty support and the short shift that it deserves.—Yours, &c.,

A. G. WHITEFIELD.

Public Works Department,
Taiping,
Federated Malay States.
March 29, 1914.

[It may be recalled that in the letter referred to by Mr. Whitefield the suggestion was made that the example of the Surveyors' Institution might well be followed, and about four young members elected to the council of the institution. These members, who, it was pointed out, would know and feel the hardships existing, should, it was further proposed, be not over thirty-five years of age, hold the testamur of the institution, should not occupy a chief appointment or be engaged in the same office as another member of the council, and their travelling expenses should be paid for from the institution funds. The desirability of amalgamation with the Institution of Municipal Engineers was also touched upon.—Ed. SURVEYOR.]

ROAD BOARD GRANTS.

A WILTSHIRE GRIEVANCE.

In the House of Commons, on Monday, Mr. C. Bathurst asked whether the Road Board, after making

EALING COUNTY SCHOOL.

REINFORCED-CONCRETE CONSTRUCTION.

By the courtesy of the proprietors of the *Indented Bar Bulletin* we are enabled to reproduce three views of the above-named school—the exterior, the assembly hall and the art room. This is another of the buildings which have been carried out for the Middlesex Education Committee on the system of the Indented Bar and Concrete Engineering Company, Limited.

In this case, the columns, beams and floors are all of reinforced concrete, as well as some of the staircases. The beams and columns for the hall are carried on strip footings, and the former are interesting owing to their large span—viz., 20 ft. 3 in. clear, having a section of 18 in. by 18 in. They are also a good illustration of how the main reinforced-concrete structural members can be made to harmonise with the architect's scheme of internal decoration.

Immediately over the assembly hall are a series of three class-rooms and a corridor, the beams over which are a trifle longer than those already mentioned—namely, 31 ft.—and shallower in section—viz., 24 in. by 12 ft.

From the view of the art room it will be seen that the roof trusses are carried on reinforced-concrete beams, which are T-shaped, with a slab approximately 3 ft. wide forming the top of the T.

The building consists of a basement, ground floor,



EALING COUNTY SCHOOL.

a grant to the Wiltshire County Council of 50 per cent of the cost of tar-spraying the main roads of the county where they pass through the more populous villages, had recently intimated that no further grant would be made for this purpose, with the result that the whole cost of the process would be thrown upon the county ratepayers; and, if so, whether, seeing that at least two-thirds of the dust nuisance from which the villages suffered was in that county occasioned by pleasure-seeking motorists living outside the county, the Government will undertake that an adequate proportion of the total cost of abating such nuisance should continue to be defrayed out of the Motor Licence and the Petrol Duties which constituted the Road Board Fund?

Mr. Montagu said a conference between the board and representatives of the Wiltshire County Council had been fixed to be held on the 21st instant. Perhaps the hon. Member would therefore postpone his question.

CIVIL SERVICE COMMISSION'S RECOMMENDATIONS.

Mr. Bridgeman asked the Prime Minister whether he proposed to take any steps to carry out the recommendations of the Civil Service Commission that the Road Board should be brought under Ministerial and Parliamentary control, and its staff brought under Civil Service rules?

In reply, the Prime Minister said: The recommendation would be carefully considered, along with the other recommendations of the Royal Commission.

first and second floors. The architect was Mr. H. G. Crothall, F.R.I.B.A., architect to the Middlesex Education Committee. The contractors were Messrs. Allan Fairhead & Son, Enfield.

Electrically-Driven Refuse Vehicles.—The Birmingham electricity department have undertaken to supply the Refuse Disposal Committee with two electric battery vehicles for the removal of street refuse. These vehicles will cost about £550 each, but it is considered they will do the work better and more economically than horse-drawn vehicles. Should the experiment prove successful it is probable that more vehicles of a similar type will be provided.

Gloucestershire Roads.—Mr. F. W. B. Cripps (chairman of the Highways Committee) at the Gloucestershire County Council meeting on Monday stated that the estimate put forward by that committee was the largest ever brought before the council. The cause and the justification of the figures were simply that they were due to the traffic which the roads of the county had to bear. From June, 1912, to 1914 the increase in the tonnage had gone up 71 per cent. For the period now to be faced the committee's expenditure would be up a matter of £29,000, and this would enable them to put 27,000 tons of increased material upon the roads. The estimate totalled £136,331, and with this the county surveyor would put upon the roads a total of 145,000 tons of material.

MUNICIPAL WORK IN AUSTRALIA.

PRAHRAN CITY SURVEYOR'S REPORT.

In his report on the works carried out under his direction during the year ended September 30th last, Mr. E. F. Gilchrist, city surveyor of Prahran, reports a slight increase of the length of roadways and pavements, there being now 65 miles of streets

not watering excessively, is a strong argument in its favour. This motor is now converted and provided with a tipping body worked mechanically from the engine, so that when not in use for street watering it can be used for general carting.

The other motor lorry has worked almost continuously since commencing, and covered during the eight months 4,407 miles for a consumption of 814 gallons of petrol, which is equal to 5.41 miles per gallon. It transported 6,087 tons of material, the average mileage per day being 21.8. The cost per ton cartage worked out at 1s. 13d.



ASSEMBLY HALL, EALING COUNTY SCHOOL.

and 18 miles of lanes. The area of the city is 2,357 acres.

During the twelve months under review over 4 miles of streets were metalled, while repairs and top dressing were carried out on a large number of foot-paths.

The tar-painting of macadam streets was carried on during the summer months, the area so treated being 114,540 sq. yds.

Mr. Gilchrist mentions that the whole of the house refuse (8,770 tons) and trade and market refuse (884 tons), making a total of 9,654 tons, were destroyed at the destructor.

The number of electrical units generated and sold was 423,770, and the power used for council's own lighting and other works was 37,648 units. The quantity of electricity generated per ton of refuse burned was 43.89 units, and the water evaporation per lb. of refuse .95 lb. The revenue received from electricity was £725, as against £678 in the previous year. The revenue for burning private refuse was £165, as against £167. The value of clinker sold to builders and others amounted to £128, and that used on the council's own works to nearly £100.

MOTOR TRACTION.

The report states that two Halford petrol motor lorries were at work for eight months up to the end of September, and had done excellent work. One of these, a 3-ton vehicle, used for street watering, covered 2,284 miles for a consumption of 418 gallons of petrol, or 5½ miles to the gallon. The advantages of this system of street watering have been found to be very great; for, although the cost works out at about the same as for horse traction, the convenience in getting over the ground so much more quickly, in being no hindrance to the travelling public, and in

collection, scavenging and street watering. Reply "Snowdon," office of this paper.

Concrete Institute: Junior Members' Meeting.—The second informal meeting of junior members of the Concrete Institute will be held on Friday, May 1st, at 7 p.m., at Denison House, 296 Vauxhall Bridge-road, Westminster, S.W. (close to Victoria Station), when

Mr. Balfour—Civil Engineer.—The interesting announcement was made yesterday that the Right Hon. Arthur James Balfour, P.C., F.R.S., D.L., M.P., 4 Carlton-gardens, S.W., has been elected an honorary member of the Institution of Civil Engineers.

Refuse Collection, &c.—

A surveyor to an urban district of about 5,000 inhabitants would be very much obliged for any information from surveyors who have had experience of contract v. direct labour as applied to house refuse



ART ROOM, EALING COUNTY SCHOOL.

Mr. E. Fiander Etchells, F.PHYS.SOC., M.MATH.A., A.M.I.MECH.E., member of council of Concrete Institute, will take the chair. The business before the meeting will be a continuation of the discussion on the paper "The Design of Steel and Reinforced-concrete Pillars, with Special Reference to Secondary and Accidental Stresses," read at the ordinary general meeting on April 16th by Mr. Oscar Faber, B.S.C., A.C.G.I., ASSOC.M. INST.C.E.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. INST. C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

Mr. H. BONE, of Falmouth, has selected the following books in respect of the March premium, and they have been duly sent to him:

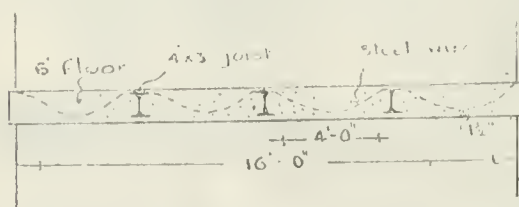
- "Public Health Act, 1875, and other Statutes, &c.," by Herbert Davey (Knight);
- "Arbitrations and Awards," by J. P. H. Soper (*Estates Gazette*, Limited);
- "A Short Specification of Materials, &c.," by James Cubitt (Lockwood); and
- "Municipal Engineering: Model Answers to Questions" (St. Bride's Press, Limited).

QUESTIONS.

This week answers are invited to the following questions:—

390. Removal of House Refuse. A new urban district has just been formed in the neighbourhood of London of which the following are particulars: Area, 3,500 acres; population, 9,000, increasing at rate of 700 per annum; number of houses, about 2,300; length of district, north to south 3 miles, east to west $1\frac{1}{4}$ miles; mileage of roads, 17; character of district, flat in northern part, hills up to 1 in 16 in southern part; distribution of population, 2,000 at north end in 240 villas, shops, &c., 500 in north-east in large houses with long approach drives, 1,000 in south and south-west in small villas and workmen's cottages. The refuse for the present will be utilised at brickfields on the southern boundary of the district. It is desired to organise the removal of house refuse on the most up-to-date methods compatible with economy. Describe fully the methods of collection and transit, the organisation of the staff, the plant required, and give an estimate of the capital and annual charges for this work. Trade refuse is negligible, and no plant has been taken over from the rural authority who formerly had control of the area. (Togun.)

391. Concrete Floor.—A concrete floor is to be constructed as shown in the sketch, with 4-in. by 3-in.



R.S. joists, and woven mesh steel wire with a 3-in. lap. The R.S. joists have a $4\frac{1}{2}$ -in. wall hold, and the floor a 2-in. wall hold. The size of the room is 16 ft. by 13 ft. Calculate the safe distributed load per super. foot, also the breaking load. (Assistant.)

392. Sewage Purification.—The sewage of a college is to be treated as follows: The liquid is first admitted to a septic tank, then to a vertical upward filter filled with agricultural pipes; thence it flows through a clarifier to the sewer of the city. The population of the college is about 300 people. (1) Give dimensions of each of the tanks, in order that the liquid effluent may be good. (2) Does the vertical upward filter act as an oxidising filter or merely as a second settling tank? (3) How often will the vertical upward filter have to be cleaned in order to keep the effluent good? (Deleatur.)

393. Surveying.—In carrying out a large survey (by triangulation) describe in full detail how you would use the centre of a tower or shaft as a station on the ground without actually setting up the theodolite inside. Give proofs of any formulæ involved. (T. W. P., *Bexhill-on-Sea*.)

REPLIES TO QUESTIONS.

388. Reactions on Beams.—Show how to find (graphically or otherwise) the pressures on the two supports of a horizontal beam which is loaded at any given point. If the distance between the supports

be 20 ft., and if one of the loads be 12 cwt., find the changes in the pressures produced by shifting this load through a space of 5 ft. along the beam. (A.M.I.C.E.)

When a beam is loaded with given weights placed at certain points, and rests in a horizontal position on two supports, it is often necessary to determine the forces of pressure on the supports, or, what amounts to the same thing (since action and reaction are equal and opposite), the reactions of the supports on the beam, which are, of course, equal and opposite to them.



FIG. 1.

These two reactions, together with the weights on the beam, and the weight of the beam itself, if it be heavy, form a system of forces in equilibrium, and hence the following statements hold:—

- (1) The sum of the forces is zero.
- (2) The sum of their moments about any point is zero.

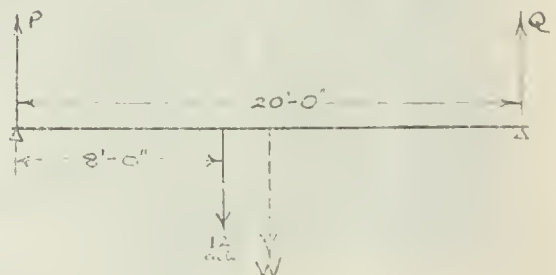


FIG. 2.

If we want to find the reactions one at a time, we therefore proceed as follows:—

(a) Take moments about one of the supports. The reaction of that support has no moment, and therefore the equation of moments at once gives the reaction of the other support.

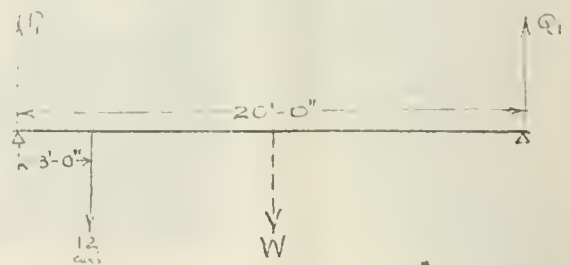


FIG. 3.

(b) Equate to zero the algebraic sum of the forces (including the two reactions). The equation gives the sum of the reactions, and hence the other required reaction.

An example will perhaps make the method quite clear:—

Let a beam, whose weight is W , acting at its centre of gravity G , be supported at X and

Y, and let any weights w_1, w_2, w_3 be attached at points A_1, A_2, A_3 .

Then if P and Q denote the unknown reactions at X and Y (see Fig. 1), the equation of moments about Y gives:

$$P \cdot XY = w_1 \cdot YA_1 + w_2 \cdot YA_2 + w_3 \cdot YA_3 + W \cdot YG \dots (1)$$

Again, the equation of moments about X gives:—

$$Q \cdot YX = w_1 \cdot XA_1 + w_2 \cdot XA_2 + w_3 \cdot XA_3 + W \cdot XG \dots (2)$$

Adding equations (1) and (2) gives:—

$$(P+Q)XY = w_1(XA_1 + YA_1) + w_2(XA_2 + YA_2) + w_3(XA_3 + YA_3) + W(XG + YG)$$

$$\text{or } (P+Q)XY = w_1 \cdot XY + w_2 \cdot XY + w_3 \cdot XY + W \cdot XY$$

i.e., P + Q = $w_1 + w_2 + w_3 + W$.

This is the equation we should have obtained by resolving perpendicular to the rod or equating the algebraic sum of the forces to zero, showing that the values of P and Q found by resolving and taking moments about the supports are consistent.

If it should be found that the thrust on one of the supports should come out negative, it is to be inferred that the rod presses upwards on its support, and that the latter has to hold it down.

Now, referring to Fig. 2, suppose that the load is originally placed at a distance of 8 ft. from the left-hand support, and let the weight of the beam be W cwt.

As above; taking moments about the left-hand support, we get:—

$$12 \times 8 + W \times 10 = Q \times 20$$

i.e., 96 + 10W = 20Q

$$\therefore Q = \frac{96 + 10W}{20}$$

$$= \frac{48 + 5W}{10}$$

Referring to Fig. 3, the load is now supposed to be moved 5 ft. nearer the left-hand support—*i.e.,* it is 3 ft. away.

And we have again:

$$12 \times 3 + W \times 10 = Q_1 \times 20$$

i.e., 36 + 10W = 20Q₁

$$\therefore Q_1 = \frac{36 + 10W}{20}$$

$$= \frac{18 + 5W}{10}$$

Hence the change in pressure at the support Q is:—

$$Q - Q_1 = \frac{48 + 5W}{10} - \frac{18 + 5W}{10}$$

$$= \frac{48 + 5W - 18 - 5W}{10}$$

$$= \frac{30}{10}$$

\therefore Change in pressure = 3 cwts.

Similarly, by taking moments about the right-hand support, it would be found in the same way the pressure altered by 3 cwt. as the load was moved, but the alteration would be a decrease, whereas the other was an increase; or symbolically—

$$Q - Q_1 = 3 \text{ cwts.} = P_1 - P$$

(T. W. P., *Bechill-on-Sea*.)

The following problem and its solution are sufficiently wide in character to answer the question submitted:—

Fig. 1 shows a system of balanced parallel forces. Determine graphically (1) the reactions of the two supports AB and GA; (2) the bending moment about B' of all the forces to the left of this point; (3) the bending moment about C' of all the forces to the left of this point.

Assume the 12-cwt. load to be any of those shown in Fig. 1, say the load DE of 1,000 lb.

(1) Construct the force polygon *bcdefg* (Fig. 3), by representing to scale (any convenient scale) the parallel forces BC, CD, DE, EF, and FG. Since all these forces act downwards they are scaled downwards; and since their direction of action is parallel, the force polygon reduces to a straight line *bg*.

Since the position of the polar point *p* in the force diagram is arbitrary, it is convenient so to

select it that the normal ray, *ph*, will be a convenient number to multiply by. To accomplish this it is sufficient to choose any point *h* in the force polygon (this applies to parallel forces only), which will be normal to the vectors of the polygon, making it represent, to the same scale as the polygon, a force, say, 100, 1,000, or 10,000 lb. In Fig. 3 it is scaled to represent 20,000 lb., and the point *h* is chosen anywhere about midway on the force polygon.

The vectors *pb, pc, pd, pe, pf,* and *pg* are now drawn and the force diagram completed.

The funicular (Fig. 2) is now constructed, having each of its strings parallel, respectively, to the vectors of the force diagram.

The intersection of the funicular strings being at the points of intersection of the strings with the vertical lines of action of the corresponding forces, these latter lines are projected in Fig. 1 for convenience.

The convenience of the lettering will now be apparent; *p* being normal to all the forces, it is used in the middle of the funicular, and is only written once to save confusion.

Then PB is drawn parallel to *pb*, PC parallel to *pc*, &c., and PG parallel to *pg*, their points of intersection being on the vertical lines of actions of the corresponding forces. These, from *b* to *g*, representing all the known forces.

Close the funicular by the line PA. From the fact that the system was stated to be a balanced system of forces, by the principles of graphic statics its funicular must close—that is, the last string of the funicular (in this case PA) must coincide with the first.

Now draw *pa* parallel to PA, and it is seen that it cuts the force polygon into two portions (forces), *ab* and *ga* (not *ag*, as this would indicate the force acting from *a* to *g*—downward, which cannot be the case of the support if the system of forces is to be kept in equilibrium), which, according to the lettering used, represent the forces exerted by the supports AB, GA.

Scaling *ab* and *ga*, they are found to be 7,200 and 11,800 lb. respectively.

(2) and (3) The bending moments about the points B' and C' (in fact, about any point on the beam) can now be determined graphically from the funicular and force diagrams. This, in terms of the intercepts and the normal ray, may be stated, in words: The moment of a force about a point is equal to the product of the normal ray, and the intercept of the force (or any other point of the beam) with the funicular both referred to the same polar point.

B' and C' are the points on the beam in question about which the moments are required. Draw lines through the points B' and C', parallel to the forces, then KL and K₁L₁ are the intercepts for these points, and by the scale of distances (1"=4' here used) are found to be 1.96 ft and 2.32 ft, respectively. The normal ray was made to represent 20,000 lb.

Therefore—

$$\text{B.M. at point B}' = 1.96 \times 20,000 \text{ lb.} = 39,200 \text{ ft. lb.}$$

$$\text{B.M. at point C}' = 2.32 \times 20,000 \text{ lb.} = 46,400 \text{ ft. lb.}$$

For practice, the 1,000 lb. load can be moved 5 ft. to the right of its present position, and the graphic method, here explained, repeated.

Analytic Method. As stated, the system of forces is in equilibrium, and therefore their resultant must equal zero; its moment about any point must also be zero; and as the moment of the resultant of a system of forces is equal to the sum of the moments of the components of the same system of forces we have, stated in equation:—

$$M_1 + M_2 + M_3 \dots \text{e.c.} = 0$$

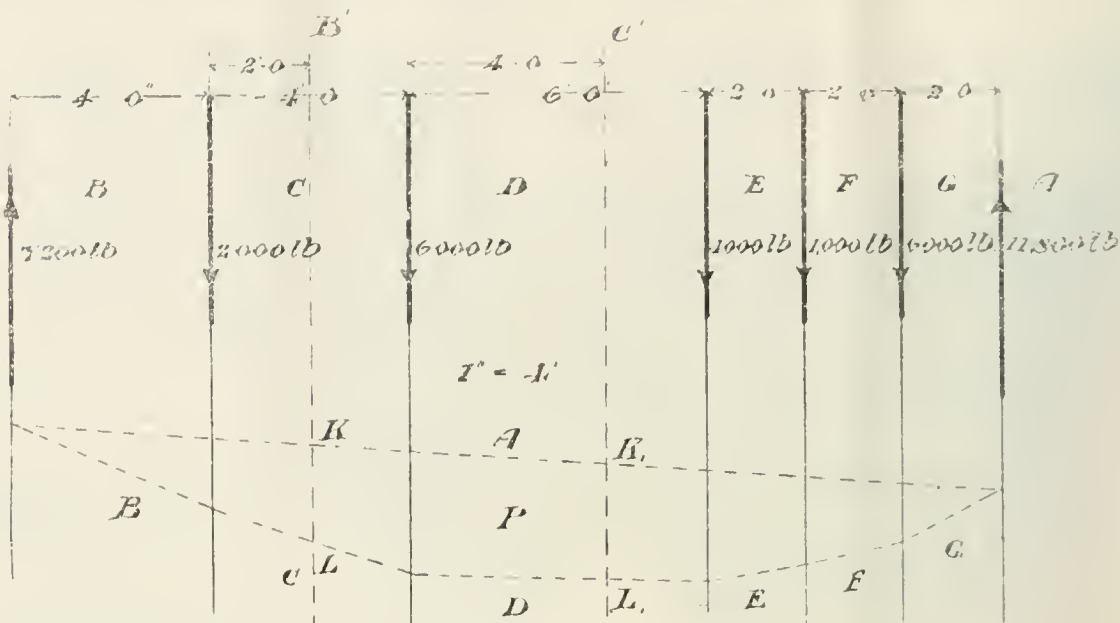
Where M_1 , &c., are the moments of the components about any point in their plane. The use of the word "sum" must be understood to be the algebraic sum, plus or minus, as the action of the moment may be about that point. For instance, the moment of the load BC about the point B' is minus—*i.e.,* it tends to move about the point B' in a contra-clockwise direction. Again, the load CD would have a plus moment about the point B', as its direction would be clockwise.

On the beam in question there are seven forces acting; two of them, the reactions of the supports, are unknown. By taking moments about the support GA, one of the unknown forces will be cau-

celled—i.e., the reaction at the support GA can have no moment about the point GA, since its lever arm is zero. There remains, then, only one unknown quantity (force) in the above equation to be determined.

Let R represent the unknown force (reaction at AB). Then, taking moments about GA, and giving

Now, moving the 4,000 lb. load 5 ft. to the right of its present position, the above equation becomes—
 $+ R \times 20 - 2000 \times 16 - 6000 \times 12 - 4000 \times 11 - 1000 \times 4 - 6000 \times 2 = 0$
 $R = \frac{164000}{20} = 8,200 \text{ lb.}$
 and $R_1 = 19000 - 8200 = 10,800 \text{ lb.}$



FIGS. 1 AND 2.

The term "lever arm" was made use of; this is merely the distance that the force is to the right or left of the point about which moments are taken.

It should be noted, too, that the equation $M_c +$

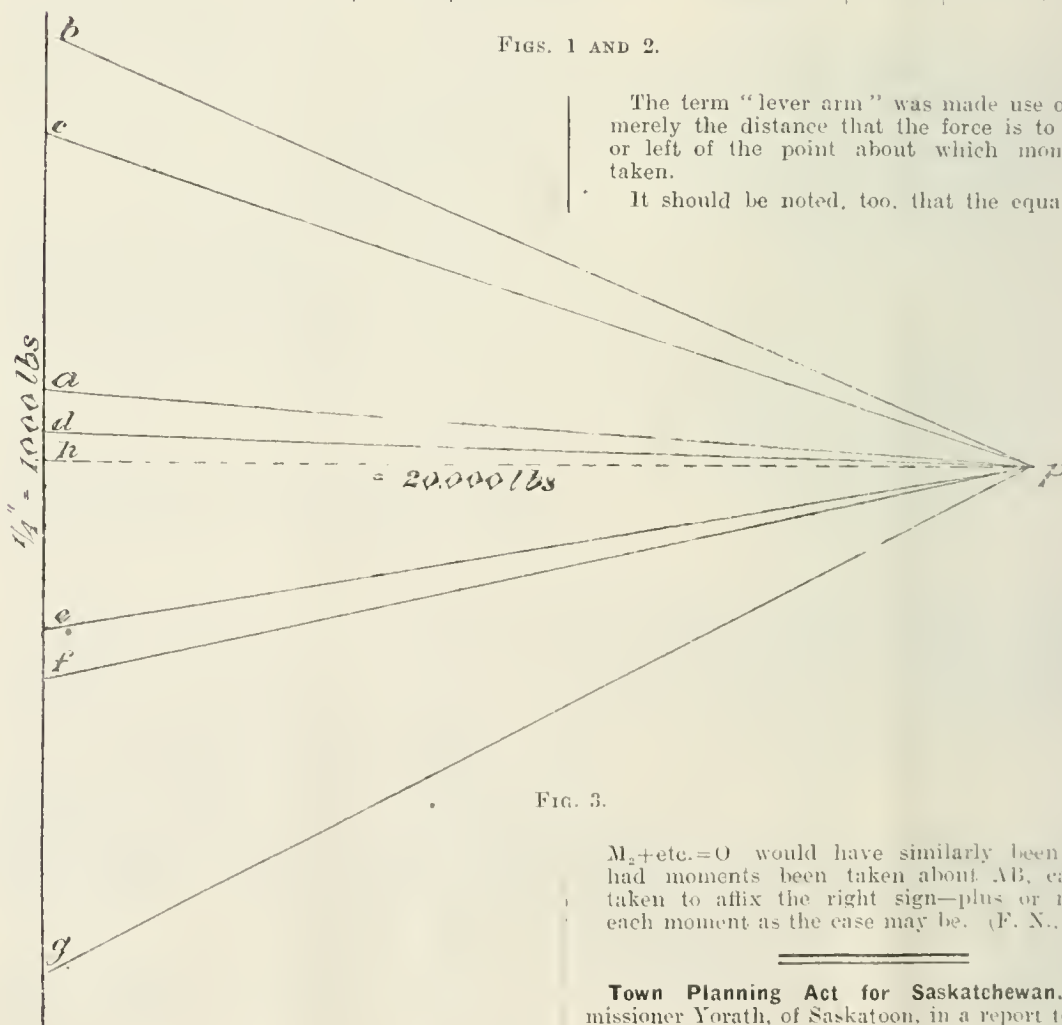


FIG. 3.

$M_2 + \text{etc.} = 0$ would have similarly been satisfied had moments been taken about AB, care being taken to affix the right sign—plus or minus—to each moment as the case may be. (F. N., Dornoch.)

each force a + or a - sign, according to the rule previously stated, we have:—

$$+ R \times 20 - 2000 \times 16 - 6000 \times 12 - 4000 \times 11 - 1000 \times 4 - 6000 \times 2 = 0$$

$$R = \frac{164000}{20} = 8,200 \text{ lb.}$$

Then R_1 (reaction at GA) = $2000 + 6000 + 4000 + 1000 + 6000 - 7200 = 11,800 \text{ lb.}$

Thus $R + R_1 = 7200 + 11800 = 19000 = \text{total load on beam.}$

Town Planning Act for Saskatchewan. — Commissioner Yorath, of Saskatoon, in a report to the city council recently, proposes to take the initiative in urging upon the Provincial Government the necessity for passing a Town Planning Act. In the opinion of Mr. Yorath, the Town Planning Act should provide: (a) The design of a proper system of main sewers, water mains and tramways; (b) the types of main, secondary and residential roads; (c) the provision of open spaces, parks and recreation grounds; (d) the space about buildings, their limitations, height and character; (e) the restriction of stores, factories and works to special areas; (f) amenity; (g) compensation and betterment.

The Surveyor

And Municipal and County Engineer.

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SOME RECENT PUBLICATIONS.*

THE MUNICIPAL YEAR BOOK, 1914. Price 15s. nett.
London: The Municipal Journal, Limited.

Although the general arrangement of this well-known and exceedingly useful annual remains the same as in former years, the new issue has been amplified in many respects, one of the most important additions being a section devoted to the subject of Motors in Municipal Service. The sections relating to Libraries and Baths and Washhouses have been recast, the former in order that municipal museums and art galleries might be enumerated, and the latter in order to differentiate between various types of baths. Evidence that the work is thoroughly up-to-date is afforded by the inclusion of the new Procedure Regulations under the Housing, Town Planning, &c., Act, 1909, issued in February this year. The general contents may be briefly reviewed under three headings—namely (1) Particulars and statistics of municipal and local government authorities (sections 1 to 8); (2) Particulars and statistics of municipal services and undertakings (sections 9 to 23); and (3) Miscellaneous matters (sections 24 to 29). As regards the first of these main divisions, some account is given of the constitution and functions of the Local Government Board, the Road Board, and the Development Commission. Then, each corporation, urban district council and rural district council is dealt with individually, the information (except as to the rural authorities) comprising statistics, names of members and officers, and an account of the chief undertakings. Special sections are devoted to similar information in regard to Scottish and Irish authorities. Under the second main division there appear general statistics and analyses of accounts of water supply, gas supply, electricity supply, and tramway undertakings, together with information regarding motors in municipal service, education, housing and town planning, markets and slaughterhouses, baths, libraries, cemeteries, sewage and refuse disposal, fire protection, small holdings and allotments, and old-age pensions. The section on town planning is deserving of special notice, and constitutes practically a short treatise on the practical execution of Part II. of the Act of 1909. The third and last main division of the work comprises a digest of legal decisions and statutes, and sections devoted to municipal trading, local taxation, wages, distress committees, and

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

municipal societies. Enough has been said to show the exhaustive character of the work, which is practically indispensable to the local government official.

ROAD CLASSIFICATION AND MAINTENANCE.

SIR GEORGE GIBB'S PROPOSALS.

Proposals for the classification of roads and a reform of the provision for their maintenance were made by Sir George Gibb, chairman of the Road Board, before the Departmental Committee on Imperial and Local Taxation. Sir George's statement is published in the appendix to the committee's final report.

The question was discussed by Sir George Gibb from three principal points:—

(1) Complaints on behalf of ratepayers in regard to the burden of road maintenance cost and the inadequacy of Exchequer contributions thereto.

(2) Complaints in regard to the distribution among highway authorities of the Exchequer contributions.

(3) Complaints of road users in regard to the standard of road maintenance in some districts.

Sir George Gibb suggested that all public roads be classified into the following groups: Urban.—

(1) Subsidised main roads; (2) subsidised county roads; (3) county local roads; (4) district roads.

Rural.—(1) Subsidised main roads; (2) subsidised county roads; (3) county local roads; (4) district roads.

The classification should be made by some central authority after conference with highway authorities and with power on its own initiative or on the application of a highway authority to determine the classification of each and every part of any road, and to alter the classification from time to time. There would be no objection to sections of a continuous length of road being in different classes.

All provisions contained in any existing Act of Parliament relating to main roads should remain applicable to roads classed as main subsidised roads, county subsidised roads, and county local roads, except that sections 15 and 16 of the Highways and Locomotives (Amendment) Act, 1878, should cease to apply to main subsidised roads. This would involve county councils taking over any district roads which may be classified as main roads in their existing condition. (See section 11 [7] of the Local Government Act, 1888.)

The central authority would decide as to whether expenditure was chargeable to maintenance or improvement. Annual estimates should be presented to the central authority. The latter would certify to the Treasury the amounts under each heading in respect of subsidised roads.

The central authority would pay out of the road maintenance fund to each county council, non-county borough council, and urban district council in respect of roads maintainable by them:—

(1) Fifty per cent of the certified estimated cost of maintaining subsidised main roads.

(2) Thirty per cent of the certified estimated cost of maintaining subsidised county roads.

(3) Special grants towards the maintenance of any main roads, and such percentage as the central authority might determine, not exceeding 25 per cent of authorised contributions by county councils to the cost of maintaining district assisted roads, but the total amount to be allowed under this head should not exceed a prescribed sum in any one year.

Grants-in-aid might be withheld or reduced if the roads had not been properly kept up.

Roads in county boroughs would be dealt with in one or other of the three following alternatives:—

(1) Roads to be selected and classified by a central authority as subsidised main roads in county borough areas, and to receive subsidies calculated as nearly as possible at the same rate per square yard on the selected roads as the average grant to subsidised main roads in the adjoining county or counties.

(2) Grant a small annual percentage—say, 5 to 10 per cent of the total cost of maintaining all roads in county boroughs.

(3) In lieu of grants to maintenance grant a fixed annual sum based on population to each county borough to be spent either on the widening of roads or the construction of new roads to relieve traffic congestion.

Roads in London should be dealt with in the same way as in county boroughs.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

SEWAGE DISPOSAL: MANUFACTURING EFFLUENTS: RIVERS POLLUTION PREVENTION ACTS, 1876 AND 1893.

An important question under the Rivers Pollution Prevention Acts 1876 and 1893 was decided in *West Riding Rivers Board v. Linthwaite Urban District Council* (King's Bench Division, January 30th). Briefly, the point at issue was whether, where an offence is committed under sec. 4 of the Act of 1876, the manufacturer or the local authority is liable. That section makes it an offence to cause to fall or flow, or to knowingly permit to fall or flow, or to be carried, into any stream any poisonous, noxious or polluting liquid proceeding from any factory or manufacturing process. But sec. 6 prohibits proceedings being taken against the offender save by a sanitary authority or without the consent of the Local Government Board, with the proviso that, if the authority, on the application of any person interested, refuses to take proceedings or to apply for the necessary consent, the board may compel the authority to proceed. The board are not to consent to proceedings by the authority of a district which is the seat of any manufacturing industry unless satisfied that means for rendering the effluents harmless are reasonably practicable and available, and that no material injury will be inflicted on the industry. By the joint effect of sec. 14 of the Local Government Act, 1888, and a Provisional Order of the Local Government Board made in 1891, the plaintiffs have the powers of a sanitary authority under the Act of 1876. They took proceedings against the council in the county court, alleging that the council had committed an offence under sec. 4 by permitting to be carried into a stream polluting liquid from a factory or manufacturing process. The county court Judge decided in favour of the plaintiffs, and the council appealed. In support of the appeal it was contended that the only persons or body against whom proceedings could be taken under sec. 4 were the persons whose factory or manufacturing process was producing the liquid. The Court accepted this view, and allowed the appeal. Mr. Justice Bankes, in the course of his judgment, said that there was nothing more in the language of sec. 4 to restrict the kind of person against whom proceedings should be taken than there was in sec. 3 (which relates to sewage pollutions). But sec. 6 clearly dealt with restrictions on proceedings under Part III. of the Act, which began with sec. 4. It was plain that secs. 4 and 6 must be read together. Looking at sec. 6 it became clear that two classes of persons were dealt with—the persons by whom proceedings were to be taken, and the persons against whom proceedings were to be taken. These could not be the same identical people. That was not, perhaps, conclusive of the matter, because it might be that one sanitary authority might be permitting manufacturing pollution to flow into a stream in another district; but when one looked further into the section to ascertain the persons against whom proceedings might be taken, it seemed to him clear that such persons were those whose factory or manufacturing process was producing the polluting liquids. The reference to the practicability of rendering the liquids harmless must refer to action by the persons creating the liquids. In his opinion, the last paragraph of the section pointed to the same conclusion, for it provided that a person against whom proceedings were to be taken might object, and was to have an opportunity of being heard against such proceedings being taken "so far as the same relate to his works or manufacturing processes."

QUERIES AND REPLIES.

In order to avoid confusion queries are requested to use distinctive words as nouns de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

EXTRAORDINARY TRAFFIC.—"L. C." writes: A gentleman buys an old stone building, has it pulled down, and requests the builder employed to haul the stone over district roads to his residence, as he wishes

to extend his outbuildings. The builder informs him that the cost of hauling by horses and wagons would come to a high figure, and suggests obtaining prices for hauling the stone by steam tractor. This is done, and the owner of the buildings accepts a tender, and instructs the builder to get the stone hauled by tractor. Some 200 tons of material were delivered, and, in consequence, the roads have been damaged. The bill for hauling was paid by the purchaser of the old building direct to the owner of the tractor, the builder having nothing to do with the transaction. The district council have repaired the damage after the hauling has been finished, and claim £50 for extraordinary traffic off the purchaser of the building, but he repudiates liability, and refers the council to the owner of the tractor. The traffic of the district is purely agricultural, there being no traction traffic whatever. The tractor owner was told verbally by the district surveyor, previous to the hauling being done, that the roads would not stand tractor traffic, but nothing in writing passed. (1) Do you think the council have a strong case, seeing that the traffic was from one definite point to another, and that tractor traffic is not the ordinary traffic of the district? (2) Is the owner of the building or the tractor owner liable?

(1) I should certainly think the council have a strong case. (2) In my opinion both are liable—the owner as the person "in consequence of whose order," and the tractor owner as the person "by whose order" the traffic was conducted.

HIGHWAY: DEDICATION.—"Highway" writes: (1) A street was formed by sewerage, kerbing, channelling and cindering. It is a *cul-de-sac*, and has one house only built upon it, and has been opened for about eighteen months. Can this road be closed by placing stumps across the entrance? (2) A street has been formed by sewerage, kerbing, channelling and cindering, and is a *cul-de-sac*. This road has been opened for about five years, and has a number of houses built upon it. Can it be closed by placing stumps across the entrance?

(1) This depends upon whether there has been a presumed dedication of the street as a public highway. The street being a *cul-de-sac*, mere acts of user alone would not be sufficient evidence of dedication. (*Whitehouse v. Hugh*, 1906, 2 Ch., 283; *London County Council v. Hughes*, 75 J.P., 239.) There would have to be evidence that the street has been used by the public generally, and not merely by residents in the house and their visitors, &c., or other persons having business there. And even if the general public have used the street, the period of user is so short that in my opinion dedication would not be presumed. See *Kirby v. Paignton Urban District Council* (noted in Vol. xliii. of THE SURVEYOR, at page 438), where after six years' user a *cul-de-sac* was held not to have been dedicated, and an adjoining owner was allowed to enclose part of it with a wall. Unless there has been dedication in the present case the road can be closed, subject to any express or implied private rights of way to which the owner of the house or other persons may be entitled. (2) The same principles apply with respect to this street. It is true that the period of user is longer, but it falls short of that in the Paignton case, and in that case no steps had been taken to exclude the public.

REMOVAL OF HOUSE REFUSE.—"W. S." writes: In our district where we undertake the removal of domestic refuse, &c., there are a number of ashpits inaccessible with a cart, and the contents have to be wheeled down narrow garden paths and passages, tipped up on the front street, and afterwards re-loaded into the carts. Can the council make any rules or by-laws insisting that ashbins should be provided in lieu of ashpits, so that the contents may be carried out and emptied into the cart direct?

If Part III. of the Public Health Acts Amendment Act, 1890, has been adopted, the council can make by-laws imposing on the occupier of any premises duties in connection with the removal of house refuse so as to facilitate the work which the council undertake or contract for. See sec. 26, subsec. (2), of that Act.

BUILDING BY-LAWS: REAR AIR SPACE.—"A. A." writes: Are buildings of the warehouse class exempt from the provision of the by-law with respect to air space at rear? I have an idea they are. Do you know of a case?

The provisions as to air space (both front and rear) contained in the Model By-laws apply only to new domestic buildings, and not to buildings of the warehouse class.

The Fertilising Value of Sewage and Sewage Sludge.

By H. W. CLARK, Chemist to the Massachusetts State Board of Health.

From time to time attention is called by various people, scientific and otherwise, to the great value of the fertilising materials in sewage, and the waste of these materials by all modern methods of sanitation and sewage disposal. This waste occurs more especially among such communities as have modern systems of water supply, sewerage and household plumbing, and at the present time the most civilised nations are those in which the greatest waste of this manurial product of human life takes place. The increased health, comfort and cleanliness in our modern life, due to our public water supply and sewerage systems, have, however, become such an integral part of our civilisation that these systems will undoubtedly continue to prevail, and the fertilising materials of sewage continue to be wasted, until some economical method of reclaiming them is devised. In other words, the prevention of this waste concerns essentially the value of these materials in a given volume of sewage when compared with the cost of extraction. Enough material of a fertilising or other value must be extracted by any process to more than pay for the cost of the process if it is to be employed. This problem will be solved eventually, but the difficulties are great, and only slight progress has thus far been made in its solution.

Average American sewage contains not much, if any, more than 2,400 lb. of suspended matter in each 1,000,000 gallons of water, and of these 2,400 lb. only about 350 lb. have fertilising or other value. European sewage is more concentrated owing to the smaller per capita water consumption, and hence the matter in suspension is greater per unit volume of sewage. Dunbar* gives the pounds of suspended matter in sewage from ten representative German and English cities—namely, Hamburg, Hanover, Cologne, Essen, Freiburg, Breslau, London, Manchester, Leeds and Birmingham—and his figures show that these matters vary from 2,800 lb. to 7,500 lb. per 1,000,000 gallons, with an average for the sewage of the cities given of about 3,450 lb. per 1,000,000 gallons. In this sludge the fertilising constituents are found in connection with a large mass of inert organic and mineral matter, and also with much fatty matter, the presence of which lessens the manurial value of the sludge.

For many years past it has been widely acknowledged in England that the utilisation of sewage upon land, or sewage farming, can show a profit only under the most favourable conditions. England has in operation hundreds of these farms at the present day, but English cities and towns are, one after the other, relinquishing this method of disposal and purification in favour of more modern methods of filtration—that is, it has been found, in most cases, that no profit can be expected from such farming, and that the cost of sewage utilisation in this way is greater under many conditions than when the sewage is treated from the view-point simply of purification rather than utilisation.

The largest and probably the best-managed sewage farms in the world are those of Paris and Berlin. The Paris farms cover more than 15,000 acres, and those of Berlin in 1907 were 39,000 acres in area. At portions of the Paris farms the farmers use the sewage without any financial return to the city, and at others the rent of the land is much increased by irrigation. According to Calmette,† however, the profits are small, and the process as a whole a costly one. The total operating cost of the Berlin farms in 1906 was \$700,000, and the receipts for that year \$750,000, showing a profit when these two items are taken into consideration. The capital sum expended on the farms up to 1907, however, aggregated \$12,000,000. The cost of operation in that year amounted to \$16.40 per 1,000,000 gallons of sewage treated, the receipts to \$17.60 per 1,000,000 gallons of sewage, while the interest on the invested capital at 3½ per cent was \$9.80 per 1,000,000 gallons treated, showing, instead of a profit, an actual cost of \$8.60 per 1,000,000 gallons of sewage treated. In fact, the only regions where sewage farming can at present probably always be carried on at a profit are arid regions such as found in India and the western parts of the United States, and in such regions the profit is due really to the value that the sewage has

as a liquid rather than to its value as a fertiliser—that is, in these regions irrigation is a necessary adjunct to crop raising.

At the Lawrence Experiment Station an investigation has been made in regard to the increased amount of fats and nitrogen obtainable by acidification of the Lawrence sewage. Summarising ten experiments of this kind, it was proved that by sedimentation of Lawrence sewage for four hours, 1,486 lb. of dry sludge, containing 49 lb. of nitrogen and 357 lb. of fatty matters, could be obtained from each 1,000,000 gallons of this sewage. When duplicate volumes of sewage were acidified with sulphuric acid, 60 deg. B., at the rate of 2.685 lb. of acid per 1,000,000 gallons of sewage, the total dry solids obtained by four hours' sedimentation were 2,171 lb. per 1,000,000 gallons, containing 87.8 lb. of nitrogen and 467 lb. of fatty matters. This showed an increase of 38.5 lb. of nitrogen and 110 lb. of fat over the amounts obtained by sedimentation without acidification; in other words, we obtained, by the use of acid to the value of \$25 additional, nitrogen and fats worth about \$7.25.

While these figures represent actual values of fatty and nitrogenous materials in the sludge, it must be borne in mind that the fatty matters must be separated from the remainder of the sludge if either portion is to be of material value, and that this separation can only be accomplished by a great additional expense.

As showing general views from widely differing sources in regard to the fertilising value of sludge, the following statements are taken from the book on "Sewage Sludge," by Elsner, Spillner and Allen:—

Page 82.—The hope of securing a revenue from sludge utilisation equal to the cost of operation, or making it a profitable undertaking, has long been destroyed, at least with city sewage. This is easily understood when one considers that in a city with an output of 2,000,000 gallons of sewage per day only, perhaps 5½ cub. yds. of sludge, with 90 per cent moisture, or 59 cub. yds. of dried material, are recovered, of which possibly 26 to 31 cub. yds. are of organic origin.

Page 84.—The fertilising material in sludge cannot be wholly utilised as is the case with sewage irrigation, for the proportion available as a plant food yields an excess of nitrogen. With grain this results in an abundance of straw, but few shrivelled grains. If, then, nitrogen is to be entirely utilised, either one must not apply too much sludge, unless vegetables only or leafy plants are to be raised, or else the lime and potash which are lacking must be brought to the field independently. For these reasons the actual value is much less than the theoretical. Moreover, artificial fertilisers are now much cheaper than formerly, and are preferred because more easily handled.

Page 91.—At Frankfort-on-the-Main sludge dried in the air was transported as far as 5 miles; in Neustadt even 6.85 miles by wagon, and in the latter case 62 cents per cubic yard was paid when no lime had been added, or 44 cents with lime. Conditions are seldom so favourable, however. In most cases a very small price is paid for dried sludge which is quite out of proportion to the cost of drying. In Leipzig, in 1908, the gross revenue (from the sale of sludge) was \$318,688, while the cost in wages for removing the dried sludge from the pits was about \$6,854.

Page 108.—Extracting grease from sewage sludge under normal conditions can never be profitable. The situation is different in towns where much grease is discharged into the sewage from factories, as, for example, in various English cities from wool-washing works.

CONCLUSIONS.

In conclusion, it is evident (1) that the total amount of fertilising and fatty matters in each 1,000 gallons of representative American sewage is not worth above 6 or 8 cents. Of this about half is represented by the ammonia in solution, and there is no method by which this material can be utilised except by application of the sewage to land. All experience, covering many years with hundreds of well-operated sewage farms ranging in size from a few acres to the vast 39,000-acre farm at Berlin, Germany, has shown that only under the most favourable conditions can the return from these farms be made to pay operating expenses, and an instance is yet to be cited where these returns pay

* Director, Hygienic Institute, Hamburg.
† Director, Pasteur Institut at Lille.

both the cost of operation and interest on the capital invested. The exceptions, perhaps, to this are certain tracts or farms in regions of low rainfall, and where the sewage is valuable as a liquid—that is, for real irrigating purposes. The Wolverhampton farm is undoubtedly a representative English farm as regards management and cost of operation, and at this farm the actual total cost of sewage treatment is \$49 per 1,000,000 gallons. (2) Much of the valuable fertilising and fatty constituents in sewage is found in the matters in suspension. Average American sewage contains, perhaps, about 2,400 lb. of sedimentable matter in 1,000,000 gallons, and the nitrogen, fatty matters, &c., in this 2,400 lb. of sludge are worth, approximately, \$15 or \$18. In order, however, to reclaim this valuable material, the sludge must be dried, pressed and also subjected to a process for the separation of grease from the fertilising constituents in the remaining body of the sludge. Only by this separation can the grease become an article of commerce, and the sludge of real agricultural value. This fact is well established by long experience and many investigations. When the fatty matters are separated by any known process, this procedure is costly. Only in a few places as yet is such separation attempted as a commercial enterprise, and the profitableness of the works at these places is as yet doubtful. When the sludge is freed, or practically freed, from fatty matters, it consists of a large weight of inert mineral and organic matter mixed with a comparatively small weight of fertilising matter; hence the cost of carriage is great even when it is well dried. It has also been well proved that the nitrogen, phosphoric acid, &c., present are generally in a less assimilable form than the same bodies in ordinary commercial fertilisers. The sludge has value, however, and as the processes of drying, pressing and fat separation are improved, and also as nitrogen advances in price, as seems inevitable, sewage sludge will become of greater agricultural value than it is at present, especially as the basis of a fertiliser enriched by the addition of potash, phosphates, &c.

HOUSING IN URBAN DISTRICTS.

COUNCILS' FAILURE TO BUILD.

In the House of Commons on Wednesday the President of the Local Government Board was asked whether he would give the names of the urban districts in which, as the result of formal complaints under sec. 10 of the Housing, Town Planning, &c., Act, 1909, or of inspections by the board's officers, the councils had, prior to January 1st last, been urged by the board to build houses under Part III. of the Housing of the Working Classes Act, 1890, and had not yet agreed to do so; and whether, as regarded cases of formal complaints, a mandamus had been applied for in any instance; and, if so, with what result.

Mr. Herbert Lewis said the names of the urban districts were: Northam, Pwllheli, Bridgnorth, Margam, Stowmarket, East Cowes, Barnoldswick, and Tenby. The last named was the only one in which there had been a formal complaint under sec. 10 of the Housing, Town Planning, &c., Act, 1909, and in which action or a promise of action had not been secured. It had not yet been thought necessary to make application for a writ of mandamus in that case. In the case of Northam, it was right that he should add that the council had stated that they were looking for a site for houses, but he was afraid that they had been a long time finding it. The Margam Council had made some provision, but not as much as the Local Government Board thought necessary, and, as regarded Stowmarket, it must be admitted that the circumstances had changed somewhat since the board recommended the council to build.

Rand Water Supply.—A Bill has been introduced into the House of Assembly, Cape Town, making provision for the construction of an impounding reservoir and a barrage across the Vaal River in the Potchefstroom district. The barrage will consist of thirty-six gates, each 23 ft. deep and 30 ft. wide, and will impound 11,560 million gallons of water, calculated to give a supply of 20,000,000 gallons a day for the benefit of the large area served by the Rand Water Board. The Rand Water Board is authorised to borrow up to £1,250,000 for this purpose, and to recover contributions from the railway department, the mines, and the corporations in the area supplied.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Axminster R.D.C. (April 16th. Mr. Courtenay Clifton).—£1,815 for the purpose of purchasing land, and erecting twelve cottages at Colyton, under the Housing of the Working Classes Act.—The clerk, Mr. Cecil Forward, stated that the council had provisionally agreed to purchase a piece of land at Ridgeway, Colyton, at £100 per acre. It is proposed to erect ten houses, to be let at 4s. 2d. per week. The council had asked the board to allow the cost of the scheme to be a special charge on the parish of Colyton. The inspector said it was a question whether Colyton wanted to pay for it. Mr. Forward replied that they would not if they could get out of it.

Bandon R.D.C. (April 3rd. Mr. A. D. Price).—£1,722 for the extension of the water supply.—Mr. Richard Evans, engineer, explained that he proposed to take a stream at Farnalough which would yield 25,000 gallons a day, and erect a filter. The scheme was essential owing to the lack of a sufficient supply in dry weather.

Birmingham T.C. (April 17th. Mr. R. H. Bicknell).—£41,260 for works of sewerage and surface-water drainage, £7,550 for the cost of construction of certain parts of a new road between Salford Bridge and Bromford-lane, and £5,150 for the purchase of land for the extension of King's Heath Park.—The deputy town clerk, Mr. H. J. McIlveen, stated that a sum of £24,400 was required for the sewerage scheme for Hall Green and Yardley Wood districts, and another sum of £16,860 for works at Griffin's Brook, near Bournville. The Local Government Board in November, 1912, sanctioned the borrowing of £19,000 for the carrying out of the sewerage scheme at Hall Green, in order to provide for the building development taking place in that district. The work comprised in the scheme was well on the way to completion, and the scheme now submitted dealt with a larger portion of the area, at the extreme south of the area. With respect to the other item, the city council recently had before them plans of the proposed development of an estate between Bristol-road and Lodge-hill cemetery by the erection of about 1,000 houses. The Bournville Village trust had also intimated to the council their intention of developing an estate between Oak Tree-lane and Bristol-road. A difficulty was experienced in dealing with the existing sewage of houses in the district, and the expense was thrown on the corporation of emptying the cesspools. It was considered advisable by the council that a sewerage scheme should be carried out in the immediate future. Concerning the £5,150 required for the extension of King's Heath Park, it seemed that the ground, which comprised about 15 acres, was purchased by the King's Norton District Council for the sum of £11,000 in 1908. Owing to the greatly increased housing accommodation in the district, it was deemed advisable to purchase an additional 14 acres, which could be obtained for £5,150. It was proposed largely to devote the new portion to playing fields.

Blaydon U.D.C. (April 16th. Mr. R. H. Bicknell).—£1,620 for the purpose of diverting the Derwent and Shotley main road at the Slide, near Lockhaugh Lodge.—Mr. Henry Dalton, the clerk, stated that the county council had agreed to pay the cost in the end, but meantime the Blaydon Council required a loan of the amount named. The period asked for the loan was five years.

Colwyn Bay U.D.C. (April 16th. Mr. H. S. Stewart).—This was an inquiry with reference to the council's scheme for the provision of workmen's dwellings.—Sir G. Everard Cayley, Bart., whose estate is being developed, has agreed to sell to the local authority a little over 6 acres of land at a nominal price, and it is largely due to this action that the council are able to initiate a self-supporting garden village scheme, which includes twenty-eight houses at a weekly rental of 4s. 6d., forty-four at 5s. 6d., and sixteen at 6s. 6d., the total of eighty-eight costing £18,700. In none of the houses, however, is provision made for a bath. This is due partly to the necessity for the strictest economy, and partly to the engineer's experience that in housing schemes in other parts of the kingdom the baths are misused. There is to be a spacious recreation ground; the cottages will have

gardens back and front, and the roads will be lined with trees.

Listowel R.D.C. (April 5th. Mr. A. D. Price).—£1,800 for a supply of water to Ballybunion, £800 for Doon and Rahavanig water supply, £1,400 for Ballyduff water supply, £430 for Ballybunion main sewers, and £230 for Newtownsandies main sewer.—The medical officer, Dr. J. Costelloe, said he had drawn attention on several occasions during the past year to the fact that there was no water supply to the houses in Ballybunion, or an inadequate supply, at any rate, and that there was imminent danger of an epidemic, or at least a very serious inconvenience, to the large concourse of people who visit Ballybunion as a popular seaside resort during three or four months.

Lymington R.D.C. (April 3rd. Mr. A. W. Brightmore).—£14,772 for sewerage and sewage disposal works at Brockenhurst.—Mr. H. C. H. Shenton, the engineer, described the scheme, and said he had adopted the method of making the sewage gravitate to one place, whence it was pumped to the disposal works. The present population of Brockenhurst was a little over 2,000, of which 400 were not included in the present scheme.

Prestwich U.D.C. (April 21st. Mr. W. O. E. Meade-King).—£1,151 for the widening of Bury Old-road.—The scheme, it was stated, had become necessary by the increase of heavy motor traffic from Manchester to Bury. Ninety per cent of the total cost of the improvement will be borne by the county council. A special staff of men will be engaged for the work, the services of the unemployed having, it was said, always proved very expensive.

Sheffield T.C. (April 8th. Mr. M. K. North).—£3,894 for private street works.—Originally the corporation had asked for sanction to borrow £5,559 for works of private street improvement, but this figure was reduced to £3,894.—It was stated that most of the streets are to be paved with gritstone setts and concrete flags. The exceptions are Shearwood-road, which will have a gritstone road and an asphalt foot-path, and Stumperlowe-avenue, where the roadway will be tar-macadam and the footway asphalt.

Walton-upon-Thames U.D.C. (April 6th. Mr. R. H. Bicknell).—£1,600 for sewer extension.—The surveyor, Mr. R. Wild, stated that the necessity for the extension of the sewerage system was brought about by the establishment of the Whiteley Homes. These were now in course of erection, and were to take the form of a model village of some 220 acres in extent, with scattered cottages for aged couples. It was anticipated that the homes would eventually contain a population of 800 to 1,000 persons. In addition to providing drainage for this estate, the new sewer would accommodate available building land on each side of the Burwood-road, the development of which had undoubtedly been retarded by the lack of drainage facilities.

Whitley and Monkseaton U.D.C. (April 15th. Mr. R. H. Bicknell).—£2,300 for the improvement of Hill Heads-road.—The surveyor, Mr. A. J. Rousell, said it was proposed to make a 40-ft. road. There was heavy traffic on the road at the present time, and it was likely to become heavier as the district expanded.

APPLICATIONS FOR LOANS.

Ayr T.C. — £25,000 for electrical generating machinery and buildings.

Carlisle T.C.—£1,500 for a drainage scheme.

Chorley R.D.C.—£200 for sewage disposal works.

Penzance T.C.—£1,100 for the provision of lavatory accommodation and offices.

Slough U.D.C.—£380 for sewerage works.

Torrington T.C.—£1,100 for the erection of five cottages.

Tynemouth T.C.—£2,000 for sanitary conversions.

Whitby R.D.C.—£600 for the purchase of the Hawsker water supply.

Yarmouth T.C.—£3,000 for high and low tension mains.

LOANS SANCTIONED.

Ouckfield U.D.C.—£1,128 for a housing scheme.

Foots Cray U.D.C.—£2,050 for municipal offices.

Hackney B.C.—£1,600 for street extension.

Harrogate T.C.—£7,000 for surface-water drainage.

Radcliffe U.D.C.—£3,000 for electricity mains.

Rathdown No. 1 R.D.C.—£3,000 for the completion of the improvement scheme.

Taunton T.C.—£4,765 for the electricity undertaking.

Warminster U.D.C.—£145 for a sewerage scheme.

FORTHCOMING INQUIRIES.

	£
27.— Croydon. For the installation of a telephonic fire alarm (Mr. F. H. Tulloch)	3,600
27.— Liverpool. For a housing scheme (Mr. Courtenay Clifton)	34,500
28.— Bingham. For a housing scheme (Mr. Courtenay Clifton)	1,008
28.— Brecon. For the provision of a public convenience (Major J. Stewart) ...	180
28.— Littlehampton. For the provision of a public convenience (Mr. P. M. Crosthwaite)	710
29.— Aberdare. For works of water supply (Major J. Stewart)	15,536
29.— Ashford. For the purposes of sewage disposal (Mr. W. M. Cross)	15,000
29.— Epsom. For works of sewerage and storm-water drainage (Major C. E. Norton)	6,050
29.— Gosport. For the repair of "The Hard" (Mr. P. M. Crosthwaite) ...	2,750
29.— Keighley. For the provision of a cemetery (Mr. M. K. North)	2,250
29.— Lichfield. For the improvement of the Guildball (Mr. R. H. Bicknell) ...	3,760
29.— Rotherham. For the electricity undertaking (Mr. T. C. Ekin)	19,956
30.— Gelligaer. For street improvement purposes (Major J. Stewart)	2,010
30.— Nuneaton. For the electricity undertaking and park extension (Mr. T. C. Ekin)	7,820
30.— Rochford. For works of sewage disposal (Mr. W. M. Cross)	9,100
30.— Walthamstow. For works of sewage disposal (Major C. E. Norton)	4,889

MAY.

1.— Aylesbury. For the purposes of electric lighting (Mr. T. C. Ekin)	21,323
1.— Cardiff. For the provision of a weights and measures office (Major J. Stewart) ...	2,000
1.— Southend. For the provision of conveniences and an electric crane (Major C. E. Norton)	2,950

St. Helens Housing.—The St. Helens Health Committee on Wednesday discussed a resolution which had been passed by the town council that tenement dwellings should be erected at a cost of £15,200. The committee passed a resolution to the effect that the erection of tenements ought not to be proceeded with.

Manchester Water Undertaking.—In the annual report of the Manchester Waterworks Committee it is stated that the total income for the year ended March 31st last was £441,878. After deducting the expenditure there was a surplus of £6,616, but included in this amount there is an item of £5,576 discount on 3 per cent consolidated stock repurchased.

Glasgow's Proposed New Water Supply.—The Bill of the Glasgow Corporation for an extension of the scope of the Highland water supply will come before the House of Commons next month, says the *Glasgow Herald*. The promoters claim that for many years they have looked to this valley, containing Lochs Voil and Doine, as the natural source from which an additional supply should be obtained. They put the limit of the supply which can be provided by the present Loch Katrine system at 1920, and therefore an additional volume of water should be ready for use by that date. Loch Voil, which is 3½ miles west of Balquhidder Station, on the Callander and Oban railway, extends westward for 3½ miles from Balquhidder Church to Monachyle Glen, at the foot of which a short and narrow strait connects Loch Voil with Loch Doine, which is about 1 mile in length. The estimated cost of the scheme is £1,250,000.

Municipal Work in Progress and Projected.

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The following are among the more important projected works of which particulars appear below: Buildings—Derby, Edinburgh £15,000, Knutsford; housing and town planning—Southgate; roads and materials—Southwark, Stockton; sewerage and sewage disposal—Aberystwyth £30,000; water, gas and electricity—Fifehire, Lindithgow, Riccall. Particulars of other projected works will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Bexhill T.C.—It has been agreed to contribute £150 towards a private scheme for the construction of a subway under the railway in Terminus-road, and to accept the liability of maintenance and lighting.

Birkenhead T.C.—The Baths Committee have been requested to report on the cost of constructing an open-air swimming bath.

Bourne R.D.C.—Plans have been completed for an isolation hospital.

Clacton U.D.C.—The surveyor, Mr. D. J. Bowe, stated at a recent council meeting that he hoped to complete the band pavilion in May, and that his estimate of £11,500 for the work would not be exceeded.

Derby T.C.—It has been agreed to carry out an extension of the administrative block of the infectious diseases hospital, at an estimated cost of £1,356. —A scheme has been prepared for an extensive improvement at the Spot, including the construction of a public convenience at an estimated cost of £3,000.

Edinburgh T.C.—It has been agreed to purchase a site at Westbank, Portobello, for the erection of a new electric light station, which is to cost £15,000.

Essex C.C.—The council have accepted a tender, at £998, for the rebuilding of Langford bridge, Ongar.

Goole U.D.C.—A letter has been received from the Local Government Board declining to sanction a loan of £8,000 for the proposed erection of new municipal offices on a site fronting the market hall.

Johnstone T.C.—Plans have been submitted for the extension of the town hall, at an estimated cost of £600.

Knutsford U.D.C.—A scheme is under consideration for new council offices and a fire station.

Warmley R.D.C.—The sanitary surveyor, Mr. H. M. Bennett, submitted on Tuesday the plan of a proposed tuberculosis sanatorium for which about 3 acres of land belonging to the council have been set apart at Mangotsfield. The building is to provide twelve beds for cases in an advanced stage, and also those in the early stage of the disease. There is to be a dining-hall in the centre, with female wards on one side and male wards on the other, with bathroom and lavatory accommodation. The offices are to be situated behind the main building, and to contain nurses' and servants' quarters, cooking department and heating arrangements. The front of the building is to face due south, and contain a verandah extending the length of the building, and 7 ft. 6 in. wide. Each ward is to open to the verandah. Mr. Bennett was instructed to complete the plan, and forward it to the Local Government Board.

Witham (Essex) U.D.C.—The tender of Messrs. McLaughlin & Harvey, Brecknock-road, London, at £370, has been accepted for the construction of a new bridge.

HOUSING AND TOWN PLANNING.

Blackburn T.C.—Under the Housing and Town Planning Act, 1909, the Highways Committee on Monday approved a scheme of streets and roadways for some 900 acres of land situate westward of Revidge, and extending from Preston New-road to Brown-hill, Wilpshire. It is not the intention to build houses or develop the estate on "garden city" lines. The chief object is to create a residential quarter on definite and ordered lines. Several new roads and streets are suggested and these are to be formed and completed as the corporation shall from time to time direct.

Boston R.D.C.—The following tenders have been accepted for the erection of twenty pairs of cottages. Wrangle, two pairs, Mr. M. H. Allen and Mr. J. W. Allen, Wrangle, one pair each at £334; Freiston, one pair, Messrs. J. Leafe & Son, Boston, £319; Frampton, two pairs, Messrs. J. Leafe & Son, £330 per pair; Kirton, Messrs. Belton & Co., Gypsy Bridge, five pairs at £324 per pair, and Messrs. J. Leafe & Son two pairs at £325 per pair; Algarkirk, three pairs, Messrs. Belton & Co., at £335; Sutterton, three pairs, Mr. Barnsdale, of Donington, at £320; Wigtoft, two pairs, Mr. Barnsdale, at £320; Palham's Lands, one pair, Messrs. Belton & Co., £327.

Bungay U.D.C.—Application is to be made to the town reeve for the purchase of sufficient land to permit of the building of twenty houses.

Clydebank T.C.—The council are seeking for sanction to prepare a housing scheme.

Killarney U.D.C.—Tenders have been received for the erection of eighteen two-story cottages.

Merthyr Tydfil T.C.—The borough architect has received instructions to prepare plans for a housing scheme on 6½ acres of land which the council propose to purchase.

Somerset C.C.—It has been agreed to build six cottages for roadmen and a depot on land attached to the Long Ashton police station. The cost of the cottages is not to exceed £220 each.

Southgate U.D.C.—The surveyor, Mr. C. G. Lawson, has received instructions to prepare plans and estimates for 160 workmen's cottages, to be erected on land belonging to the council.

PARKS AND OPEN SPACES.

Bexhill T.C.—The borough surveyor, Mr. G. Ball, has prepared a plan and estimate for laying out two new football grounds on the portion of the Down immediately to the east of West Down-road. The estimated cost is £3,126. It is intended to ask the sanction of the Local Government Board to a loan for the scheme.

Glasgow T.C.—Lord Glenconner has offered to give 13 acres of land to the corporation to provide a public park and recreation ground in the St. Rollox district.

Liverpool T.C.—Three additional open spaces were dedicated to the public on Wednesday—viz., Pownall-square recreation ground, Donaldson-street recreation ground, and the Grant Gardens.

Rochdale T.C.—The borough surveyor, Mr. S. S. Platt, has been instructed to prepare plans and estimates for fencing, draining and levelling the proposed recreation ground at Spotland preparatory to application being made to the Local Government Board for a loan.

REFUSE COLLECTION AND DISPOSAL.

Haltwhistle R.D.C.—The tender of Mr. Wilson, of Haydon Bridge, at £280 a year, has been accepted for the scavenging of the town of Haltwhistle.

ROADS AND MATERIALS.

Bideford T.C.—The council by resolution have directed the attention of the county council to the condition of the road between Bideford and Hartland, which was described as dangerous and impassable.

Bristol T.C.—It has been agreed to pay £4,750 for the purchase of property for the improvement of Rupert-street.

Cardiff T.C.—The Finance Committee recommend the council to purchase 153 yds. of land for £1,000 at the East Canal Wharf for street widening. The city engineer, Mr. W. Harpur, estimates that it will cost £100 to effect the widening.

Essex C.C.—The council have agreed to the following highway improvements: Widening of Queen's-road corner, Brentwood, approximate cost £750; widening of main road at Springfield, near Chelmsford borough boundary, £150; kerbing and paving works, Chingford, £200; improvements of corners, consisting in most cases of taking away quick hedges and substituting open railings, at Littlebury, Patching Hall,

Roxwell-road, Froyz Hall, Sible Hedingham (two), Foxearth Hall, and Theydon Bois, £310; widening main road at Bell Inn corner, Great Baddow, £241; contribution of £200 to Halsted Urban District Council towards acquiring and demolishing buildings at corners of High-street and North-street, Halsted, and the carrying out of certain road works at the spot; widening Pier-avenue, Clacton, opposite Royal Hotel, £95; and widening main road at West Thurreck, adjoining the Old Ship Inn, £190.

Guildford T.C.—The county council having agreed to contribute a sum not exceeding £206, a third of the cost of the proposed improvement in Farnham-road opposite the new secondary school, it has been decided to make provision for the improvement in the next estimates.

Hendon U.D.C.—It is proposed to lay down tar-paving in Love-lane, at an estimated cost of £1,761.—The estimates of the surveyor, Mr. S. S. Grimley, have been approved for making up four roads.

Lowestoft T.C.—The clerk to the East Suffolk County Council has written to the town council a letter on the practice to be pursued in the proposed maining of roads. He says: "The county council have recently had under consideration the question of dealing with applications from local authorities to declare certain highways to be main roads, and in connection with other matters the question has been discussed with the Road Board. The county council are advised that they should be the governing body to control the expenditure on main roads in borough and urban districts. With regard to bringing the proposed main road into a proper standard of efficiency, the Road Board would probably be prepared to assist the various local authorities through the county council by way of loan, free of interest, towards the cost of the work, provided the county council are to directly carry out the work and maintain the main roads when finally accepted."—The borough surveyor, Mr. G. H. Hamby, has received instructions to prepare estimates of the cost of channeling several streets.

Middlesbrough T.C.—The tender of Messrs. R. Lander & Co., West Hartlepool, has been accepted for 250,000 creosoted soft wood paving blocks, at £6 1s. 6d. per 1,000, for the paving of Marton-road, and the continuation of Park-road South.

Poole T.C.—High-street is to be paved with wood blocks, and the tender of Messrs. W. Griffiths & Co. has been accepted for the work.

Reigate T.C.—The Highways Committee have been requested to consider the question of making up Woods-road East, under the Private Street Works Act.

Rochdale T.C.—The borough surveyor, Mr. S. S. Platt, has been authorised to proceed with the remainder of the work of widening Heights-lane on the easterly side between Howard-street and Quarry Hill.

Southwark B.C.—Southwark-street is to be repaved with wood blocks, at an estimated cost of £3,387. The question of repaving portions of Walworth-road, New Kent-road, and Camberwell-road is under the consideration of the Works Committee.—The council have accepted the tenders of Messrs. Thos. Gabriel & Sons, and Messrs. Burton, of Lambeth, for a supply of creosoted blocks, at £7 5s. per 1,000.

Stockton T.C.—A special committee has been appointed to consider the provision of new roads, or the extension of existing roads, at the west side of the town.

SEWERAGE AND SEWAGE DISPOSAL.

Aberystwyth T.C.—The council on Tuesday adopted the sewerage scheme prepared by Messrs. James Diggle & Son, and it was decided to apply to the Local Government Board for sanction to borrow £30,000, repayable in fifty years.

Burnham (Essex) U.D.C.—The surveyor, Mr. J. Cook, has been authorised to make inquiry into the merits of the Fieldhouse tank, to visit Guildford and other places where this tank is in use, and report to the council.

Leyburn R.D.C.—The Local Government Board, acting upon a report by their inspector, recommend the council to make six specific alterations at the sewage works, and the council have forwarded the communication to their consulting engineer.

Witham (Essex) U.D.C.—A letter has been received from the county council drawing attention to certain

defects in the sewage disposal system, and the council have replied that the matter is receiving attention.

Womhwell U.D.C.—The surveyor, Mr. W. Quest, has received instructions to raise the carriers at the sewage disposal works, and, in conjunction with the medical officer, he has been asked to consider and report upon a comprehensive scheme for effectively dealing with the sewage now being carried and likely to be carried to the works in the near future.

WATER, GAS, AND ELECTRICITY.

Berwick T.C.—The Special Water Committee have reported that the amount of water from the borehole was not sufficient for the purposes of the joint scheme. There was sufficient to supply Tweedmouth, but not both Spittal and Tweedmouth. In the circumstances the council have asked Messrs. Leslie & Reid, Edinburgh, to prepare a report as to an auxiliary supply.

Cork T.C.—As a result of a new and improved method of inspection, the city engineer reports a considerable improvement in the water supply. "There have been more genuine defects brought to light in six months' work," the city engineer states, "than was possible in ten years under the old system."

Fifeshire C.C.—The Dunfermline District Committee have accepted the tender of Mr. W. Tawse, Aberdeen, at £28,435, for contract No. 1, in connection with the construction of new waterworks at Glendevon.

Flint T.C.—The council on Tuesday agreed to a scheme for the electric lighting of the borough, which is estimated to cost £6,000.

Hammersmith B.C.—The engineer has reported that considerable improvement in the main street lighting could be effected by installing a number of small 10kw. transformers in switch pillars, which would considerably reduce the loss of electrical energy in the mains and improve the lighting effect to the individual lamps. The council have agreed to obtain quotations from firms for the supply of six transformers as required.

Linlithgow C.C.—The Linlithgow District Committee have accepted the tender of Messrs. H. M. Murray & Co., Glasgow, at £18,331, for constructing the new reservoir at Beeceairs. It is estimated that the total cost of the water supply scheme will be £30,000.

Margam U.D.C.—The seal of the council was on Monday affixed to contracts with Messrs. Gibbon Brothers, Limited, and Messrs. Cockey & Sons, Limited, for the erection of the new gasworks at Port Talbot.

Riccall R.D.C.—A special water committee has been appointed to consider a scheme, estimated to cost £3,000, for carrying water from Selby across the bed of the Ouse to the Balbyside.

Shepshed U.D.C.—The Gas Committee recommend the council to obtain a loan for the extension of the gasworks.

Thrapston R.D.C.—The engineers, Messrs. Everard, Son & Pick, have received instructions to prepare a report in connection with the proposed water supply for the town, and the services of the council's surveyor, Mr. T. Lloyd, have been placed at the disposal of the Parochial Committee in carrying out the scheme.

MISCELLANEOUS.

Reigate T.C.—The tender of Messrs. Dennis Brothers, of Guildford, at £765, has been accepted for a first aid motor tender.

Publishers' Announcement.—The Homeland Association, Limited, announces that new and revised editions of the handbooks for Minehead, Newquay, St. Ives, Lynton, Torquay, Isles of Scilly, and many other places are ready for the 1914 season. A completely revised edition of "Where Shall We Live," describing the residential districts around London, will be published in May, and new books on Harpenden (Herts), Falmouth and Truro, and Bexhill-on-Sea, are in the press. A new book, "Our Homeland Cathedrals and How to Study Them," will be published towards the end of the summer, and some new volumes on footpath rambles in the neighbourhood of London will be issued.

PERSONAL.

Mr. J. Stones, sanitary surveyor to the Sedgefield Rural District Council, has received an increase of salary.

Mr. Michael Conway, of Easkey, co. Sligo, has been appointed deputy county surveyor to the Sligo County Council.

Mr. G. M. Khan, city engineer's office, Edinburgh, has been admitted as a student of the Institution of Civil Engineers.

Mr. C. A. Howard, surveyor to the Brigg Rural District Council, is to be provided with a motor cycle by the council, at a cost of £60.

Mr. H. E. Cackett, surveyor of highways to the Redruth Rural District Council, has been voted an increase of salary of £15 a year.

Mr. R. H. Jenkins, engineer and surveyor to the Skegness Urban District Council, has been voted an increase of salary of £30 per annum.

Mr. W. R. Maxwell, burgh surveyor of Dunfermline, has been voted £50 for his services in connection with the town council's water supply scheme.

Mr. G. W. Knowles, surveyor to the Clevedon Urban District Council, has been voted £50 for his services in connection with the pier landing-stage.

Mr. J. S. Pickering, borough surveyor of Cheltenham, is to be provided with a motor car to replace the hired car he has hitherto made use of.

Mr. W. F. Wilkins, surveyor to the Barnet Urban District Council, has been voted 50 guineas for "his valuable services in connection with the council's housing scheme."

Mr. E. S. Simmott, county surveyor of Gloucestershire, has received an immediate increase of salary of £100, with two annual increments of £50 until the maximum of £800 is reached.

Mr. J. S. Walton, borough surveyor of Falmouth, has been presented with a silver hot-water jug by the borough officials upon leaving to take up his new appointment at Barrow-in-Furness.

Mr. Robert Heslop, surveyor to the Tanfield Urban District Council, has received the thanks of the council "for his very exhaustive and splendid annual report, which did him much credit."

Mr. Henry C. Adams, junior partner in the firm of Henry Adams & Son, consulting engineers, is included in the recent list of transfers to full membership of the Institution of Civil Engineers.

Alderman J. P. Spencer, ASSOC. M. INST. C. E., one of the oldest members of the Institution of Municipal and County Engineers, was on Tuesday presented with the honorary freedom of the county borough of Tynemouth.

Mr. T. Clement Jones, engineer and surveyor to the Frimley Urban District Council, Surrey, has been voted an increase of salary of £55 per annum. The council also expressed their appreciation of the work done by the surveyor.

Mr. F. Sadler, engineer and surveyor to the Acton Urban District Council, has been voted £100 and an increased salary of £100 a year to meet the cost of the upkeep of his official motor car, which will be garaged by the council.

Mr. William Greig, assistant superintendent, has been appointed superintendent of cleansing under the Glasgow Corporation, in succession to Mr. D. M'Coll, retired. There were 149 applicants for the position, the salary attached to which is £550, rising to £700 per annum.

Mr. W. B. Chancellor, borough engineer and surveyor of Lichfield, has been appointed engineer and surveyor to the Barnet Urban District Council. Mr. Chancellor has held office at Lichfield for seven years, and he was previously surveyor to the Brownhills Urban District Council.

Mr. W. W. Price, inspector of main roads, Central Division, Oxfordshire, has been appointed main road inspector of District 1 under the Essex County Council; Mr. G. G. Grace, assistant in the city surveyor's department, Birmingham, inspector of District 2; and Mr. W. A. Rogerson, district surveyor to the Norfolk County Council, inspector of District 4.

The Rosyth Drainage Contract.—Mr. Andrew Blair, Glasgow and North Queensferry, who is completing the laying of the first section of the new main outfall sewer for Rosyth, has obtained the contract to lay the third section of the work from Pitreavie to the southern boundary of old Dunfermline. The distance is nearly 2 miles, and the most of it will require to be tunnelled. The amount of the tender was nearly £28,000.

FOR OTHER ADVERTISEMENTS

See End of Paper.

WEST SUFFOLK COUNTY COUNCIL.

COUNTY SURVEYOR'S DEPARTMENT.

APPOINTMENT OF CLERK OF WORKS.

Applications are invited for the post of Clerk of Works during the Reconstruction of certain Main Roads in the County.

Applicants should possess a thorough knowledge of road construction, and be prepared to keep the same hours as the workmen.

Salary £2 15s. per week, in addition to locomotion expenses.

Applications, endorsed "Clerk of Works," to be made, in candidate's own handwriting, upon Forms to be obtained from the undersigned (together with particulars of the duties), accompanied by copies of three testimonials, to be received not later than 4th May, 1914.

W. LIONEL JENKINS, ASSOC. M. INST. C. E.,
County Surveyor.

Shire Hall,
Bury St. Edmunds.
April 22, 1914.

(1,547)

RUGELEY URBAN DISTRICT COUNCIL.

APPOINTMENT OF INSPECTOR OF
NUISANCES.

The above Council invite applications for the appointment of an Inspector of Nuisances, who will also act as Officer for the purposes of the Housing (Inspector of District) Regulations, 1910, and as Inspector for certain purposes under the Factory and Workshops Acts, at an inclusive salary of £90 per annum.

Candidates must possess the Certificate of Inspector of Nuisances of the Royal Sanitary Institute, or its equivalent.

Applications, stating age, experience and qualifications, and endorsed "Inspector of Nuisances," to be delivered to the undersigned, with copies of not more than three recent testimonials, not later than Monday, the 4th May, 1914.

Canvassing, directly or indirectly, will be deemed a disqualification.

(By order)

W. L. ORGILL,
Clerk to the Council.

Rugeley.
April 22, 1914.

(1,546)

ASSISTANT required in Civil Engineer's Office, Westminster. Sewerage and Water Supply. State references, wages, &c., to Box 1,416, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,549)

UNIVERSITY OF LONDON.

Goldsmiths' College, New Cross, S.E.

ENGINEERING AND BUILDING DEPARTMENTS

SUMMER SESSION, MAY AND JUNE.

Land Surveying Classes are held during May and June; elementary lectures, with practical work, on Chain Surveying and Levelling, and advanced lectures, with practical work, on the Theodolite and all other angular instruments. Fee, 10s. elementary, 10s. advanced.

Also special summer courses in Wireless Telegraphy, Reinforced Concrete, Drawing Office and Engineering Workshop Practice, Engineering Costs and Management, Mechanical and Hydraulic Laboratory Demonstrations.

For details apply to the Warden. (1,548)

Birmingham Water Supply.

MR. ANTONY LEES AT THE INSTITUTE OF SANITARY ENGINEERS.

A paper descriptive of the Birmingham Corporation waterworks was read on Monday evening by Mr. E. A. Lees, A. INST. C. E., secretary and manager of the Birmingham water department, at a meeting of the Institute of Sanitary Engineers presided over by Mr. W. B. Bryan, M. INST. C. E., chief engineer to the Metropolitan Water Board.

At the outset Mr. Lees alluded to the situation of the works in the Elan Valley, and the construction and capacity of the reservoirs. The gathering ground, he mentioned, contains a total area of 45,562 acres—that is over 70 square miles—and has an extreme length of about 15 miles and an extreme breadth of 8 miles. Of this area 20,515 acres drain into the Elan and 25,047 acres into the Claerwen. The minimum elevation of the gathering ground is 822 ft. ordnance datum, that being top water level of the lowest reservoir at the site of the lowest dam. Some of the hills round the rim of the watershed rise to elevations of over 2,000 ft.

The geological formation is silurian, and consists of shales and flagstones, with some very massive layers of conglomerate. None of the land is cultivated, the whole being occupied as hill pasture restricted to sheep-farming. The corporation have secured the full control over the whole gathering ground of the Elan, and most of that of the Claerwen by the acquisition of the freeholds and manorial and common rights. The population of the gathering ground is very sparse, there being only thirty-one houses, occupied by the sheep farmers, who hold their farms under strict regulations for preventing contamination of the streams and reservoirs.

RAINFALL.

As regards rainfall, for the purpose of circulating the storage capacity, a minimum rainfall of 60 in. per annum was assumed, and allowing for deductions for successive years of exceptional drought, evaporation, percolation, and loss in floods, the yield of the gathering ground was calculated on the basis of 36 in. per annum, and on this basis there is an available yield of 99,000,000 gallons per day. Of this quantity 27,000,000 gallons per diem are appropriated as compensation to the river Wye, leaving 72,000,000 gallons for supply.

The completed scheme provides a total storage capacity of 17,960 million gallons, of which 11,320 million gallons are provided by the works already executed.

The rainfall is measured by twenty-five gauges located on the gathering ground under the direction of Dr. Hugh Robert Mill, of the British Rainfall Organisation. Up to six years ago the average rainfall over the whole of the watershed was calculated by taking the arithmetical average of the records of the rain gauges. For the year 1908, and in subsequent years, the average yield has been calculated by means of the Isoyhetal areas. "It is evident," Mr. Lees observed, "that the arithmetical method assumes that the area represented by all of the gauges shall be equal. This manifestly is not the case in fact, and the Isoyhetal method aims at determining the area to which the record of each rain gauge applies." The difference between the two methods of calculation was shown by a table in the paper.

Mr. Lees recalled that the construction of the impounding dams and all of the other work on the gathering ground was carried out by the corporation by administration, this course being taken in view of the tremendous responsibility entailed by these works. The aqueduct and all the distribution works at the Birmingham end were carried out by contract.

The inlet to the aqueduct is situate at Careg-ddu, a point $1\frac{1}{2}$ miles above the Caban Cŏch dam. The inlet to the aqueduct is controlled at the Foel Valve Tower. Proceeding up the valley the next reservoir reached is Pen-y-gareg, and the third is Craig Gŏch. The reservoirs in the Claer Valley have not been constructed, the only work carried out there being the foundations of the first dam at Dol-y-mynach, which were put in owing to the fact that the site of the dam was submerged by the filling of the Caban Cŏch reservoir. Below the Caban Cŏch dam the

Elan village has been constructed for the accommodation of the permanent staff.

FILTRATION.

An important part of the works consists of the Foel filter-beds, by means of which the water is strained through copper gauze of forty threads to the inch, and rough filtered. The Foel filters did not form part of the original scheme. The decision to provide them was arrived at in the year 1901, in view of the experience of Liverpool, which showed that the discharging capacity of lines of iron pipes conveying water from a similar gathering ground was liable to serious diminution in consequence of a growth on the interior of their pipes. As it was proved at Liverpool that this growth was prevented by filtration through coarse sand, it was decided to provide filter-beds at the head of the aqueduct, and the construction of the filters at the Foel was undertaken. The filters are thirty in number. Their dimensions, with slight individual variations, are 80 ft by 50 ft, the total filtering area being 120,000 sq. ft. The construction of these filters has been fully justified, as there has not been in the pipes any of the growth peculiar to moorland waters. The filtering material is formed of layers of shingle graded up to rough sand.

The method of cleansing and renewing the filters is as follows: The washing stages are situate at the west end of the beds, and the sand is conveyed to and from the filters by means of conveyors running on an overhead railway operated by electric energy generated in the turbine. Mr. Lees mentioned incidentally that all of the power required on the works is derived from the compensation water, which is utilised to generate electricity by means of turbines and dynamos situate in the turbine houses at the foot of the Caban dam. What has been termed the "reservation system" of renewing the filter sand has been adopted, the method being the following: When a bed becomes blocked, a layer of 1 in. or more, as may be required, is skimmed off and removed to the washing stage; the filter is then restarted without re-sanding, successive layers of dirty sand being taken away until the stratum of sand remaining in the filter is reduced to the minimum consistent with efficient working. The remainder of the sand is then removed to one side and the filter entirely remade with clean sand at the bottom and the removed sand at the top. Sand which has been washed and is awaiting replacement on the filters is stored in two filter basins at the inlet end, which have been temporarily converted into sand stores.

The washers employed are those known as "Greenway's patent," and are of a capacity to deal with 8 or 9 cub. yds. per hour. The washers are driven by hydraulic engines. The water used for sand washing and also for cleansing the copper gauze strainers, is obtained from a tank having a capacity of 100,000 gallons, situated on the hill at the back of the filters. Water is pumped into this tank from the aqueduct by means of an electrically driven rotary pump situated in the gauge chamber.

The water from the sand washers, containing the peaty material removed from the sand, flows into a settling tank, from which the deposit is removed periodically by means of a rotary pump driven electrically.

TREATMENT OF SOFT WATER.

In view of the danger of the action of the water on lead, in consequence of its softness, the medical officer of health of the city considered it prudent to introduce a small quantity of hardening matter. The medium adopted is finely powdered chalk, and the quantity used varies from 1 to 1.75 grains per gallon, the amount being varied as required from time to time.

The method of introducing the chalk into the water is as follows: A vessel is provided into which is put the quantity of chalk required for adding the fixed proportion for the time being to the water to be discharged into the aqueduct during the following twelve hours. The chalk is then mixed with water. The vessel is provided with a stirrer operated by means of a water engine. The same engine operates an endless band on which are small cups, each of

which picks up a small quantity of the mixture and discharges it into a launder, where it mixes with the tail water from the water engine. This further dilutes it, and it is then discharged into the aqueduct.

The apparatus is situated in a building at the head of the aqueduct, and the passage of the water through the 73 miles suffices for the complete solution of the chalk. The whole apparatus is very simple and works admirably.

CONSUMPTION OF WATER.

Statistics relating to the consumption of water were submitted by Mr. Lees. These showed that with a "population in supply" of 84,820 (the estimated average during the half-year to September 30, 1913), the maximum daily consumption was 28,325 million gallons. The minimums were 15,970 million gallons (all days) and 16,328 million gallons (excluding Sundays and holiday weeks), while the average quantity per diem was 22,404 million gallons. The average consumption per head per diem by meter for trade and public sanitary purposes was 6.68 gallons, and for domestic purposes and unmeasured trade supplies, including water supplied for fire and waste, was 19.62 gallons, a total of 26.30 gallons.

TAR-MACADAM ROADS IN CALCUTTA.

A COMPARISON OF METHODS.

The issue of *Indian Engineering* for March 28th contains an article on the new tar-macadam roads that are being constructed in Calcutta, from which we gather that the work is being somewhat freely criticised. The writer of the article, with the intent of informing the mind of the public, alludes to the discussion two and a-half years ago of two papers on roads which were read at the Institution of Civil Engineers. The Road Board Specification, No. 2, with respect to surfacing with tar-macadam, is quoted, as are also the remarks of Mr. Jansen, an engineer from the Netherlands, who took part in the discussion, to the effect that the tar-macadam road when "fresh" required time, traffic, and warmth (for the evaporation of volatile compounds of the bitumen) before the tractive effort would become lower than on the common macadam road. "These are only some of the salient points in connection with tar-macadam roads," the article continues, "that have a bearing on those being now laid down in this city, and we quote them to show that the roads here seem to be receiving somewhat hasty condemnation. It is known to everyone that before the old macadam roads are surfaced with tar-macadam their cross-section is being reduced, and thus the recognised and legitimate precaution is being taken against slipperiness; it is also known that, according to the best of their judgment, municipal authorities have used pitch of a viscosity somewhat firmer than used at home on account of the high temperature prevailing in Calcutta, a measure quite in accordance with one clause of the Road Board Specification, which says: 'For making pitch-grouted macadam the pitch used should comply with the Road Board Specification for pitch, its viscosity being altered to suit climatic and local conditions by varying the quantity of the tar oils as specified therein.' Lastly, the thickness of the surfacing does not differ materially from what the Road Board lays down. We may then fairly conclude that the results here are the same as at home, making some allowance for difference of climate.

But what are the complaints made here? First, that the road surface is sticky and gives rise to increased tractive effort; second, that the road surface is slippery. The objection to its stickiness is answered by the remark of Mr. Jansen quoted above, which plainly tells us that when first laid they are sticky elsewhere, too, and that this defect lessens with time, as is clear to any observer in Calcutta, too. As regards slipperiness, the little said about it in the two papers, the discussion and the correspondence we are here considering, is significant. It suggests to our mind that this defect is just as little absent at home, is accepted as inevitable, and weighs little in the balance against the vast advantages of these roads over the water-bound macadam roads. That stickiness and slipperiness have been complained of at home most bitterly is common knowledge, and that both are still defects of the bituminous-bound macadam is also indisputable, so that Calcutta has

not a monopoly of these defects, and, judging by precedent, will also one day cease to lament them. It is freely admitted at the same time that much remains to be studied for the improvement of present methods, and, as a matter of fact, the problems are being carefully studied, and must result in time in still better roads.

The directions in which further detailed knowledge needs to be sought are mainly the following: (1) The investigation and standardisation of bituminous binders; (2) the investigation and standardisation of road metal; (3) the investigation and standardisation of methods of preparing materials and constructing roads with known or standard constituents; (4) the compilation of statistics of traffic, of wear, and of initial and maintenance cost; (5) the recording of all local and other influences, such as extent and condition of foundations, gradient, crossfall, presence or absence of overhanging trees, direction of road with regard to prevailing wind, meteorological observations, both during construction and in subsequent service.

The method of construction pursued in Calcutta is somewhat analogous to what is known as the 'penetration' method at home, with this essential difference, that at home the stone is placed first and the grouting poured on it, while here the grouting is laid first in a stiff layer, the stone laid on it and rolled in, forcing the grouting to come up between the pieces of stone, and also cover the top. Personally, we cannot help thinking that the Calcutta method of carefully arranging the stone piece by piece on the surface of the grouting ensures a better distribution of the grout around each piece. In both the home and Calcutta method the surface is finally sprinkled with dry chippings of the stone, so that it is difficult to understand why one surface should be more slippery than the other, if it is so.

It seems almost superfluous to dwell at this date on the advantages of bituminous-bound roads. It is universally conceded that, compared to water-bound roads, they are more lasting, freer from dust, more easily cleaned, smoother to run on, and, in the long run, more economical. The chief complaint against Calcutta roads so far has been on the score of their dustiness; and people still complain that the tar-macadam roads are not materially less dusty. It must not be forgotten, however, that most of the dust on these roads is nothing more than mud imported by the traffic from the water-bound roads, and that as the latter are eliminated one by one so will the tar-macadam roads become less dusty. As regards economy, even with the statistics now available it has been shown that the cost of maintenance would be only half that of maintaining water-bound roads when the cost of strengthening was repaid. Nor should the question of economy be looked at from the point of view of the road only. There is an appreciable saving in the wear of vehicles and horses due to the reduced tractive effort on the smoother roads, which the public are apt to lose sight of in balancing the cost of the two classes of roads."

The Sanitary Inspector. Sir James Orichton Browne stated that the sanitary inspector has to be a bit of a lawyer, a bit of a doctor, and a great deal of a diplomat. Mr. J. H. Brocklehurst, at the Sanitary Inspectors' Conference at Hoyle, suggested that "rat-catcher" and "rag-washer" should be added to those qualifications.

Chartered Surveyors' Golfing Society: Spring Meeting. By kind permission of the Bramshot Golf Club, a one-day competition will be held on that club's course on Wednesday, May 6th. The station is Fleet (L. & S.W.Rly.), where cabs may be obtained, about 3/4 mile from the course. There is also a halt at the club-house, and the train leaving Waterloo at 9.25 will stop there. In the morning a Bogey Competition will be played under handicap. A prize, kindly presented by Mr. Samuel Martin (captain), will be given for the best nett return. In the afternoon a Stroke Competition under handicap. A prize will be given for the best nett return. There will be no entrance fees. Members of the society will be made members of the course for the day. In order to facilitate the necessary arrangements, members who intend to be present for either the whole day or any part of the day are requested to notify Mr. Sydney A. Smith, 22 Chancery-lane, W.C., who, if application is made in time, will be able to provide railway vouchers to enable members to travel at reduced fares.

THE UNITED STATES OFFICE OF PUBLIC ROADS.

ANNUAL REPORT OF THE DIRECTOR.

The report of Mr. L. W. Page, director of the United States Office of Public Roads, for the fiscal year ended June 30, 1913, is a brief record of useful work of a comprehensive character. The educative, technical, and administrative activities of the department are closely related, and the conditions in the United States are such that the central office is able to do very useful work in areas where the means for intelligent planning and construction of roads would not otherwise be available. It is much to the advantage of the United States that a large amount of the information presented to the public on the subjects of road problems and road finance is from a well-informed source, and is of an authoritative character. In the year under review 558 lectures and addresses were delivered in various parts of the States by twenty-nine representatives of the office. The number was less than in the previous year, and the total attendance less than half, and this form of primary education in road matters is probably not expected to be, on any considerable scale, a feature of the permanent work of the office. Close attention is given, however, to the matter of imparting direct instruction in highway engineering, and during the year eight graduates in civil engineering were appointed to the position of civil engineering student, and put through a post-graduate course in highway engineering, including work in the field and in the laboratories of the office. Some of these students are appointed to the position of junior highway engineer at the end of the first year, and at the end of the second year to that of highway engineer.

COUNTY ROAD SYSTEMS.

The work of the office in the matter of planning county road systems is specially interesting. In one case an engineer and an assistant were stationed in a county for the purpose of devising a county system; making the surveys for relocation, investigating materials, designing road structures, and advising the county officials in matters of construction, administration, and maintenance for a system of about 120 miles of road. In this case the general plan of the roads was already fixed, but in another county, in Texas, the study involved a consideration of the farm area, the productive crops, the distribution of population, and other elements affecting the selection of roads for improvement. In another county of the same State a short study of 120 miles of road was undertaken, and included an investigation of the road-making materials throughout the county, and, after the materials had been tested at headquarters, it was recommended that in view of the small resources of the county the roads should be made of graded earth and sand-clay. In twenty-three States consultations were held with engineers from the central office, and an engineer was deputed to begin a study of the roads and trails in the national forests.

A number of "object-lesson" and experimental road lengths were put down during the year, and a table in the report shows the area in square yards of each kind of crust. Out of a total area of just over 500,000 sq. yds., nearly 163,000 sq. yds. were earthen, 123,000 sand-clay, 63,000 gravel, 57,000 macadam, 44,000 shell, and 16,000 bituminous macadam. To the class of sand-clay roads must be added about 5,300 sq. yds. of "sand-gumbo." Taking into account only the "object-lesson" roads proper, it may be noted that, since 1905, brick and concrete appear in one year only, and several other types very seldom; but it must not be overlooked that this work is carried out mainly in the less thickly peopled and less developed States.

MAINTENANCE EXPERIMENTS.

Maintenance experiments were conducted during the year on eleven types of bituminous macadam road, built in 1911-1912, and on 8 miles of road in Virginia, and the manner in which the time of the patrolman was divided is shown in tables in the report. On the bituminous road the patrolman's length was 3.2 miles, and he worked eight hours a day, and was provided with a horse and cart.

In the case of the earth and gravel road in Virginia, the length allotted to each patrolman is not stated, but the days given to each kind of work are shown, month by month, for a year. The chief features are as follows: Repairing, cleaning, and improving ditches and underdrains, 80 days, of which

17 were in August, 14 in July, 13½ in November, 12 in October, and none in February, March, or May (one in June). Miscellaneous, including the clearing away of leaves, filling holes, repairing the shoulders, and shaping the road bed, 47 days, of which 10 were in June, 8 in October, and 4 to 7 apiece in March, April, September, November, and December. Loading, hauling, and spreading gravel, 46 days, of which 11 were in February, 5 in March, 7 in April, 8 in May, and 7 in June. Cutting brush, &c., 36 days, of which 9 were in May, 8 in March, 7 in February, and 4 in June. Dragging, 36 days, of which 8 were in January, 5 in December, with 2 to 4 days in other months, except June and November, one day each, and February none. Inspection during storms 25 days, none in July, August, or October, one each in November and June, 2 in September, and 3 or 4 in each of the remaining months. Picking off stones, 18 days, of which 5 were in July, 4½ in August, 2 each in September, October, and January, one each in June and November, and half a day in April (none in December, February, March, or May). The remaining three days were given to a traffic census.

LABORATORY WORK.

Eight hundred and thirty-nine samples of road building materials were received for investigation in the chemical and physical laboratories. In the petrographic laboratory 95 samples of rock were analysed qualitatively, 33 quantitatively, and 373 were examined for the purpose of identification. Two colleges sent each a member of its faculty to take a full course of instruction, with a view to introducing similar work in their curricula. During the year 124 specifications for bituminous materials and methods of using them were issued from the laboratory. Special attention was given to some specimens of Texas natural rock asphalt, and to the means of using bitumen with the Florida coralline rocks. Reports were made as to the road building properties of 118 samples of dolomite, 96 of limestone, 70 of gravel, 41 of sandstone, 19 of granite, and 40 of trap rock, besides 118 other samples, including gneiss and schist.

THE IMPROVEMENT OF POST ROADS.

The Office of Public Roads undertakes preliminary inspection of post roads designated for improvement, makes economic studies in relation to these roads, and superintends the construction of projects approved by the Postmaster-General. The inspections made covered 1,143 miles of road, and construction work has been begun on two projects. Under the head of "Economic Investigations," arrangements are made for censuses to be taken by the collaborators of the office, in the case of the post roads for one week before improvement, and afterwards at other times each year for a period of one week. The number of tons hauled over each mile of road in the year is estimated as nearly as possible, and photographs are taken at distances not less than ½ mile apart. The studies tend to show that a very small reduction per ton-mile in the cost of hauling will pay all interest and maintenance charges, and meet sinking fund requirements "on the road investment proposed." A wagon equipped with a traction meter is run over each post road before improvement, and the pull in pounds for a standard load on standard tyre widths is automatically registered throughout the length of the road.

Change of Address.—Messrs. Wailes, Dove & Co., Limited, announce that, owing to the rebuilding of their present premises, they have taken larger offices, and their address will in future be Channel Chambers, James-street, Cardiff (corner of South William-street). These new offices are on the first floor, and very convenient owing to their central situation. The company's representative, Mr. T. I. Forward, and his assistant, Mr. T. J. O'Leary, will continue to look after the firm's interests.

Waterproofing of Lime. We have recently received a booklet dealing with this subject. The need of such a material for use with lime in setting and pointing ancient and modern stone and brick work, for rough-cast walls rendered with lime, and for obtaining a white joint for modern brickwork, is recognised. The booklet deals with the substance called Lime Pudlo, which is a by-product of the well-known Cement Pudlo. Lime Pudlo, we are given to understand, has been found by tests to prevent disintegration of lime mortar by frost.

DUBLIN HOUSING CONDITIONS.

(From a Correspondent.)

The Lord Lieutenant of Ireland and Lady Aberdeen are taking an active interest in the Dublin housing problem, and with the object of directing public attention to the subject the Lord Lieutenant, as already announced in your columns, has offered a prize for the best plan for laying-out and rebuilding the slum areas of Dublin.

The coming Civic Exhibition in Dublin is to have a special display of town planning, which is being organised under the direction of Lady Aberdeen, who is president of the Executive Committee of the exhibition. Her ladyship hopes to make the town planning section the most important in the exhibition, and by its means to educate the citizens in the principles of town planning.

It is understood that Lord Aberdeen favours the recommendations of the Departmental Committee's report as to the housing conditions of Dublin, and that his lordship is not a believer in dealing with the problem piecemeal. He recognises that any scheme of such magnitude must of necessity be a State-aided scheme.

Since the Fire of London in 1666 no city rebuilding of this magnitude has been under consideration in Great Britain.

Turning to the report of the Departmental Committee appointed by the Irish Local Government Board to inquire into the housing conditions of the working classes in the city of Dublin, it is generally interesting, when considering documents of this kind, to look at the position of those composing the committee. We here find the following four gentlemen appointed by the Irish Local Government Board to serve on this committee—viz.:—

Mr. Charles H. O'Connor is a son of The O'Connor Don. Mr. Charles H. O'Connor is one of the lay inspectors of the Local Government Board, and has occupied that position for some ten years. He is thirty-five years of age.

Mr. S. Watt is a first-class clerk in the Irish Local Government Board, and is thirty-three years of age.

Mr. J. F. McCabe, a son of Sir Francis McCabe, is a Bachelor of Arts, Trinity College, Dublin. He is thirty-four years of age, and an inspector of the Local Government Board, Ireland.

Mr. Alfred Delaney, who is thirty-four years of age, is a reporter on the staff of the *Irish Times*.

The report of the Departmental Committee goes into the subject very fully, and expresses many good ideas and many new ideas. The good ideas are not, however, in all cases new, neither are the new ones uniformly good. It seems a matter of regret that none of the leading municipal engineers of this country were added to the committee, nor the evidence of any such experts taken. The four gentlemen who composed the committee were not wanting in diligence, and they appear to have performed their task in a highly creditable manner, but the report they produced, although doubtless a correct record of facts, lacks the weight which the recommendations contained in it would otherwise have had.

The wretched state of things that at present exists in Dublin are set out in much detail, and illustrated by numerous photographs.

From the slum point of view, Dublin may certainly be considered the first city in the Empire. No other community of its extent can show such an area of slum-land.

The report is signed by all four gentlemen named, but appended is a memorandum by Mr. McCabe, which seeks to give a clean bill of health to the Dublin Corporation. In his opinion, what the Dublin Corporation left undone was beyond their power to effect in practice. With this view one cannot agree. We have only to look at the enormous improvements effected under similar conditions in Liverpool, Manchester, Birmingham, Glasgow, and other large cities in Great Britain to see that much might have been done by the Dublin authorities, had they been so minded.

The Dublin Corporation had given to them compulsory powers which were not enforced as they should have been. This is clearly set out in the body of the report, which is signed (under reservation) by Mr. McCabe. It is therefore difficult to see how he could consistently absolve the Dublin Corporation if the facts stated in the report are accurate.

The committee recommend the rebuilding of the slum areas of the city, and the erection of 14,000 houses, at an estimated cost of £3,500,000.

They make it clear that they favour a State-aided scheme.

It is to be hoped that if the matter is to be pressed forward to a practical issue the advice of engineers skilled in work of this character will be taken, and that a comprehensive scheme will be produced and agreed upon before any piecemeal rebuilding is undertaken. One also hopes that the Dublin authorities will be more fortunate in dealing with private landowners than the City of London Corporation were in the seventeenth century when endeavouring to carry out the bold scheme of Sir Christopher Wren. The property owners in those days were apparently too strong for the City Corporation and for the Government of the day who legislated upon the subject. The London owners objected to parting with their properties in exchange for similar areas on the lines of the intended new and more commodious thoroughfares, and their influence secured their success. The result was that Wren's scheme was, for the most part, abandoned. The Corporation of the City of London, aided by contributions from other portions of the Metropolis, have spent many millions during the past century in trying to undo to a small extent the unfortunate muddle due to the obstinacy and shortsightedness of the landowners of those days.

It appears from the Dublin local press that the Lord Mayor has charged the Local Government Board with giving specific and deliberate opposition to well-matured and well-considered efforts made by the corporation to prevent rural labourers from coming into Dublin. One can scarcely see how the Local Government Board could draw a barrier round Dublin to prevent the influx of rural labour—which is taking place in all large towns. The solution would probably have been found had the jobbers in slum property less influence in the City council.

The commissioners in their report have been rather severe on the sanitary department of the Dublin Corporation, but before attaching blame to any official in that department it is well to consider their remarks with respect to the constitution of the council and the position of small property owners thereon.

So long as it is legal for interested councillors to protect individual interests to the detriment of the public interest such difficulties will always arise. The evils arising from local interests represented and worked by unscrupulous members of municipal councils are generally recognised. It is to the personal interest of such persons to become members of public bodies, and they spare neither time nor trouble to secure and retain such positions.

The Municipal Corporations Act makes an attempt to preclude such persons from voting on matters in which they are interested, but it does not prevent them from being present at committee and council meetings, or canvassing their friends and colleagues on the council. Where many interests of this kind are involved it is often a case of "you scratch my back and I'll scratch yours," and in this way parties most interested often influence other members of the committee, whose interests they have served on previous occasions.

One can only hope that the prominent part which the Lord Lieutenant and Lady Aberdeen are taking in the promotion of the Civic Exhibition, and their interest in the housing question in Dublin, will lead to good results and remove from Dublin that unenviable notoriety which attaches to it as one of the largest slum communities in the United Kingdom.

London District Surveyors' Fees.—A letter has been received from the London County Council acknowledging the receipt of a communication from Kensington Borough Council in support of the views expressed by the Wandsworth Borough Council, that a revision of the scale of fees of district surveyors in respect of additions or alterations to existing buildings should be sought, and intimating that, in the absence of specific instances of alleged excessive fees, it is not proposed to take any action in the matter; also pointing out that under the London Building Act, 1894, the county council are required to pay compensation to a district surveyor in respect of any diminution of his income caused by the reduction by the county council of the amount of the fees specified in the third schedule to the Act.

FOURTH INTERNATIONAL ROAD CONGRESS.**PROGRAMME OF QUESTIONS.**

Appended is the programme of questions drawn up by the Permanent International Commission for the Fourth International Road Congress, which is to be held at Munich next year.

1ST SECTION: CONSTRUCTION AND MAINTENANCE.

1st Question.—Methods of repair of macadamised roads of all kinds for minor damage (unevenness, pot-holes, &c.).

- Repair by patching or by resurfacing.
- Nature, quality and size of materials employed and crushing of the materials employed.
- Plant; methods of carrying out work.
- Prime cost; comparisons.

2nd Question.—Asphalt roads (urban roads carpeted with asphalt, or laid with hard asphalt, compressed asphalt, asphalt slabs, and pavings and similar methods).

- Conditions governing the selection of type of the surfacing; constitution of the mastic; specification and inspection.
- Methods of construction and maintenance; prime cost; life.
- Advantages and disadvantages of the various methods.

3rd Question.—Small setts, including brick roads.

In what circumstances is the use of setts to be recommended (a) for urban roads, (b) for roads in open country?

Gauge and kind of materials to be used; methods of construction, substructure and maintenance; prime cost; life.

Advantages and disadvantages.

4th Question.—Laying tram rails on various kinds of road surface (macadam, ordinary setts and small setts, wood paving, asphalt, &c.).

To what extent does the section rail, type of rolling stock, ballast and infiltration of water affect the destruction of the road (surfacing and foundation)?

How should the foundations and surfacing of the road be constituted according to the various methods of construction? Experiments carried out with this object.

Methods of fixing the rails in various surfacings; advantages and disadvantages of these various expedients.

Steps to be taken to deaden the noise and vibration caused by heavy tramcars.

2ND SECTION: TRAFFIC AND ADMINISTRATION.

5th Question.—Special deterioration of roads caused by various kinds of traffic.

Effect of weight, speed traction or propulsion; various kinds of tyres; construction and shape of vehicles (chassis, coach work and wheels); fittings of carriages and harnessing.

6th Question.—Traffic census.

Methods used or recommended; classification and counting of vehicles and animals; calculation of tonnage.

Conclusions to be drawn from the point of view of construction and maintenance

7th Question.—Road Products.

Cut grass; trees and shrubs, and especially fruit trees; sale of old material, &c.

INSTITUTION OF WATER ENGINEERS.**SUMMER MEETING AT STOCKPORT.**

The annual summer meeting of the Institution of Water Engineers will be held this year on June 11th, 12th and 13th at Stockport (headquarters at Midland Hotel, Manchester). Candidates for election at the council meeting to be held on June 11th should see that their proposal forms (duly filled in and signed) are received by the secretary, Mr. Percy Griffith, 20 Victoria-street, Westminster, S.W., not later than June 1st.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A R.I.B.A.,
Borough Surveyor, Great Yarmouth.

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District is to be held at Sheffield on May 2nd.

PROGRAMME.

2 p.m.—Meet at the town hall to inspect the plans of the town planning scheme.

2.30 p.m.—Leave town hall for Wincobank to inspect the sewage disposal works.

4.30 p.m.—Leave sewage disposal works to view the High Wincobank Corporation model dwellings.

5.30 p.m.—Return to town hall, where tea will be provided by the kind invitation of the Right Hon. the Lord Mayor (Colonel G. E. Branson, J.P.).

6.30 p.m.—District business.

In order that the necessary arrangements may be made, members must give notice of their intention to be present not later than Tuesday, April 28th.

J. P. WAKEFORD, M.I.C.E., F. MASSIE, M.I.C.E.,
Hon. District Secretary. *District Chairman.*
Wakefield. Wakefield.

DOVER MEETING.

A meeting of the institution is to be held in the South-Eastern District at Dover on May 9th.

SALISBURY MEETING.

A meeting of the institution is to be held in the Southern District at Salisbury on May 16th.

WEST MIDLAND DISTRICT.

A meeting of the West Midland District is to be held at Birmingham on May 23rd.

SCOTTISH DISTRICT.

The annual Scottish meeting of the institution will be held in Dunfermline on June 5th and 6th.—not at Edinburgh, as previously announced.

The following papers will be read—viz.:—

“A Town Planning Scheme: Its Effects on Housing and Architecture,” by Mr. Raymond Unwin.

“Edinburgh and Its Early Examples of Town Planning,” by Mr. A. Horsburgh Campbell.

“Town Planning from a Lawyer’s Point of View,” by Mr. John L. Jack.

“The Advantages of Steam Tractor Haulage over Team Labour for Road Material,” by Mr. W. L. Gibson.

On the first day the members are to be entertained to luncheon by the corporation of the city of Dunfermline. On the second day, by the courtesy of the Admiralty and Messrs. Easton, Gibb & Co., the members are to be permitted to visit the works at Rosyth.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on Saturday, June 13th.

ANNUAL MEETING.

A town planning, housing and road conference and the forty-first annual general meeting are to be held at Cheltenham from June 24th-27th.

The following is a preliminary list of the papers to be read and discussed at the conference:—

- (1) “Town Planning Large Areas,” by Mr. W. A. Clarry, borough surveyor, and Mr. R. A. Reay-Nadin, town clerk, Sutton Coldfield.
- (2) “The Housing, Town Planning, &c., Act, 1909 (Part 2) as Applied to Commercial and Industrial Districts,” by Mr. J. C. Midgley, deputy city surveyor, Newcastle-upon-Tyne.
- (3) “Town Planning and Architectural Issues,” by Prof. S. D. Ashead, Liverpool University.
- (4) “The Abnormal Development of Coventry and some of its Town Planning and Housing Problems,” by Mr. J. E. Swindlehurst, city engineer, Coventry.
- (5) “Town Planning Amended Procedure Regulations,” by Mr. H. E. Stilgoe, city engineer, Birmingham.
- (6) “Town Planning Procedure,” by Mr. Fred. W.

Pearce, engineer to the Twickenham Urban District Council.

- (7) "Town Planning Practice in America," by Mr. C. M. Robinson, Rochester, N.Y.
- (8) "Some Notes on Highway Law as Affecting the Municipal Engineer," by Mr. S. G. Turner, Barrister-at-Law, London.
- (9) "The Training of the Highway Engineer of the Future," by Mr. H. Percy Boulnois, London.
- (10) "The Control, Management and Maintenance of Roads," by Mr. J. Fred. Hawkins, county surveyor, Berkshire.
- (11) "The Prevention of Sub-Crust Movement in Roads," by Mr. E. S. Sinnott, county surveyor, Gloucestershire.
- (12) "The Economics of Modern Methods of Road Construction," by Mr. Francis Wood, borough engineer, Fulham.
- (13) "Some Notes on Grouting and Penetrating Methods of Road Surfaces," by Mr. Geo. Green, borough engineer, Wolverhampton.
- (14) "The Organisation of a Municipal Engineer's Department," by Mr. E. Willis, surveyor to the Chiswick Urban District Council.
- (15) "The City of Worcester Sewage Disposal Works," by Mr. T. Caink, city engineer, Worcester.
- (16) "Notes on the Protection of the Foundations of Chepstow Bridge over the river Wye in Ferro-Concrete," by Mr. E. S. Sinnott, county surveyor, Gloucestershire.

The conference will be opened on Wednesday afternoon June 24th (when the delegates will be welcomed by the Mayor and Corporation of Cheltenham), and continued during the two following days. Visits will be made on Thursday afternoon, June 25th, and Saturday morning, June 27th, to the corporation new sewage purification works, waterworks, destructor, concrete slab factory, &c.

PROGRAMME.

- Wednesday, June 24th (Morning).—General business of the institution.
 Presidential address and presentation of premiums.
 Afternoon.—Conference—Town planning and housing; conference—Roads, &c.
 Evening.—Exhibition of town planning and housing schemes, &c.
- Thursday, June 25th (Morning).—Conference—Town planning and housing; conference—Roads, &c.
 Luncheon given by mayor to members of the institution and delegates.
 Afternoon.—Drive to inspect planned areas of town. Visit to refuse destructor, concrete slab factory and new sewage purification works.
 Evening.—Annual dinner.
- Friday, June 26th (Morning).—Conference—Town planning and housing; conference—Roads, &c.
 Afternoon.—Conference—Town planning and housing; conference—Roads, &c.
 Evening.—Open-air concert—Montpellier Gardens.
- Saturday, June 27th (Morning).—Visit to corporation waterworks at Tewkesbury, &c.

THOMAS COLE,
Secretary.

92 Victoria-street, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

NORTHERN DISTRICT.

Meetings will be held at Hexham on Saturday, May 2nd, Cumberland in June, Alnwick on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Hull on Saturday, May 16th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

GENERAL MEETINGS.

A meeting will be held at the Institution of Electrical Engineers, Victoria Embankment, W.C. (corner

of Savoy-street, Strand), on Monday, May 11, at 7.30 p.m., for the discussion of a paper.

GREATER NEW YORK'S WATER SUPPLY SCHEME, which has been presented for that purpose by Mr. William T. Taylor, Fellow A.M.I.E.E., M.I.E.E., M.A.M. SOC.M.E., A.M.I.MECH.E., F.R.G.S. (Member).

The meeting is being held jointly with the Society of Engineers. The paper will be printed in the forthcoming issue of the "Journal."

A general meeting will be held at Birmingham in May, when a visit will be paid to the works of the General Electric Company.

COUNCIL MEETING.

A council meeting will be held in London on Wednesday, April 29th.

EASTERN AND NORTH-EASTERN DISTRICTS.

A joint Eastern and North-Eastern District meeting will be held at Finedon and Kettering on Thursday, May 7th, when a visit will be paid to the works of the Excelsior Stone Company at Finedon, and certain municipal works inspected at Kettering.

PROGRAMME.

12.20 a.m.—Meet at the works of the Excelsior Stone Company at Finedon, and inspect the manufacture of patent stone slabs, kerbs, channels, architectural dressings, &c.

Proceed thence by motor bus to Kettering for lunch at the Royal Hotel, at the kind invitation of the Excelsior Patent Stone Company, when a short paper will be read by Mr. W. B. Mortimer, managing director of the firm.

An inspection will afterwards be made of works in Excelsior stone at Kingsley-avenue, the new Co-operative Clothing factory, and the county police station.

G. BELSON CHILVERS,
Hon. District Secretary.

Council Offices,
 Oundle.

A joint Eastern and North-Eastern District meeting will be held at Hunstanton in July.

WESTERN DISTRICT.

A Western District meeting will be held at Tisbury on Saturday, June 13th, when the municipal works of the town will be inspected and a paper, "Wiltshire Roads, Past and Present," will be read by Mr. E. Plummer Davies (member).

B. WYAND,
Secretary.
 39 Victoria-street, S.W.

ASSOCIATION OF SOMERSET SURVEYORS.

President—Mr. W. ALEX. COLLINS, Surveyor to the Bridgwater Rural District Council.

A meeting of the above association will be held in the vestry-room at Street, to-morrow (Saturday). Previous to the meeting the members are to lunch at the Bear Hotel, by the kind invitation of the chairman and members of the Street Urban District Council. Mr. A. W. Stacey, J.R., will preside.

PROGRAMME.

- 1.15 p.m.—Lunch at the Bear Hotel.
- 2.15 p.m.—Inspection of the new houses recently erected by the council under the Housing and Town Planning Act.
- 3.15 p.m.—Meeting at the vestry-room and discussion on a paper on the "Financial and other Aspects of Housing," by Mr. W. H. Cousins, F.A.S.L., surveyor to the Street Urban District Council.
- 4 p.m.—Tea at the Bear Hotel, by the kind invitation of the president (Mr. W. Alex. Collins).

A motor char-à-banc may be hired from Bridgwater to Street, providing an interesting drive over the Polden Hills, for £2 5s. If only fifteen members would join in this means of travelling the price per head would be 3s. return, and the return journey made at a time to suit the convenience of all the members.

D. EDWARDS, ASSOC.M.INST.C.E.,
Hon. Secretary.

Taunton.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

CLERK OF WORKS.—April 28th.—Pontardawe Rural District Council. £4 per week.—Mr. Wyndham Lewis, clerk.

JUNIOR ASSISTANT.—April 28th.—Ilford Urban District Council. £80—£100 per annum.—Mr. H. Shaw, engineer and surveyor.

TEMPORARY ASSISTANT.—April 29th.—Maidenhead Town Council. £2 10s. per week.—Mr. Percy Johns, borough surveyor.

SURVEYOR'S GENERAL ASSISTANT.—May 1st.—Ulverston Urban District Council. £1 15s. per week.—Mr. C. Telford Hague, surveyor.

ASSISTANT SURVEYOR OF MAIN ROADS.—May 1st.—Staffs County Council. £175—£250 per annum.—Mr. James Moncur, county surveyor.

GASWORKS MANAGER.—May 2nd.—Bollington Urban District Council. £110 per annum.—Mr. Samuel Knight, clerk.

CLERK OF WORKS.—May 2nd.—Corporation of Swansea. £2 10s. per week.—Mr. H. L. Coath, town clerk.

INSPECTOR OF NUISANCES.—May 4th.—Corporation of Birkenhead. 35s. per week.—Mr. J. Fearnley, town clerk.

BOROUGH ARCHITECT'S ASSISTANT.—May 6th.—Corporation of Swansea. £150 per annum.—Mr. H. L. Coath, town clerk.

CLERK OF WORKS.—May 9th.—Guildford Rural District Council. £3 10s. per week.—Mr. John Anstee, engineer, Commercial-road, Guildford.

SURVEYOR.—June 15th.—Board of Trustees for the Improvement of Calcutta. 600—800 rupees per month (rupee valued at 1s. 4d.). Chairman, Calcutta Improvement Trust.

ASSISTANT ENGINEERS.—Public Works Department of the Government of Nigeria. £300—£400, with free quarters.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

CHIEF DRAUGHTSMAN.—Federated Malay States. £300—£400.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

DRAUGHTSMAN.—Nigerian Government Railway. £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

MANCHESTER.—May 23rd.—Plans, specifications, and estimates for semi-detached cottages, for the Manchester Sanitary Committee.—Sanitary Department, Civic Buildings, Mount-street.

HYTHE.—May 30th.—Designs for a concert hall and public shelter, for the Hythe Corporation. Premiums, 50, 25 and 10 guineas.—Mr. B. C. Drake, town clerk.

SUNDERLAND.—June 23rd.—Designs for a secondary school for 600 scholars, for the Corporation of Sunderland. Premiums, £100, £50, and £25.—Mr. J. W. Moncur, borough engineer and surveyor, Town Hall.

BELPER.—Designs and estimates for the erection of a bridge over the River Derwent, for the Belper Rural District Council.—Mr. Robert C. Cordon, surveyor, Duffield, near Derby.

CHESTER.—Designs for working-class dwellings, for the Corporation of Chester. Premiums, £50, £25, and £10. Mr. Patrick Abercrombie, M.A., Liverpool University School of Civic Design, has been appointed assessor.—Mr. J. H. Dickson, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

BURY (Laucs).—April 27th.—For the construction of concrete foundations to generator, for the corporation.—Borough Engineer.

EAST COWES.—April 27th.—For driving ferro-concrete piles and strengthening the sea wall, for the urban district council.—Mr. Albert Barton, surveyor.

ABERDEEN.—April 27th.—For the erection of a car shed, for the corporation.—Mr. W. Dyack, burgh surveyor.

EASTBOURNE.—April 27th.—For the erection of public conveniences, for the corporation.—Borough Surveyor.

HARROGATE.—April 27th.—For the rebuilding of the market hall, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

MEXBOROUGH.—April 27th.—For the erection of public baths, for the urban district council.—Mr. H. Burgess, architect, Queen Anne's Chambers, Westminster, W.C.

PONTEFRAC.—April 27th.—For deepening a well and other incidental works, for the corporation.—Messrs. G. & F. W. Hodson, engineers, Bank Chambers, Loughborough.

HETTON.—April 27th.—For the erection of a public convenience, for the urban district council.—Mr. J. Harding, surveyor.

ARBROATH.—April 28th.—For the erection of public baths, for the corporation.—Mr. H. Gavin, architect, 42 Hill-street.

TRURO.—April 28th.—For the erection of a stone bridge, for the rural district council.—Mr. C. Hancock, clerk.

WANDSWORTH.—April 28th.—For deepening the artesian well and supplying and fixing an air-compressor engine and water and air tubes, for the borough council.—Mr. P. Dodd, borough engineer.

ILFORD.—April 28th.—For the erection of electricity station and lodge, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

EAST RIDING.—April 28th.—For the erection of clerk and steward's house, six cottages, bailiff's house and dairy, for the Asylum Visiting Committee.—Mr. C. W. Hobson, clerk, 26 and 28 Lairgate, Beverley.

WESTMINSTER. April 29th.—For the execution of certain alterations and sanitary work at the Buckingham Palace-road public baths, for the city council.—City Engineer.

KENT.—April 29th—May 18th.—For the extension of a school, for the Education Committee.—Mr. W. H. Robinson, architect, Sessions House, Maidstone.

HULL.—April 29th.—For building workshops, and alterations to car shed, for the corporation.—Mr. A. E. White, city engineer.

HULL.—April 29th.—For the building of a market, for the corporation.—Mr. A. E. White, city engineer.

BURTON-UPON-TRENT.—April 29th.—For the extension of the refuse destructor, Bond End, for the corporation.—Mr. George T. Lynam, borough engineer and surveyor.

CARDIFF.—April 30th.—For the erection of a fire station, for the corporation.—Messrs. E. V. Harris & T. A. Moodie, architects, 8 New-square, Lincoln's Inn, London, W.C.

ASHFORD.—April 30th.—For the erection of baths and attendant's room, for the urban district council.—Mr. W. Terrill, surveyor.

BIRMINGHAM.—April 30th—May 25th.—For the construction of piling in foundations, basement floors, cooling ponds, canal basin, and canal widening, for the corporation.—Secretary, Electric Supply Department, 11 Dale-end.

LANCASHIRE.—May 1st.—For the erection of a school, for the Education Committee.—Mr. H. Littler, county architect, 16 Ribblesdale-place, Preston.

BROMLEY.—May 1st.—For work of hospital extension, for the Joint Hospital Board.—Mr. F. H. Gedney, clerk, Park House, Bromley.

BURTON-ON-TRENT.—May 1st.—For the extension of a retort house, for the corporation.—Manager, Gasworks.

CHESHIRE.—May 1st.—For widening a bridge, for the county council.—Mr. W. Holland, The Castle, Chester.

BLACKPOOL.—May 2nd.—For additions to Waterloo-road school, for the corporation.—Mr. John S. Brodie, borough engineer.

COVENTRY.—May 4th.—For additions to certain premises, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

FEATHERSTONE.—May 5th.—For the erection of 149 working-class dwellings and laying sewers, for the urban district council.—Mr. S. Chesney, engineer.

FOOTS CRAY.—May 5th.—For the erection of council offices, for the urban district council.—Mr. W. A. Farnham, surveyor.

HERTS.—May 7th.—For the erection of a school, for the county council.—County Surveyor, Hatfield.

GUILDFORD.—May 11th.—For the erection of twenty cottages, for the corporation.—Mr. C. G. Mason, borough engineer.

ILKLEY.—May 11th.—For the erection of an electricity generating station, for the urban district council.—Mr. George Wilkinson, consulting engineer, Beech Mount, Harrogate.

DURHAM.—May 19th.—For the erection of a school, for the county council.—Mr. A. J. Dawson, clerk to the Education Committee, Shire Hall, Durham.

KIDSGROVE.—For the erection of a urinal, for the urban district council.—Mr. F. C. Crimes, engineer and surveyor.

Iron and Steel.

DUNDEE.—April 27th.—For the erection of a corrugated-iron shed, for the Water Commissioners.—Mr. G. Baxter, 93 Commercial-street.

CHELMSFORD.—April 30th.—For the provision and erection of a pumping installation, including suction-gas plant, for the corporation.—Mr. Percival T. Harrison, borough engineer.

BURNLEY.—May 2nd.—For the supply of 4-in. weldless steel spigot and faucet tubes, for the rural district council.—Mr. H. Pritchard, engineer.

ENFIELD.—May 6th.—For the supply of 350 lin. yds. (more or less) of wrought-iron unclimbable fencing, 5 ft. high, and one pair of gates, for the urban district council.—Mr. Richard Collins, surveyor.

MADRAS.—June 17th.—For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer, and Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

Roads.

ANTRIM.—April 25th.—For resurfacing certain roads, for the county council.—County Surveyor, County Courthouse, Belfast.

SOUTHWICK.—April 27th.—For laying concrete slab paving in certain streets, for the urban district council.—Mr. G. W. Warr, surveyor.

YORK.—April 27th.—For excavating existing material of roadway, and laying concrete foundation and tar-macadam surface on about 1½ miles of main road, for the corporation.—Mr. F. W. Spurr, city engineer.

BLAENAVON.—April 27th.—For the supply of 850 tons of broken limestone and 150 tons of limestone gravel, for the urban district council.—Mr. E. W. Edwards, surveyor.

ASHFORD WEST.—April 27th.—For the supply of basalt and quartzite, for the rural district council.—Mr. A. Sims, surveyor.

YORK.—April 27th.—For making up with concrete and tar-macadam, for the corporation.—Mr. F. W. Spurr, city engineer.

FARNBOROUGH.—April 27th.—For the supply of broken granite, slag, or granite tar-macadam, for the urban district council.—Mr. J. E. Hargreaves, surveyor.

EAST SUSSEX.—April 27th.—For the widening, improvement, and reconstruction of the Lewes-Newhaven road, for the county council.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

FINSBURY. April 27th.—For paving work with creosoted deal on Portland cement concrete, for the borough council.—Borough Surveyor.

RUNCORN.—April 27th.—For the supply of broken stone, and granite tar-macadam, for the urban district council.—Mr. J. Wilding, surveyor.

LLANDAFF.—April 28th.—For flagging footpaths, for the rural district council.—Mr. J. Holden, surveyor, 20 Park-place, Cardiff.

GOSFORTH.—April 28th.—For making up a back street, for the urban district council.—Mr. G. Nelson, surveyor.

WOODFORD.—April 28th.—For making up certain streets, for the urban district council.—Mr. W. Farrington, surveyor.

BERWICK.—April 28th.—For the supply of machine-broken whinstone, for the corporation.—Borough Surveyor.

WATERLOO.—April 28th.—For making up a road, for the urban district council.—Mr. F. S. Yates, surveyor.

BELFAST.—April 29th.—For the supply of 280 tons of setts, for the Harbour Commissioners.—Mr. W. R. Kelly, harbour engineer.

LYDD.—April 29th.—For the supply of tarred Kent ragstone and basalt, for the corporation.—Mr. T. Kettle, borough surveyor.

BOLLINGTON.—April 29th.—For the supply of 300 tons of granite macadam, for the urban district council.—Mr. S. Knight, clerk, Council Offices, Bollington, near Macclesfield.

CHESTER-LE-STREET.—April 30th.—For making up certain streets, for the urban district council.—Mr. W. Ridley, surveyor.

WELTON.—April 30th.—For the hire of a 12½-ton steam roller with scarifier fitted, for the rural district council.—Mr. W. B. Danby, clerk, 2 Bank-street, Lincoln.

ASHFORD.—April 30th.—For the supply of unbroken Kentish ragstone and broken pit flints or coarse gravel, for the urban district council.—Mr. W. Terrill, surveyor.

ARGYLL.—April 30th.—For work of road maintenance, for the county council.—Mr. J. Thomson, surveyor, Strontian.

RICHMOND (Surrey).—May 1st.—For constructing granite sett paving, for the corporation.—Mr. J. Brierley, borough surveyor.

LANCASTER.—May 2nd.—For highway construction, for the rural district council.—Mr. W. Dixon, surveyor.

WHITWORTH.—May 4th.—For paving sections of the main road, for the urban district council.—Mr. J. C. Owen, clerk, Council Offices, Facit, near Rochdale.

WIMBLEDON.—May 4th.—For work of surfacing with asphalt or other bituminous material, for the corporation.—Borough Surveyor.

MADRAS.—May 4th.—For the supply of 400 40-gallon casks of tar, for the corporation. A copy of specification and conditions may be obtained at the office of The Surveyor, 24 Bride-lane, Fleet-street, E.C.

LONDON.—May 5th.—For paving work in Blackwall and Rotherhithe tunnels, for the county council.—Mr. G. W. Humphreys, chief engineer, Spring-gardens, S.W.

BARNET.—May 5th.—For private street works in Byng-road and Wentworth-road, for the urban district council.—The Surveyor.

ALDERSHOT.—May 5th.—For the supply of 100 tons of 2½-in. basalt, 200 tons of slag tar-macadam, 130 tons of ¾-in. and 1½-in. limestone tar-paving, and 1,750 yds. of 2½-in. Hungry Hill flints, for the urban district council.—Mr. F. C. Uren, surveyor.

EALING.—May 5th.—For making up Curzon-road (portion), Hope-road, Gumleigh-road, Ellis-road (portion), and Ealing Park-gardens (portion), for the corporation.—Mr. W. R. Hicks, borough engineer.

WREXHAM.—May 5th.—For making up certain streets, for the corporation.—Mr. J. England, borough engineer.

KINGSTON-UPON-THAMES.—May 6th.—For the supply of 2,000 tons of Guernsey, Quenast, or other granite, the whole to be broken so as to pass through rings having 1½ in. or 2 in. internal diameter, accord-

ing to percentages specified, for the corporation.—Mr. R. Hampton Clucas, borough surveyor.

ENFIELD.—May 6th.—For the supply of 780 yds. of granite kerbing, 780 yds. of granite channelling, and 4,100 yds. of artificial stone paving, for the urban district council.—Mr. Richard Collins, surveyor.

HAMMERSMITH.—May 6th.—For paving the carriageways of portions of Latimer-road, Bridge-avenue, and North Pole-road with creosoted deal blocks, for the borough council. Mr. H. Mair, borough surveyor.

STRETFORD.—May 9th.—For making up certain streets, for the urban district council.—Mr. Ernest Worrall, surveyor.

SOUTHAMPTON.—May 11th.—For laying tarpaving, for the corporation.—Borough Engineer.

COLCHESTER.—May 12th.—For making up tarpaved roads, paths, and surface-water drainage, for the Committee of Visitors of the Asylums.—Mr. H. H. Gepp, clerk, 57 New-street, Chelmsford.

ST. MELLONS.—May 12th.—For widening and improving part of Lighthouse-road, for the rural district council.—Mr. Gomer S. Morgan, engineer, Pontypridd.

WOOLWICH.—May 12th.—For resurfacing roads in Woolwich, Plumstead, and Eltham with asphalt, asphalt macadam, and wood and other material, for the borough council.—Mr. J. Rush Dixon, borough engineer.

LITTLEHAMPTON.—May 13th.—For scarifying and surfacing work, for the urban district council.—Mr. H. Howard, surveyor.

TANGIER.—June 8th.—For the construction of about 10 miles of road, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

CLARE.—For resurfacing and steam rolling, for the county council.—County Surveyor, Court House, Ennis.

Sanitary.

CHERTSEY.—April 27th.—For the extension of the Byfleet sewerage works, comprising 643 yds. of 9-in. and 7-in. Hassall's stoneware pipes, with manholes and appurtenances, also ejector chamber, and laying 1,420 yds. of 2½-in. cast-iron compressed-air main, and 194 yds. of 5-in. cast-iron pumping main, for the rural district council.—Messrs. Elliott & Brown, engineers, Burton Buildings, Parliament-street, Nottingham.

CHERTON.—April 27th.—For the collection and removal of house refuse, for the urban district council.—Mr. A. Atkinson, clerk.

HINDLEY.—April 27th.—For the construction of eight circular percolating filters, for the urban district council.—Mr. O. P. Abbott, surveyor.

ILFORD.—April 28th.—For the construction of a concrete tube sewer, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

SMALLTHORNE.—April 29th.—For drainage and paving works, for the urban district council.—Mr. J. W. Deane, surveyor.

OAKWORTH.—April 29th.—For scavenging certain districts, for the urban district council.—Mr. J. Spencer, inspector, Cooke-street, Keighley.

BRADFORD.—April 29th.—For the supply of 20,000 filter press cloths, for the corporation.—Engineer, Esholt Hall.

HARROGATE.—April 29th.—For the construction of a surface-water drain, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

WANDSWORTH.—April 30th.—For the construction of drainage works at Streatham cemetery, for the borough council.—Mr. P. Dodd, borough engineer.

LISKEARD.—April 30th.—For the construction of a drainage scheme, for the rural district council.—Mr. B. C. Andrew, engineer, St. Austell.

GRAVESEND.—May 1st.—For the construction of a cesspool, for the corporation.—Borough Surveyor.

KENT.—May 1st.—For the construction of a septic tank and incidental drainage work, for the Education Committee.—Mr. W. H. Robinson, architect, Sessions House, Maidstone.

BISHOP AUCKLAND.—May 4th.—For the supply of disinfectants, for the rural district council.—Dr. Macdonald, medical officer of health.

GOOLE.—May 4th.—For the construction of drainage works, for the Joint Hospital Board. Messrs. Chambers & Son, Belgravia, Goole.

STANLEY.—May 4th.—For scavenging work, for the urban district council.—Mr. J. Harris, sanitary inspector.

FEATHERSTONE.—May 5th.—For the construction of sewerage and other works.—Mr. S. Chesney, engineer.

HOOLE.—May 5th.—For the reconstruction of sewers, for the urban district council.—Mr. F. Davies, surveyor, 11 Newgate-street, Chester.

HOLMFIRTH.—May 6th.—For the construction of sewers and manholes, for the urban district council.—Messrs. J. Barrowclough & Son, engineers.

KENDAL.—May 8th.—For the supply of 100 ft. diameter sprinklers, floating arms, decanting and sludge valves, penstocks, sluices, cast-iron pipes, and specials, for the corporation.—Mr. F. W. Oxberry, borough surveyor.

WOOLWICH.—May 12th.—For the construction of main and subsidiary sewers, for the borough council.—Mr. J. Rush Dixon, borough engineer.

RICHMOND.—May 12th.—For the supply of Welsh steam coal, house coal, lime for precipitation, lime for sludge pressing, sulphate of ammonia, green copperas, and filter press cloth, for the Main Sewerage Board.—Mr. William Fairley, engineer, West Hall-road, Kew Gardens.

RHYMNEY.—May 18th.—For the construction of outfall sewer, storage tank, discharge pipe, and storm overflow pipe, for the Sewerage Board.—Mr. J. S. Alford, 9 Victoria-street, Westminster, S.W.; Messrs. Willcox & Raikes, 63 Temple-row, Birmingham; and Mr. T. J. Thomas, 36 High-street, Bargoed.

CHEPPING WYCOMBE.—May 28th.—For the supply and erection of steam engines, air compressors, air lifts, ejectors, and all necessary appurtenances in the extension of the sewage outfall works at Wycombe Marsh, for the corporation.—Mr. T. J. Rushbrooke, borough engineer and surveyor.

DEWSBURY.—May 30th.—For the construction of sewage disposal works, for the corporation.—Mr. Henry Dearden, borough engineer.

Stores.

SUTTON (Surrey).—April 22nd.—For the supply of road materials, ironmongery, oils, paints, coal, coke, horse forage, and team labour, for the urban district council.—Mr. W. Hedley Grieves, surveyor.

INVERNESS.—April 20th.—For supplies for the Gas Commissioners.—Manager to the Gasworks.

TEES VALLEY.—For the supply of road and valve boxes, brass castings, taps, ferrules, and general stores, for the Water Board.—Mr. Hugh Wilson, clerk.

Miscellaneous.

BRIGHTON.—April 21st.—For the supply of Portland cement, for the corporation.—Borough Surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted † Recommended for acceptance.
‡ Provisionally accepted.

BAILDON.—For the construction of detritus tanks, alterations to settling tanks, percolating filters and sludge filters, for the urban district council. Mr. J. N. Nicholson, Bradford:—

Kaye Brothers, Huddersfield	£1,824
Bushby & Son, Leeds	1,682
C. Chamberlain, Leicester	1,646
Pullar & Co., Pickering	1,596
J. & P. Obank, Bradford	1,454
J. E. Hardy, Bradford	1,396
W. J. Kendall & Co., Pudsey	1,337
T. Smith, Menston	1,276
E. Framley & Sons, Bradford	1,259
Ward & Tetley, Bradford	1,245

CROYDON.—For the execution of private street works, for the rural district council.—Mr. R. M. Chart, surveyor:—

DOWNS COURT-ROAD, CROYDON.	
H. Farrow, Brixton	£3,288
J. Mowlem & Co., Westminster	3,185
W. Hall, Thornton Heath	3,053
E. Hes, seur., Croydon	3,040
E. Free & Sons, Maidenhead	2,999
E. B. Yewen, Croydon*	2,897

CLIVE-ROAD, MITCHAM.	
H. Farrow, Brixton	£663
E. Free & Sons, Maidenhead	620
J. Mowlem & Co., Westminster	607
E. B. Yewen, Croydon	597
E. Hes, seur., Croydon*	591

BIRDBURST-ROAD, MITCHAM.

H. Farrow, Brixton	£435
E. Free & Sons, Maidenhead	390
J. Mowlem & Co., Westminster	389
E. B. Yewen, Croydon	377
E. Hes, senr., Croydon	377

WARREN-ROAD, MITCHAM

E. B. Yewen, Croydon	£223
J. Mowlem & Co., Westminster	216
H. Farrow, Brixton	214
E. Hes, senr., Croydon	205
E. Free & Sons, Maidenhead	199

MELROSE-AVENUE, MITCHAM.

H. Farrow, Brixton	£1,383
J. Mowlem & Co., Westminster	1,295
E. Free & Sons, Maidenhead	1,290
E. B. Yewen, Croydon	1,237
E. Hes, senr., Croydon	1,230

GODMANCHESTER.—For building a river wall, for the corporation. Mr. C. Mayfield, borough surveyor:

J. Allen & Sons, Brompton, Hunts	£203
Pearson & Wright, Huntingdon	182
C. Pettit, Godmanchester	160
J. L. Murphy, Huntingdon	154
F. Markham, Godmanchester	152
A. Pettit, Godmanchester	150

HORSFORTH.—For laying stoneware sewers, cast-iron rising main and manholes, for the urban district council.

Mr. H. Raven, engineer:	
Greaves & Wheeler, Calverley	£3,060
Arnold & Sons, Doncaster	3,058
Williams & Co., Cheltenham	2,311
J. Hudson, Horsforth	2,165
W. J. Turnbull, Leeds	2,100
Parkin & Furness, Horsforth	2,000

Engineer's estimate, £2,370.

LIVERSEDEGE.—For the rubble fencing walling to be constructed around the new circular sewage filters, for the urban district council.—Mr. A. Rothera, engineer and surveyor:—

S. Drake & Sons, Liversedge, £1,376.

MONAGHAN.—For the conversion of military barracks into eleven cottages, and the erection of sixteen new cottages, for the urban district council.—Mr. J. J. Inglis, Dublin:—

Section 1.—I. Copeland, Belfast, £995.
Sections 2 and 3.—R. Ritchie, Belfast, £2,089 and £218.

PONTYPRIDD.—For the execution of private street works, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor:—

BROOK-STREET.

S. Hewlett, Cardiff	£1,001
G. L. Morgan, Pontypridd	779
W. Jones, Llanbradach	772
D. Jones, Pontypridd	769
W. J. Davies, Pontypridd	737
A. G. Collins, Barry	721
H. Murray, Pontypridd	721

Surveyor's estimate, £704.

PRINCESS-STREET.

S. Hewlett, Cardiff	£1,318
G. L. Morgan, Pontypridd	756
D. Jones, Pontypridd	708
W. Jones, Llanbradach	704
W. J. Davies, Pontypridd	704
A. G. Collins, Barry	697
H. Murray, Pontypridd	684

Surveyor's estimate, £751.

EGYPT-STREET.

S. Hewlett, Cardiff	£351
G. L. Morgan, Pontypridd	264
W. Jones, Llanbradach	255
H. Murray, Pontypridd	253
W. J. Davies, Pontypridd	247
D. Jones, Pontypridd	244
A. G. Collins, Barry	237

Surveyor's estimate, £230.

NILE-STREET.

S. Hewlett, Cardiff	£658
W. J. Davies, Pontypridd	538
W. Jones, Llanbradach	475
H. Murray, Pontypridd	466
G. L. Morgan, Pontypridd	460
D. Jones, Pontypridd	458
A. G. Collins, Barry	415

Surveyor's estimate, £436.

OXFORD-STREET.

S. Hewlett, Cardiff	£613
W. Jones, Llanbradach	459
W. J. Davies, Pontypridd	456
D. Jones, Pontypridd	456
A. G. Collins, Barry	442
G. L. Morgan, Pontypridd	437
H. Murray, Pontypridd	433

Surveyor's estimate, £374.

DUKE-STREET.

S. Hewlett, Cardiff	£514
D. Jones, Pontypridd	369
W. Jones, Llanbradach	362
G. L. Morgan, Pontypridd	348
A. G. Collins, Barry	345
W. J. Davies, Pontypridd	343
H. Murray, Pontypridd	336

Surveyor's estimate, £324.

SOUTH SHIELDS.—For laying concrete on footways and back streets, for the corporation.—Mr. L. Roseveare, borough engineer and surveyor:—

G. Thornton & Co., South Shields.

SOUTH SHIELDS.—For the erection of a dispensary, for the corporation.—Mr. L. Roseveare, borough engineer:—

S. Sheriff & Sons, South Shields, £960.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

APRIL.

28.—Institution of Civil Engineers: Annual General Meeting of Corporate Members. 8 p.m.

MAY.

- Concrete Institute. Informal Meeting of Junior Members. 7 p.m.
- Junior Institution of Engineers. Mr. S. T. Robson on "The Control and Organisation of the Engineering Profession." 39 Victoria-street, S.W. 8 p.m.
- Institution of Municipal and County Engineers: Meeting at Dover.
- Institution of Municipal Engineers (with Society of Engineers): Mr. W. T. Taylor on "The Greater New York Water Supply Scheme." Institution of Electrical Engineers. 7.30 p.m.
- Institute of Sanitary Engineers: Mr. Guy B. Grave on "A London Builder's Experiences with Sanitary Officials in the Metropolis." 8 p.m.
- Royal Sanitary Institute: Annual Dinner, Langham Hotel.
- Institute of Sanitary Engineers: Visit to Metropolitan Water Board's Reservoirs at Chingford.
- Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham; Mr. A. S. Parsons on "Bridge Construction."
- Institution of Civil Engineers (Students' Meeting): Mr. A. A. Hudson, k.c., on "Engineering Contracts." 8 p.m.
- Institute of Sanitary Engineers: Visit to Eton Rural District Council's sewage outfall works at Gerrard's Cross. Train from Marylebone, 2 p.m.

JUNE.

- Institution of Municipal and County Engineers: Meeting in Dunfermline.
- Institution of Municipal and County Engineers: Meeting at Southend.
- Institution of Water Engineers: Summer Meeting at Stockport.
- Institution of Municipal Engineers: Western District Meeting at Tisbury. Mr. E. Plummer Davies on "Wiltshire Roads, Past and Present."
- Royal Institute of British Architects: Annual Dinner, Hotel Cecil.
- Institute of Sanitary Engineers: Visit to Luton sewage farm. Train from St. Pancras, 2.50 p.m.
- Institution of Municipal and County Engineers: Annual Meeting and Town Planning, Housing and Road Conference at Cheltenham.

JULY.

- Royal Sanitary Institute: Annual Congress and Exhibition at Blackpool.
- Institution of Mechanical Engineers: Summer Meeting in Paris.

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

PONTARDAWE RURAL DISTRICT COUNCIL.

CLERK OF WORKS.

The Council invite applications for the Appointment of a temporary Clerk of Works in connection with the Construction of a Ferro-Concrete Bridge under the Hennebique system. It is anticipated that the work will take about three months. Applicants must be good practical men, between 30 and 45 years of age, and must have had good experience in this particular class of work. The salary will be at the rate of £4 per week. Applications, endorsed "Clerk of Works," stating age, qualifications, and experience, and accompanied by copies of not more than three recent testimonials, to be sent to Mr. Wyndham Lewis, Clerk to the Council, Pontardawe, Glam., by April 28th. Duties to be commenced at once.

(1,532)

ULVERSTON URBAN DISTRICT COUNCIL.

Wanted, in the Surveyor's Office, a General Assistant at a salary of £1 10s. per week.

Candidates must be competent Surveyors, Levellers, neat Draughtsmen, and have a practical knowledge of Sewerage, Street Works, and Road Improvement Works, and be under 30 years of age.

Applications, in the handwriting of candidates, giving full particulars of present and previous appointments, age, &c., accompanied by copies of not more than three testimonials of recent date, with envelope endorsed "General Assistant," must reach me by the first post on Friday, May 1st, 1914. Canvassing will disqualify.

C. TELFORD HAGUE,

Surveyor.

Town Hall,
Ulverston.

April 21, 1914.

(1,542)

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BOROUGH OF HOVE.

Applications are invited for the post of General Assistant in the Borough Surveyor's Office. Salary, £104 per annum.

Candidates must have had experience in the work of a Borough Surveyor's Office. Applications, stating age, experience and qualifications, with copies of three testimonials, to be sent to the undersigned not later than the 25th inst.

H. H. SCOTT,
Borough Surveyor.
(1,521)

April 14, 1914.

COUNTY OF STAFFORD.

The Staffordshire County Council invite applications for the post of Assistant Surveyor of Main Roads. The person appointed will be required to devote the whole of his time to the discharge of his duties, and to enter upon same on an early date.

The salary will commence at £175 per annum, rising to a maximum of £250 per annum, as follows: After 1½ years' service £200 per annum, after a further 5½ years' service £225 per annum, with a further annual increment of £5 after each succeeding year's service, until a maximum of £250 per annum is reached.

Candidates must have good practical knowledge in the maintenance of roads, and be accustomed to the management and organisation of labour.

Applications, endorsed "Assistant Surveyor," stating age (not over 45), present occupation and past experience, accompanied by testimonials (not more than three), to be sent to me on or before the 1st day of May, 1914.

Further particulars of duties and terms of engagement can be obtained on application to the undersigned.

JAMES MONGUR, ASSOC.M.INST.C.E.,
County Surveyor.

County Buildings,
Stafford.
April 16, 1914. (1,531)

GUILDFORD RURAL DISTRICT COUNCIL.

The Guildford Rural District Council invite applications from qualified persons as Clerk of the Works in connection with the Construction of Four Bridges, one being Ferro-Concrete on the Hennebique system and the others Steel and Brick.

The person appointed must be experienced in Ferro-Concrete and Bridge Construction generally, and will be required to take up the appointment about the middle of May, the salary being at the rate of £3 10s. per week.

Particulars and Forms of Application can be obtained from, and must be sent, accompanied by copies of three recent testimonials, to me the undersigned, not later than Saturday, the 9th day of May.

JOHN ANSTEE,
Engineer to the Council.

Commercial-road,
Guildford.
April 21, 1914. (1,540)

BOROUGH OF MAIDENHEAD.**TEMPORARY ASSISTANT.**

A Temporary Assistant with sound Architectural experience and some knowledge of Quantities is required immediately in the office of the undersigned.

Six weeks' engagement certain, at a salary of £2 10s. per week.

Applications, with one recent testimonial, to be delivered on or before Wednesday, 29th April, 1914.

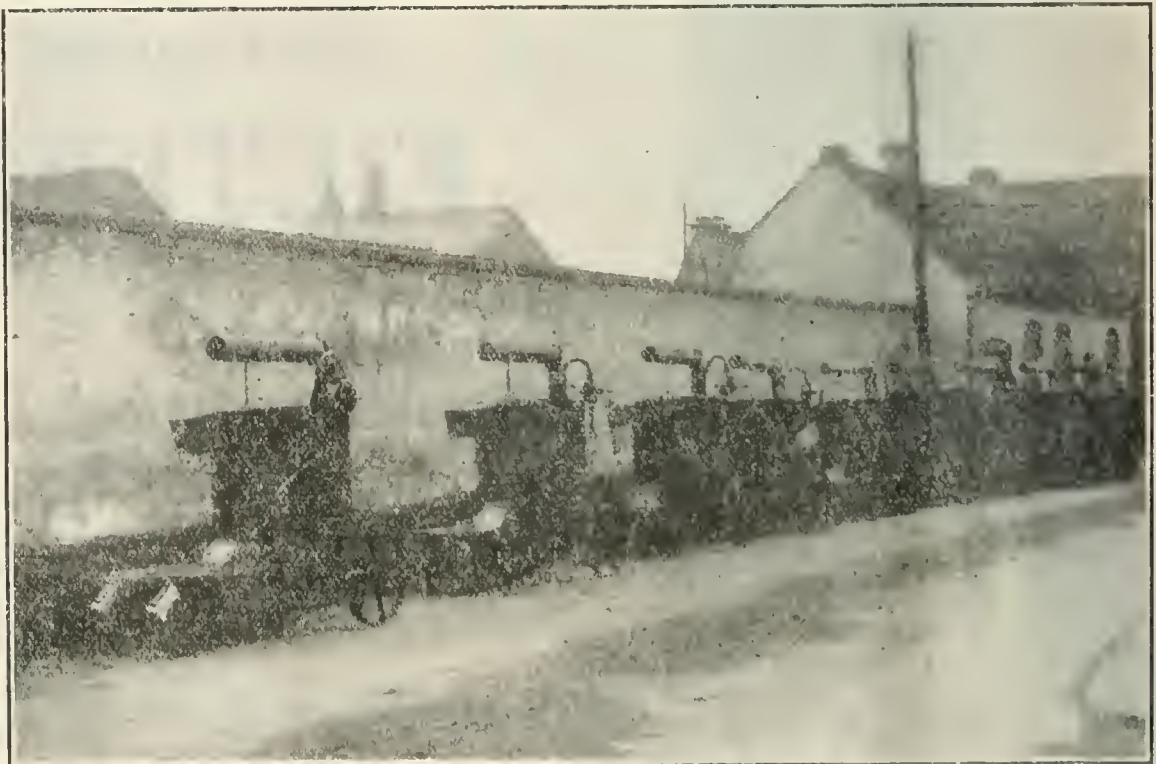
PERCY JOHNS, ASSOC.M.INST.C.E.,
Borough Surveyor.

Guildhall,
Maidenhead.
April 21, 1914. (1,541)

CLERK-PUPIL Wanted by Surveyor to Rural Council (F.S.I.). Important engineering schemes in hand. Premium low, as small salary will be paid for clerical work.—Apply Box 1,415, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,538)

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The Surveyor

And Municipal and County Engineer.

Vol. XLV.

MAY 1, 1914.

No. 1,163.

Minutes of Proceedings.

Exchequer Grants in Aid of Roads: Sir George Gibb's Memorandum.

We have pleasure in reproducing, with Sir George Gibb's permission, the valuable memorandum on Exchequer Grants in Aid of Roads, which is printed as an appendix to the final report (England and Wales) of the Departmental Committee on Local Taxation. The greater part of the memorandum appears in our present issue, and the remainder will appear next week. The memorandum begins with a brief outline of the present position as regards the classes and mileages of roads maintained by the various highway authorities, and the sources from which, in each case, the funds for the maintenance of these roads are derived. The way in which local ratepayers have become liable for the costs of maintaining roads is then explained by means of a lucid historical summary. "It is very important," we read, "to remember, in connection with any discussion of the claim of local ratepayers to State assistance, that before turnpikes existed there was no settled policy that all roads should be made and maintained at the cost of ratepayers." The fact that at common law parishioners were liable to maintain all public roads led to the responsibility for the maintenance of turnpike roads being thrown upon the local ratepayers when these roads were disturnpiked. In 1882 the burden was partly shifted on to the State, but as regards the share of the cost borne by the Imperial Exchequer, Sir George Gibb shows, further on in the memorandum, that it is only some portion, not easily to be determined, of a sum of less than £1,500,000, and is probably about £1,280,000, the estimated figure for 1908. The value of the contribution is, moreover, heavily discounted by the inequalities in its distribution. It may here be pointed out that the number of turnpike trusts in the year 1864 was 1,100, not 11,000 as printed in the report, the error being, of course, too obvious to mislead any one who knows anything of the subject. The memorandum proceeds with a summary of the main provisions of the Act of 1888, and Sir George Gibb expresses the opinion that the conclusions to be drawn from the history of main roads are that the claim of local authorities for substantial contributions to the cost of maintaining disturnpiked roads is indisputable, and that the existing classification of main and other roads is practically useless as a basis for the distribution of Exchequer contributions. With both these conclusions we fully agree; and as regards disturnpiked roads, we may remind our readers that in our Special Coming-of-Age issue, January 17, 1913, our "Highways" article contained a sketch of the conditions as regards turnpike roads in the 'thirties, with special reference to certain counties repre-

sentative of important areas. The total mileage of disturnpiked roads which became main roads is given in the memorandum—12,553 miles in rural areas, and 1,567 in urban sanitary districts; so that about half the rural main road mileage is of turnpike origin, and more than a third in urban districts.

Sir George explains very clearly the financial position as regards State contributions towards the cost of maintenance of disturnpiked and of declared main roads, and shows, with striking examples, how great are the inequalities between different counties as regards the burdens borne by the local ratepayers. The inequalities between counties are shown in the table accompanying the memorandum, and reference is also made to inequalities between rural districts, and between county boroughs and adjacent counties. As regards some of the natural and inevitable differences which exist between different areas, we do not quite follow Sir George to his conclusion that such differences cannot be taken into account in distributing Exchequer grants for road maintenance. We have, in fact, expressed the definite opinion that a considerable number of factors affecting costs, factors such as the nature of the soil, the pursuits of the inhabitants, and the cost of road materials, might properly, in their combined effect, be taken into account as one basis of such distribution of grants. There are inequalities in the relation of local traffic to the rateable value of the persons causing the traffic. For instance, in several rural districts South of London there are many persons owning motor vehicles whose direct and indirect contributions to the rateable value of the district are relatively very small, though they contribute largely to Imperial taxation and to the Road Board funds. We do not therefore agree with the conclusion that "in order to adapt State assistance as far as possible to the varying cost of the main roads in each county, grants in relief of road maintenance should take the shape of definite proportions of actual expenditure, and that some provision should be made for making grants in special cases"—that is, we do not consider this adequate without a corresponding provision for roads other than main roads, nor adequate unless, in addition to the provision for special cases, there is to be a logical general provision for a distribution of regular grants, based upon a number of factors affecting the financial position. With the conclusion that the substitution of unallocated assigned revenues was a most unfortunate step as regards the road system we agree, and we are glad to find that Sir George Gibb brings to the notice of the Government Committee the fact that the present system may lead to roads being imperfectly or wastefully maintained.

Classification of Roads.

The next part of the memorandum deals with the important subject of road classification, and a number of extracts from the report of the Departmental Committee on Local Taxation, of 1901, and the separate reports of members of the committee are followed by an excellent presentation of the position to-day as regards traffic and the costs of maintenance. Next comes the recommendation that roads should be divided into four classes: Subsidised main roads (50 per cent Exchequer grants), subsidised county roads (30 per cent Exchequer grants), county local roads, and district roads. It is also recommended that a loan fund should be created, to be administered by a central authority, from which local authorities might borrow without interest "for the purpose of enabling them to strengthen and improve road crusts." The sum of £5,000,000 is mentioned, and it is suggested that at an average cost of £500 a mile, 10,000 miles of road could be improved in the manner indicated. We trust that if such a fund be created it will not be used mainly for the purpose mentioned, which suggests the influence of the advice of motorists rather than that of highway engineers. We have often urged in these columns the importance of recognising the fact that in most places where crust reconstruction, or substantial improvement, is desirable, works of a different kind are even more desirable, or, at any rate, should be done first. In some cases these other works are the more important, first and last. It would seem to be far better to use such a fund as this for primary improvement, and for such improvements as cannot conveniently be made from year to year, with the help of Road Board grants, from their fund of about £1,250,000 per annum. We also wish to put in a plea for the roads which would fall into the third and fourth of Sir George Gibb's four classes. The improvements which are desirable on these roads would usually cost but little per mile, but the improvement of considerable mileages should be undertaken as single works. Crust improvements, on the other hand, can usually be carried out a mile, or a furlong, at a time, without prejudice to the quality of the work. We are, however, fully in accord with the principle that if fairly heavy expenditure is to be met by loans these should be for short terms—the shorter the better—and free of interest. To pay for the privilege of spending one's own money is a logical absurdity, except when the gambling element justifies it—financially.

The traffic relations between large urban areas, cities and county boroughs, and neighbouring administrative counties are excellently described in the memorandum, with convincing examples, and the conclusions to which Sir George Gibb arrives with respect to financial requirements seem to be quite sound. As regards the passages relating to county surveyors and their staffs, the recommendations are in harmony with what has been the consistent policy of this journal for many years, and we are glad to find the phrase "subject to a central authority being satisfied as to the qualifications, duties, and tenure of office of the county surveyor." It must be realised that, in this connection, Sir George Gibb was able to refer only to such points as could properly be included in a memorandum forming a part of a report on local taxation; but, in view of his reference to the fact that half the salary of a sanitary inspector is paid by the State, we should have been glad to find a further recommendation that surveyors to district councils should, in their capacity as road surveyors, be in a similar position to that of the county surveyor as regards pay and tenure of office. We know, of course, that Sir George Gibb would not countenance a policy tending to the neglect of roads of the humbler classes, or to the thrusting aside of district surveyors from participation in a scheme of administrative reorganisa-

tion, and we do not for a moment suggest that the omission referred to ought to bear the interpretation which some might be willing to place upon it. As regards the proposed classification, we regret that the Departmental Committee did not see fit to accept the recommendation. Whatever be the system of road administration, the facts as regards the nature of the roads and of the chief classes of traffic point to the desirableness of recognising a class comprising a relatively small mileage of the most important trunk roads, without doing away with the class comprising the ordinary important main roads of the counties. Obviously, if this be accepted, the rest of the roads cannot be regarded as falling into one class. If we start at the other end of the scale, the roads now regarded as by-roads, many of them narrow lanes or moorland roads with very little traffic, cannot be included with roads regarded as ordinary district roads of some importance, or the less important secondary roads. We need, in fact, two classes before we come to main roads of ordinary importance, or even to those of definitely less than average importance, of which there is a large mileage; and above this class there must be at least one more. Most competent authorities recommend four classes. For instance, the British Committee reporting to the Third International Road Congress on the subject of statistics and cost of construction and maintenance, recommended that there should be four classes: Second Class District, First Class District, County Main Roads, and a class which they called "National Roads," the major share of the cost of which should be borne by the State, the maintenance of these roads remaining in the hands of the county councils. The ordinary county main roads cannot, in fact, be regarded as in the same class as *those parts* of certain trunk roads on which the traffic is especially heavy. Sir George Gibb's memorandum concludes with a very useful summary of his recommendations and of the procedure suggested for giving effect to them, and this summary, as well as the whole of the memorandum and the accompanying tables, should be very carefully studied by all road surveyors and members of local authorities.

* * *

Sanitary Administration of Dartmouth.

The report which Dr. Mivart has just presented to the Local Government Board on the sanitary circumstances and administration of Dartmouth is a most interesting document, and illustrates both how things ought *not* to be done and how appointments ought *not* to be made. In introducing his conclusions, Dr. Mivart points out that a number of weighty questions, gravely affecting the good government and health of the borough, are awaiting consideration by the town council, whose supineness for many years past has permitted the gradual growth of a large number of insanitary conditions, many of them now difficult of abatement. A perusal of the report shows that these severe words are amply justified. The council have lamentably failed in their duty as regards ordinary administration and in the discharge of their obligation systematically to inspect their district under the Housing, Town Planning, &c., Act, 1909. Further counts in the indictment are absence of public water supply to many houses of the poorer class, the discharge of the sewage without treatment into the River Dart, the absence of by-laws as to the drainage of existing houses, and insanitary means of refuse disposal.

In some ways the most interesting part of the report is that which deals with administration. It is pointed out that the inspector of nuisances, Mr. Frederick John Voisey, formerly for some years in business as a builder, possesses no sanitary certificate, and has had no previous experience as to his present duties.

Some years ago he was a town councillor, but gave up office and remained "off" the council. In October, 1912, however, he was again elected a town councillor, resigning office three months later in order to become candidate for "the combined office of surveyor, water engineer, and sanitary inspector," applications for which were invited by advertisement dated January 24, 1913. The advertisement stated that "Canvassing of members of the corporation either directly or indirectly will disqualify an applicant. Applicants must state salary required." Mr. Voisey was appointed in preference to some 108 other applicants, many of whom are stated to have had experience of the duties or to have possessed certificates of sanitary knowledge obtained, after examination, from the Royal Sanitary Institute or other similar bodies. At the time this appointment was made it seems to have been understood that Mr. Voisey himself would study sanitary work with a view to obtaining such certificate, but he does not seem to have taken, or to be about to take, any active steps in this direction, and the report states that he appears to have little knowledge of the duties of his office. In this connection it is interesting to refer to our observations at the time he was appointed. In a "Minute" which appeared in our issue of February 21, 1913, we criticised the appointment of Mr. Voisey, and every word that we then wrote has apparently been justified. The matter having now come directly and officially before the Local Government Board, it is to be hoped that some drastic action may be possible.

* * *

The Improvement of Calcutta.

An exceedingly interesting and comprehensive report on the condition, improvement and town planning of the City of Calcutta and the contiguous areas has been prepared, at the request of the Calcutta Improvement Trust, by Mr. E. P. Richards, the chief engineer to that body. The compilation of the report, some extracts of which appear elsewhere in this issue, has occupied the author for over a year, and the amount of labour involved in its preparation must have been enormous. The main problems with which the report deals are three in number—namely, the city main roads, slums and rehousing, and suburban planning and development. In the case of Calcutta, the first of these problems presents unusual difficulties, inasmuch as there is at present no general or proper connection between the city and its suburbs. In the case of most cities suburban main road planning depends on an already existing and well-developed city street system, but the peculiar conditions of Calcutta have necessitated the design of a new system of main roads for the city itself. For this purpose no fewer than nine separate schemes have been prepared—in itself an evidence of the thoroughness with which Mr. Richards has done his work. The basis of the scheme ultimately selected for adoption is an "ideal" design, showing complete access to and from the city and suburbs, and internally to and from a series of focal centres, which are themselves completely joined up. It embodies the best plan for the city which in any circumstances could be regarded as reasonably practicable, but it is, nevertheless, beyond the means at present at the disposal of the Trust. This ideal scheme, with a general reduction of road widths and the elimination of all absolutely non-vital roads, but with certain added improvements, constitutes the scheme which is recommended as being the best possible under all the limiting conditions. If this scheme were carried out, the total estimated expenditure on internal city main roads would be no less than £3,750,000. Dealing with the present extent and condition of slum and

insanitary property, the report points out that the inevitable evils are aggravated by reason both of the excessive height of the buildings and the narrowness of the streets, with the consequent reduction in the amount of available open space. The result of these appalling conditions appears in an infant mortality rate which is about three times that of European slums, and the highest recorded mortality from tuberculosis. This terrible state of affairs has been produced by the lack of by-law control in the past, coupled with a great deficiency in main roads for rapid transit to outlying districts. Mr. Richards points out that the areas to be dealt with are so vast that the expense of acquisition and demolition, except in the very worst districts, would be prohibitive. He is therefore constrained to recommend the undertaking of the repair of insanitary property on a wholesale scale. Finally, the report deals with the town planning of the outlying districts with a view to future development, and points out that an ordered, carefully designed street plan, divided into segments by the great main roads to be constructed in the future, must be designed for the whole of Calcutta, and carried into execution as and when required by natural expansion. The report is a bold one, inasmuch as Mr. Richards has not hesitated to insist upon the inadequacy of the funds at the disposal of the Trust, and the need for further legislation if Calcutta is to be transformed into a city of beauty and health. While this new legislation is being obtained, the work of rehousing should be pressed forward, thus preparing the way for the creation of the internal main roads and the inception of a scheme of slum repair.

* * *

The Architect as Structural Engineer.

It is not often that a paper read before a professional society is written in direct criticism of opinions expressed at a former meeting, although in our view such a proceeding is entirely commendable as being calculated to act as a tonic and stimulant to the meetings of such bodies and to those who contribute to their deliberations. The paper on "The Architect and Structural Engineering," which Mr. William E. Brown, A.R.I.B.A., read at the last meeting of the Concrete Institute, was the outcome of certain observations which had been made in the course of the discussion on Mr. Cocking's paper a few weeks ago [THE SURVEYOR, March 13th], and constituted a defence of the ability of the architect to deal with the structural portions of a building. Although the term "structural engineering" in its wider sense includes many other matters, Mr. Brown dealt particularly with steelwork, and with a statement made by Mr. Cocking as to the relative positions of the engineer and architect as regards the design and construction of a steel frame building. The question is one of importance, not only to architects and engineers, but also to building owners, and it was dealt with by Mr. Brown in the proper spirit. Without attempting in any way to belittle the status of the structural or consulting engineer, he emphasised that it is the duty of the architect to determine at least the positions of all the girders and supports in the building he designs. He should also be able to make the necessary calculations for the steelwork of ordinary buildings, even though lack of time or the magnitude or special nature of the work might sometimes lead to the employment of a specialist for this purpose. In such a case the relationship should be something like that of practitioner and consultant—a relationship which is well known, in every great profession, and one which can be worked to the benefit of every party concerned. A summary of Mr. Brown's paper, which also dealt with many matters of practical interest, will be found in another column.

Calcutta : Its Evils and Required Improvements.

By E. P. RICHARDS, M.INST.C.E., F.G.S., M.R.SAN.I., Chief Engineer to the Calcutta Improvement Trust.

[The subjoined matter is extracted from a report which Mr. Richards has prepared at the request of the Calcutta Improvement Trust, whose chief engineer he became in 1912 after a short service as City Engineer of Madras. The exhaustive character of Mr. Richards' report will be realised when it is stated that it covers nearly 400 foolscap pages, and is accompanied by numerous maps and plans explanatory of the matters with which it deals. So comprehensive is it that it is quite impossible in the space at our disposal to do anything like justice to the contents, but the "Minute" on another page will, we trust, furnish some slight idea of the manner in which Mr. Richards proposes that the difficulties with which the Improvement Trust are confronted can best be overcome.]

Calcutta has been built mostly on the left bank of the Hugli river, is situated in the giant delta of the Ganges, and occupies a south-central position in the interminably flat, marshy plain of Bengal. South-east from Calcutta the swampy and low-lying flat land extends 80 miles without a break to the sea; west, north and east for 80, 150 and 180 miles the same flat, low-lying land extends from Calcutta without scarcely a single hillock appearing. This vast plain is composed mostly of the finest silt—an intimate mixture of fine sand and clay particles—underlaid deeply by saturated gravels.

The railways have been brought to Calcutta on hundreds of miles of embankments, almost every one raised from the dug-out ponds and tanks that now border them on each side for mile after mile. Countless bridges convey the railways over the channels that intersect the delta. In old days the Calcutta site was wellnigh inaccessible by road, and the river Hugli was then, as it is still to-day, the greatest highway of trade.

The river at Calcutta varies from about 500 to 1,300 yds. wide, and from about 25 to 70 ft. deep, according to tide and position—for the river is tidal, and has a maximum range from this cause only of some 20 ft. between high and low water, although the sea is 80 miles distant. So flat and low-lying is the site of Calcutta, that a really big marine wave, caused by an earthquake, would almost certainly reach and might wellnigh wipe out Calcutta. It has even been argued ironically that such would give town planning an excellent chance. Exceptional high tides, especially when combined with river-flood, or with a strong southerly gale, cause flooding in Strand-road and other localities.

The city on the east is bounded closely by actual swamp and salt lakes, and less closely by swamp lands on the south-east and south-west. Land along the river banks is higher in general than land half a mile away, and is very definitely higher than land one mile away. This is due to frequent ancient overflows of the river. The flood-borne silt was caught and deposited in the grass and vegetation extending from each side of the river, and these tracts were thus raised above the general swamp-plain. The same phenomenon occurs, and has occurred on a big scale, in nearly all great deltas.

This site condition of extreme flatness and low-level is a very grave disadvantage to any modern city.

CLIMATIC CONDITIONS.

The climate is so moist, and the silty ground so wet and low, that good grass, most grateful to the eye, covers the great Maidan almost the whole year round, thinning and browning only in May and early June. Vegetation flourishes exceedingly, and after the rains the great delta plain round Calcutta becomes a sea of level, brilliantly green rice fields, broken only by dark palms and the tall, reed-like jute crops. The climate of Calcutta, plus the crowded condition of the city, is trying both to Europeans and Indians, but especially to the former. Death rates are very high.

THE CITY MASS CHARACTERISTICS.

Dalhousie-square is about the centre of gravity of the city, and is the main focus of business and administration of traffic and tramways. It touches on the oldest fort-site, the first and original chief focus of growth. From Dalhousie-square the dense built-up city extends northwards for almost 3 miles to Cossipore-Chitpore; eastwards to Sealdah for 1½ miles; southwards, with decreasing density, the city curves round outside the east and south boundaries of the Maidan, through Ballygunge to Kidderpore; the south-east limit of the building area being about 3 miles, and the south-west limit about 4 miles from Dalhousie-square.

One of the next most salient features on the Calcutta map is Circular-road, girdling on north, east and south, the internal oldest and most densely built-up portion of the city, and forming with the Hugli and Tollys Nullah the ancient line of the Mahratta Ditch. Circular-road now forms perhaps the sole long, broad, nearly perfect example of a big city road in Calcutta. Unfortunately, it is in a very secondary position, and much of its comparatively small traffic is due to the absolute want of normal roads and routes for such traffic.

A straight line drawn from Howrah Bridge to the east end of Park-street divides the mass of the city into two bodies of very different character. All that lies north and east of the line is of intense density, is almost streetless, and is served by an abnormally sparse set of right-angle, narrow main roads, which bound some nineteen huge blocks of property. These latter contain about 2,500 acres of streetless property, arranged anyhow. This slum-like city mass, north and east of the Howrah Bridge to Park-street line, houses the bulk of the population of Calcutta, and contains both the best and worst of the Indian residential quarters. In this section lie also the chief Indian markets, shops, bazaars, and places of business. Along the river north of the bridge are the most important of the sacred bathing ghats, and there, too, is the greatest activity in light river traffic and shipping.

In the past this main section of Calcutta was shut in from free expansion by the Mahratta Ditch, and later by the Circular Canal forming an outer parallel; still later by the railway embankment; and always by the nearness of swamp conditions. It is now one of the densest city areas in the world, and contains on an average not more than 12 per cent of open total space in squares, streets and passages. Portions contain only 5 per cent in open space of all kinds, both public and private.

Owing to the natural physical conditions already described, the chief district road traffic enters Calcutta from the north and north-east, and that from the north-west, west, and a portion of the south-west, enters Calcutta by Howrah Bridge—i.e., it enters on the west centre pivot of densely built-up Calcutta. This concentration of road traffic on the north, north-east and north-west has assisted in some degree to produce the great density of the north half of Calcutta.

South-west of the same line, drawn from Howrah Bridge to the east end of Park-street, we have in general quite different conditions. All around Dalhousie-square, and arranged in a moderately good street system, are built the chief British business houses, the banks, the exchange, the seats of Government, and the public offices. Following along the line, we find just south-west of it the leading hotels and more European business premises, bringing us *via* Old Court House-street and Esplanade East to Chowringhee—the combined Oxford-street, Piccadilly and Park-lane of Calcutta; this development along the Maidan edge continues southwards in a thin band along Chowringhee front, and brings one to the Park-street area, the only section of all Calcutta that has a really decent street system. It is almost purely residential, chiefly European, with a sprinkling of Indian.

South-east of Park-street area is the huge, undeveloped, thinly peopled suburb of Ballygunge, more and more waterlogged and crammed with tanks as one penetrates south, yet a very promising area.

Bhowanipore, owing its existence and much denser population almost solely to the Chowringhee tramway service, occupies a position south of Park-street area and the Maidan, and is an increasingly popular Indian residential district.

Due south of the racecourse, and extending to the Tollys Nullah Canal, is Alipore, an English-Indian residential suburb likely to be shut in, injured and

encroached on by the future railway and dock extensions of Kidderpore, and the working-class dwellings they will bring in their train. Alipore is hardly in a sound position for development as a high-class suburb.

Lastly, on the left bank of the Hugli, we have Kidderpore, a straggling and vitally important industrial railway and shipping area, growing up fast, badly, anyhow, criminally undisciplined, and like every other suburb and section of Calcutta, choking and diseasing itself for want of order, plan and direction.

Howrah remains to be outlined. It owes its original growth chiefly to the East Indian and Bengal-Nagpur Railway passenger and goods termini at Howrah Bridge and Shalimar. Howrah has now become in reality the most important manufacturing district of Calcutta; it is also an increasing residential suburb.

THE ROAD AND STREET SYSTEM.

In the existing road and street system of Calcutta we notice the following striking defects:—

(1) The maximum density of building and population concurs, unfortunately, with the least provision of roads and streets.

(2) The city exhibits in general a rectangular system

and east there are far too few outlets, and these are each troubled by the same inadequate type of bridge bottle-neck.

The obstacles to free main road extension are chiefly the canals and railways on the north, north-east and east. On the south-west Kidderpore docks and railway yards, and their future extensions, offer an impediment that must be met fully, and be overcome. On the west is the Hugli, the present sole route across this great natural barrier being the Howrah Bridge. A new and very wide bridge is required to replace the existing 60-ft. structure, and a very real want is a second big bridge at Aheeritolla.

The above items relate only to main roads. A casual glance at the Calcutta plans shows instantly that the city, as a whole, actually possesses no streets. There are but two small areas in Calcutta having the normal street system which is found throughout the whole area of almost every city in the world.

This enormous lack of streets throughout the mass of Calcutta is a giant defect, and of extreme gravity. It is hardly necessary to remind ourselves that normal cities are composed of streets, forming the unbroken small, close mesh between many big main roads. The plan of Calcutta is composed of a dozen main roads,



TYPICAL VIEW IN THE BUILT-UP MASS OF CALCUTTA.

Mud and bamboo bungalow in foreground, enclosed by streetless better-class property.

of main roads, the meshes being many times larger than those of any other city—i.e., the roads are far more widely separated than is normal.

(3) The roads forming the rectangular system are of very unequal width and traffic capacity, and there is no ordinary relation between width and position. Some of the best roads are so placed that they carry but a small traffic.

(4) There is a very great lack of diagonals.

(5) There is scarcely a single true radial direct route out of or into the main focus of the city.

(6) The north and south main road parallels—which normally should increase in width, traffic capacity, and nearness to each other, as they become closer to the riverside—positively decrease in reverse ratio. This is a grave defect in a riverside port.

(7) The normal and vital riverside road of Calcutta Strand-road is comparatively very narrow indeed, and lies out suddenly in the middle of what should be its northern half.

(8) Detached fragments of main road lie about the map haphazard.

(9) The city main road inlets and outlets on the north are fairly well placed, but are constricted by hopelessly out-of-date bridges and approaches. On the north-east

thrown down criss-cross and far apart, as it might be done by a child from a handful of sticks; between these distant, narrow, over-burdened main roads lie immense compressed streetless jumbles.

Quite apart from main roads, it would cost, to provide Calcutta with a fairly normal street system, such as is possessed by every western city, or such as is possessed even by Madras, not less than £15,000,000, apart from the cost of impossible rehousing problems that would arise. Remedial gradual measures during the next century will have to be the reform policy for this grievous state of things. The first want in the existing road and street system of Calcutta is seen to be that of more main roads, and secondly the logical working into a main road system, and the sensible inter-connection and improvement of every useful piece of main road we already possess.

SLUM AREAS IN THE CITY.

Lack of a street system indicates its concomitant—i.e., built-up Calcutta contains slum areas of an extent and a density undreamt of in European cities. The subject is dealt with in six chapters of this report, and it is sufficient at this point to mention that there are 2,500 acres of streetless property in built-up Cal-

cutta. The various slum blocks are found from Cossipore almost to Park-street, and from Sealdah to the Strand, and are separated from each other, in most cases, only by the main roads and the better buildings that line them. Judged even by a very low sanitary and housing standard, at least 800 acres of the above 2,500 acres must be classed as rank slum.

PARKS AND OPEN SPACES.

The Maidan, forming a great park of 800 acres, occupies a south-west-west central position in relation to the city whole. It is a little larger than Hyde Park, London, and is, perhaps, the finest possession of Calcutta, and is so placed as to be fairly close and accessible to about one-quarter of the inhabitants of the city. It is, unhappily, too far south to be of any daily use to the dense population of north Calcutta; nevertheless, it is a most valuable large city reservoir of open space and decently fresh air, and without the Maidan and the zone of modern buildings that bound it on the north and east, Calcutta would be something of a hell.

With the exception of the Maidan, Calcutta is very badly off for parks and open spaces. In the mass of built-up Calcutta there are but six open spaces worthy of much notice. The largest is Dalhousie-square, which measures between the building lines about 1,000 ft. by 1,000 ft., but the actual square is only about 800 ft. by 800 ft., and out of this the best and most central part is occupied by a very plain tank, almost certainly breeding mosquitos and serving no very definite purpose, but confining the public

most attractive and useful park in Calcutta. They are closely accessible by tram.

Three miles west of the Zoological are the Botanical Gardens, situated far away in the southern extremity of Howrah, and almost inaccessible from Calcutta, except by occasional ferry. These grounds are park-like, admirably cared for, and have been ably designed. They are full of solemn beauty, quiet and dignity. Usually, the grounds are almost quite deserted, and they are at present of little or no value to the Calcutta populace, who are cut off from them by the lack of tramways over Howrah Bridge, and by the lack of any tramway going nearer than 2 miles to the gardens. Then, also, the road from Howrah Bridge is an almost continuous 4 miles of dusty, congested and hideous street and lane. We must therefore reluctantly dismiss these noble glades as not being available for the people of Calcutta.

The only other park-like enclosure is that belonging to the Body Guard Lines, whose large exercise ground lies out to the south-east in Ballygunge; it is not, of course, open for public use.

TRAMWAYS.

The tramways of Calcutta do not belong to the city, but to a limited liability company.

The city (apart from Howrah) is served by about 31 miles-run of 4-ft. 8½-in. gauge tramway route—mostly of double track, the cars being of the usual electric-driven, overhead trolley-pole type. The main city focus of tramways is Dalhousie-square. The tracks and rolling stock are good, and there are



MID-DAY TRAFFIC IN CANNING-STREET, CALCUTTA.

to the narrow strips that lie between the tank and the traffic-filled roads. This square can be immensely improved, beautified, and made far more valuable both to the public and to traffic, at a trifling cost—as will be shown later on.

Four of the other noticeable city squares all lie at intervals along the east side of the long single north and south road known by so many parts and names: Cornwallis-street, College-street, Wellington-street, Wellesley-street, and Wood-street. The dimensions of these four squares vary between about 500 ft. to 700 ft., by 300 ft. to 500 ft. Three of them are very much occupied by plain, colourless and useless tanks. No real skill or thought has been expended on their lay-out. Chitpore-road possesses a square at Beadon-street, and this has been rather nicely laid out: it measures about 500 ft. square. Several little open spaces, like Jorapuker-square, lie hidden in the dense built-up city mass.

The north half of Calcutta is very badly in want of a good sprinkling of green, small open spaces to be used as playgrounds for children and sitting-out places for adults. The big Maidan—one, two or more miles away, or the usual "town-planning park" clapped down far away out in the suburbs, and containing on most days about half a child per acre—these would be of no service to the 600,000 people crammed into built-up northern Calcutta.

In southern Calcutta, and almost touching the Maidan, are the Zoological Gardens, about 800 yds. by 400 yds. in extent. They have been laid out with very great taste and skill, and are maintained in excellent order. After the Maidan, they form the

plenty of cars, but the abnormal narrowness and scarcity of Calcutta roads is a great hindrance to the tram service, and the mileage works out to be only one quarter of that found in cities of the same size as Calcutta.

On the north and east all the tram routes stop abruptly on the edge of the closely built-up city. The great south-east would-be suburban areas are absolutely devoid of any tram service, or of any main road able to take such a service; and it is only in a south direction that Calcutta tram routes run out into suburban areas in a manner resembling the normal of all other cities.

No tram route crosses the river by the Howrah Bridge. During the past twenty years this lack of tramway tracks and bridges into Howrah has much helped in the shocking and increasing building congestion of North Calcutta.

The length of roads and streets traversed by tramway track in Calcutta, as stated above, is only some 31 miles, and in Howrah we find but a little over 4 miles. These exceedingly low figures are in keeping with the abnormal lack of roads, the quite neglected condition of all suburbs, and the dense central congestion. No city to-day can hope to expand properly unless it is served by numerous fast radial tram routes. The normal tram-mileage found necessary and kept busy in all modern cities that are similar in position to Calcutta is rarely less than 60 miles, and often is very considerably more.

WATER SUPPLY AND DRAINAGE.

Calcutta possesses a good water supply, which has been obtained only by overcoming great difficulties,

chiefly because of the unbroken flatness of country for so very great a distance all round the city. The largest water tower in the world has been a necessary

pipe sewerage. Very little or no work has, however, been done in the undeveloped suburbs. Owing to extreme flatness, but very much more on account of



AN EXAMPLE OF INADEQUATE BY-LAWS, CALCUTTA.

A large new building is to be crammed into the open space, and has been commenced. A narrow passage will be the only source of light and air to about 100 existing dwelling-rooms, mostly one family, one room.

consequence. Calcutta can be proud of her water supply.



TRAFFIC IN THE CALCUTTA LANES.

Within Circular-road, and for some distance outside, especially to the south, Calcutta enjoys modern

the sloppy and saturated subsoil, sewerage operations in Calcutta are very costly, difficult, and slow. On the north-east no sewerage extends beyond the Circular Canal. Manicktola possesses neither sewerage nor land drainage. South of Sealdah Station and east of Circular-road, a fair amount of drainage has been done in Entally, and again to south-east and south, several lines of sewerage extend a considerable distance into Ballygunge. Alipore has been seweraged to a fair extent. West Kidderpore is in need of sewerage. Howrah is but very partially seweraged.

Manicktola, and the south portion of Ballygunge, of Alipore, and of Kidderpore, need land surface drainage in addition to sewerage. This need not be very costly; the linking up and improvement of existing earth channels, and the provision of tidal exit sluices being all that is required to make large areas more habitable.

HOUSING AND RESIDENTIAL CONDITIONS OF CALCUTTA.

These are scandalously bad; an acute house famine prevails, and increases. It has prevailed during the last thirty years, and nothing has been done to remedy it. Europeans, Indians, and all castes are affected. Rents are tremendous, and the accommodation given is all too small, and far too crowded.

Comfortable, wholesome family life is being pushed right out of existence in Calcutta. It has already vanished to the extent of 45 per cent. The number of women in the city continually decreases in proportion to the population of men—always an indication of thoroughly bad housing conditions. Infant mortality and tuberculosis stand at world records. The monstrous chawl, the flat and the hotel are becoming the only places of residence for immense numbers of people. The poor are herded and forced into abominably packed slums. The barrack chawl is the home of the next stratum. But all classes suffer. Nearly every European bungalow,* built for single families, and only of moderate size, has too many occupants. The original drawing-rooms and reception-rooms on ground floors are now the hot and close ground-floor bedrooms of a flat, and the original bedrooms upstairs now compose another uncomfortable and inconvenient flat. The rent will seldom be less than £25 a month

* Two or three story villa.

for each half of the converted bungalow, which costs about £700 when built.

Nine hundred thousand people live in 45,000 houses—i.e., the average number of people per house is twenty. The average Indian house contains about twice as many rooms as an English house, so that, for genuine comparison, the Calcutta housing squeeze is equal to about ten people per house in Great Britain. The actual number of people per house in Great Britain is a shade over five, and the size of each family is a shade under five. If the present housing accommodation of England were untouched, but the population were doubled, then we would produce an

open spaces. Northern Calcutta especially is badly in need of a dozen good squares and playgrounds. A riverside promenade road would be as good as a park in North Calcutta, and would be of very great use for traffic, and the increasing river shipping, and is perfectly feasible of execution. Radial parks—coming into Calcutta from south, east and north, plus plenty of small squares, would, perhaps, be the best system for Calcutta—given plenty of money and powers. Nearly all existing squares can be much improved at trifling cost.

(j) Private and public-company housing enterprise needs every possible encouragement at Calcutta, not



ARMENIAN STREET, TYPICAL OF THE BETTER STREETS IN CENTRAL CONGESTED CALCUTTA.

overcrowding and house famine about equal to that which now exists in Calcutta.

NECESSARY IMPROVEMENTS.

The improvements required to bring Calcutta up to a moderate standard of city amenity may be summarised as follows:—

(a) Urban built-up Calcutta requires about 21 miles of new wide main roads, and 8 miles of widenings. These would bring the city fairly into line with a western city as regards main road provision and traffic facilities.

(b) Urban built-up Calcutta has no street system: 2,500 acres are provided only with highly irregular lanes and passages. It would require the creation of about 110 miles of ordinary 30-ft. to 40-ft. streets to bring Calcutta into line even with the old built-up sections of European cities.

(c) Of the 2,500 acres, not less than 800 acres are slums of a much worse type than anything in Europe, and they require removal or remedy.

(d) 6,000 acres of suburbs inside the city boundary are growing up anyhow, and require replanning, roads, tramways, and development.

(e) 2,000 acres of land in Manicktola (outside the city boundary) need planning, sewerage, tramways, and development.

(f) 2,000 acres in Cossipore Chitpore will one day become part of Calcutta. This area likewise requires replanning at once.

(g) Bridge communication with Howrah needs radical improvement and augmentation. A second bridge is wanted; it should be at Aheeritola.

(h) Sixteen defective out-of-date existing road bridges over railways and canals need reconstruction and widening, or replacement by new bridges of two or three times the existing widths. Approaches and gradients also need improvement. New bridges are needed at several points, such as at Halsi Bagan.

(i) The dense built-up city is remarkably short of

only by suburban and tramway development, but by the British and European loan systems.

(k) Calcutta and Howrah are short by 60 miles of the normal allowance of tramway routes. There are no roads for them, either in the city or suburbs.

Norwich Shirehall Improvement.—The work of restoring the front of the Norwich Shirehall, which has been proceeding for several months past, has now been completed. The old front was of stucco, and owing to the serious settlement in the foundations it was seriously out of perpendicular. The new work was undertaken first for the purpose of improving the appearance generally, and, second, to restore the front to the perpendicular. The design generally followed exactly the design of the old building. The bricks, which were specially made, are small and thin. They are 1½ in. in thickness. They were specially selected for colour, too, as many of the grey bricks as possible being introduced to tone down the somewhat garish effect of the ordinary red brick facing. The joints in the brickwork are thicker than usual, and considerably enhance the appearance. The work was carried out in conjunction with the general restoration of the interior, as owing to the settlement in the front, the walls and floors throughout the building and the general interior of the old premises were in a somewhat serious condition, with the possibility of a collapse had not the foundations been underpinned and made sound. Now the whole of the interior is being satisfactorily repaired. The roof and the gutters have also been repaired, a very large amount of unseen work having to be done. On account of the decayed nature of the woodwork the whole of the roof had been made good in the front with new timbering throughout where required. The *Eastern Daily Press* states that the improvement has been carried out entirely, and with the utmost satisfaction, by the county surveyor, Mr. T. H. B. Heslop.

Some Financial Aspects of Housing, with Details of the Street Housing Scheme.*

By W. H. COUSINS, P.A.S.I., Surveyor to the Street Urban District Council.

The housing question, I should think, holds the field as the most prominent question before local authorities. The housing of the working classes had, of course, received mixed and varied attention for many years previous to the 1909 Act, but the additional powers given local authorities by that Act, with also the additional obligations, have brought the question to the front, and a local authority or municipality can hardly be considered in the fashion, as it were, unless it has either launched out a scheme or is definitely considering one.

There are few authorities, whether it be rural or urban, who could not, with advantage as regards sanitation, and generally better housing conditions, as well as the provision of additional houses, undertake a housing scheme; but the question of building at an economic rental is the serious drawback. . . .

It is not my intention to deal in detail with the financial aspect of housing in general, but more particularly to present a few details of the financial part of the Street Urban District Council housing scheme.

It is common knowledge that the cost of building has enormously increased during the past twenty or thirty years, owing to various causes, principally increased cost of materials and labour. No one can deny the increased cost in the production of certain manufactured goods used in the building trade, but one cannot get away from the fact that competition is one of the chief means of cheapening any goods in whatever market. In the face of this, what can be said of the combines in the building trades? In this trade there is a cement combine, an iron combine, a lead combine, a timber combine, and combines in many other branches.

It is not my purpose to criticise the business methods of merchants or manufacturers, but when builders, local authorities, and others interested are up against these combines, it cannot but affect the cost of building, to the disadvantage of the tenant in cases where the scheme has taken practical shape, another result being the possible postponement of quite necessary schemes in other cases.

What should be, and no doubt is, the principal detail for consideration in a scheme generally is the class of tenant to be provided for, for this, to some extent, governs the amount of rent which can reasonably be expected.

It would, of course, be folly to build houses which could not be economically let at less than about 6s. per week for persons of the labouring class and others with wages of, say, 12s. or 16s. per week; yet these people, as a rule requiring more accommodation than those above the income-tax limit, are entitled to be decently housed. Many and varied are the suggested methods of solving that problem, yet the problem has not been, and under the existing state of things cannot be, solved in a practical sense.

THE STREET HOUSING SCHEME.

With regard to the Street housing scheme, it was clear, I think, that the class to be catered for was the artisan class, the large majority of the population being engaged in the boot and shoe industry. The council were faced with the shortage of houses in the urban district, and in 1910 the medical officer of health and the surveyor reported on the matter. The council, realising their responsibilities, at once decided to take advantage of the Housing Act of 1909, and land was purchased.

The scheme resolves itself into two parts—one named "Merriman-road" and the other "Brooks." The site of Merriman-road was originally an orchard, close to High-street, containing nearly 4 acres, and could no doubt be considered as ideal for the purpose of development. Several years ago the then owner of the orchard cut a new road, and divided the site into building plots which, however, were not developed, and the road was not opened to the public. In a sewerage extension for Silver-road, carried out by the council later, it was found that the best direction to carry the sewer was through this new road, and connect into the existing sewer in Vestry-road. Here was

a site with road cut and partly made and sewer laid, and this was purchased for the sum of £743 15s., at the rate of £200 per acre. Directly the land was bought, plans were prepared for thirty-six houses in semi-detached pairs. The Local Government Board, after holding an inquiry, sanctioned the purchase of the land, but would not approve of the type of house.

After some correspondence and interviews at the Local Government Board offices, the present scheme was sanctioned, building was commenced in October, 1911, and the first block of four houses was occupied in May, 1912.

Only one side of the road has been built upon, the other side being let as an orchard at a rent of £7 per annum. This space will, of course, be built upon if required. Twenty-one houses have been erected in the following order: Four houses in one block, one single house, two semi-detached houses, six in one block, another semi-detached pair, and another block of six. Fifteen of the houses are let at 6s. per week each inclusive, four at 7s. 3d., one at 7s., and one at 8s.

With regard to the Brooks part of the scheme, the council had in view the requirements of the part-time small holder, and a field of 5 acres, about a $\frac{1}{2}$ mile from the centre of the village, and containing a good quarry, was bought for £450, or £90 per acre, including the quarry.

Twelve houses have been erected on this site in six semi-detached pairs, and to each house is allotted about one-third of an acre of land. Six of these houses are let at 6s. per week, inclusive, and six at 5s. 6d. per week, while a plot of spare land alongside the quarry has been let at 30s. per year.

The original estimates were made on the basis of 4d. per cubic foot, and the scheme has been carried out under that figure.

The total amount of loans is £8,560, of which £993 15s. was for land, £90 15s. 3d. for Local Government Board transfer and other expenses, £230 for management and clerk of works, the remainder, £7,245 9s. 9d., being for buildings, footpaths, road, drains, boundary walls, fences and building plant, there being about £30 worth of the last-named in hand.

Taking the total number of houses in the scheme—that is, 33—the average cost per house, including paths, drains, fences, &c., but excluding land and management, works out at about £230 (the lowest houses are £173 each).

The whole of the work has been carried out by direct labour. The materials were bought from the open market on the best possible terms, and it should be stated that the wages of all the classes of workmen employed on the buildings were put on a higher scale than had ever before been the custom in this district.

The council were fortunate in being able to retain the services of my predecessor, Mr. James Jursey, he being a man of wide experience in building, and keenly interested in the matter for many years. He was appointed by the council, upon his retirement from the surveyorship, as clerk of works over the whole scheme, the success of which is to a very great extent undoubtedly owing to his energy and capable management.

DIRECT LABOUR.

A good deal can be said in favour of direct labour for carrying out schemes of this kind, but it is quite possible and easy to overestimate its advantages as compared with work done by contract—that is, from a financial point of view. The argument used, and with which I agree, provisionally, is that by doing such work by direct labour, builders' profits are saved; but, on the other hand, such assumed profits can very soon be lost by careless supervision of the labour and inexperienced buying of materials and goods. When the person responsible gets unquestionably the very best value for money, no matter whether in labour or materials, then it is beyond question the most economical and the very best method.

I hardly think it is advisable to lay down hard-and-fast rules; the question is one which should be settled by circumstances and conditions, and, as with

* Paper read at a meeting of the Association of Somerset Surveyors, held at Street on Saturday last.

housing schemes generally, each district can almost be said to be a law unto itself.

The houses erected by the Street Council were eagerly sought after, and were occupied directly they were finished.

The balance-sheet for the working of the scheme is as follows:—

Receipts.		Per annum.	Expenditure.		Per annum.
		£ s. d.			£ s. d.
15 houses at 6s. per week	Merriman-road.	234 0 0	Interest and sinking fund on £8,560 at 4 per cent		342 8 0
4 houses at 7s. 3d. per week		75 8 0	Rates, Merriman-road		77 11 11
1 house at 8s. per week		20 16 0	Rates, Brooks		39 9 3
1 house at 7s. per week		18 4 0	Property tax, Merriman-road		11 19 8
Unmade part of orchard		7 0 0	Property tax, Brooks		6 3 0
Brooks.			Land tax		1 5 6
6 houses at 6s. per week		93 12 0	Collection of rents at 33 per cent		20 1 0
6 houses at 5s. 6d. per week		85 16 0	Fire insurance		5 0 0
Spare land by quarry		1 10 0			
		£536 6 0	Annual balance for repairs, voids, &c.		32 7 8
					£536 6 0

The sum of nearly £20 for taxes appears quite an unfair charge, seeing that on the scheme there will be no actual profit or income. It would be interesting to hear what is being done in other districts where this charge is made in respect to housing schemes. We cannot claim to have solved the housing problem, but I think the council can claim to have overcome the difficulties which had obtained at Street previous to the carrying out of the scheme.

There is just one point which I might have mentioned earlier in this paper, and that is with regard to the period of the loan. As is known, the length of the periods for houses, lands, fences, roads, &c., vary considerably, but in our case the Local Government Board agreed to a flat rate of 4 per cent for a period of fifty-eight years on the whole scheme.

ENGINEERING JOTTINGS.

2.—LOOPING OR LOWERING OF ROADS OVER HILLS.

By HERBERT G. COALES, ASSOC. M. INST. C. E., F. S. I.

Most people feel the romance of the old coaching days, with their highwaymen and the posting inns. Possibly the passengers did not experience much romance themselves at the time, when the roads were ill-kept and dangerous, and the hills heart-breaking. We know that the old roads, as a rule, had to be used, badly as they served the countryside, until in sheer exasperation people cried out for something better. In many cases, to ease the gradients, cuttings were made through the worst of the hills, and the excavated material was used to flatten out the hill approaches. This no doubt was a decided improvement, and was then looked upon as a considerable engineering work—as indeed it was. At least, we can give the authorities of the past due praise for having realised an objectionable fact, and for having the pluck and enterprise to alter it. How many hills have been lowered in our time? None of us can say we have not noticed objectionable hills round about us. But beyond grumbling at the exertion of mounting them, no action, broadly speaking, has been taken to remedy the state of things. We watch an ant, laden with food, going to its home. It hurries straight along, and if it finds a stone in its path it goes over the top of it instead of making a detour. We, with our superior knowledge, condemn it as a fool, although we do the same thing ourselves every day; we make no detour, but climb right over the hills. Horses—poor things—realise the punishment in front of them, and strive to mitigate it by zig-zagging backwards and forwards across the road—reducing the gradient as far as the width of the road will allow.

A steep hill not only curtails the weight of the load which can be drawn, but slows up the traffic, and wears out the horse or other motive power.

Let us examine a concrete case. Here is a village, a couple of miles from a town, where the connecting road passes over a long hill, with a gradient of, say, 1 in 15. Every farmer in the village knows that, whereas his horses could each comfortably draw 30 cwt. of corn to the railway station, he must only load up with a ton because of the hill. For the same reason, the town merchant can deliver only two-thirds of an average load of coal to the village.

Supposing the daily traffic to and from the village over the hill is only ten loads, there is a loss in cost of haulage of 5 tons per day, or, say, 1,500 tons per annum, which at 3s. a ton totals up to £225—a nice little tax on the village. If then one village suffers to this extent, what of the other traffic—the through traffic?

It cannot, therefore, be economical to tolerate steep hills. What is the remedy?

There are two remedies:—

(1) If the hill is short the gradient may be reduced by cutting down the summit and making up the approaches by a give-and-take process.

(2) If the hill is long the difficulty may be overcome by making a loop road round it.

Imagine a short hill which for countless generations has imposed its objectionable self between two towns. It is 100 yds. to the top, and a like distance down the other side. The gradient is 1 in 15, which means that the total rise is only about 20 ft. Twenty feet! Why the whole of the hill covered by the road might be levelled by moving 14,000 cub. yds. of earth! But the shifting of only 3,000 yds. would reduce the gradient from 1 in 15 to 1 in 50 at the worst, where it was possible to tip the excavated material on the hill approaches. If, however, the level of the road at the bottom of the hill could not be raised, then the shifting of 4,000 cub. yds. would reduce the gradient of the hill from 1 in 15 to 1 in 30. In either case, the expense incurred would probably be recouped within a year by the saving in haulage expenditure alone.

There is little doubt that the crust and foundation of an existing road, when disturbed for the new gradient, would be utterly insufficient for making the new road. Therefore the purchase of new pitching and macadam would have to be faced. In the case of a long, steep hill, probably the cost of the lowering and tipping would approximate to the cost of the new road building.

One serious difficulty in carrying out a cutting would be the hindrance to traffic involved; the road would have to be temporarily closed, and, unless the traffic could be sent round another way, the inconvenience would be considerable.

If, however, it were decided to make a new loop road, the interference to traffic would not arise. The construction of a loop road would be based upon engineering and economical principles. The hill would have to be carefully contoured, and the road plotted in such a position as to furnish an easy, workable gradient for the traffic around instead of over the hill. Or, in the case of people having (from the geography of a district) to climb to the summit of a hill, then the reduction in the gradient would be effected by, say, making the loop double the length of the old direct route. Presumably, owing to the acquired rights of the public, as well as of the owners of the abutting land, the new loop road would have to be in addition to, and not in substitution of, the old direct road. A general Act of Parliament might, of course, on terms, overcome the difficulty.

Here and there the local authority might purchase all the land between the loop and the old road for a garden suburb, allotments, or small holdings, or recreation ground or other public purpose. In some cases the new road would be an asset to the adjoining land, and in others nothing but a nuisance. The terms for the acquisition of the soil of the new road would consequently vary in every case. Whereas in one place it might be negotiated free of a monetary payment, in consideration of the value of the frontage, in another substantial compensation would have to be paid for severance and depreciation of property.

Where the frontage to a new road was of no value to anybody, the land occupied by the road might be considered waste economically, for it would be permanently lost to agriculture. But as against this fact there is the overwhelmingly more important consideration of the saving in the cost of haulage year in and year out.

Has a remedy for the stiff, heartbreaking, hilly roads all over the country had proper consideration? No doubt the draught horses think a lot if they do not speak!

Surveyors' Institution: Country Meeting.—The council have accepted the invitation to hold the next country meeting at York on May 22nd and 23rd.

The Architect and Structural Engineering.

By WILLIAM E. A. BROWN, A.R.I.B.A., M.C.I.

At a meeting of the Concrete Institute, held on Thursday of last week at Denison House, Westminster, Mr. William E. A. Brown, A.R.I.B.A., M.C.I., submitted a paper entitled "The Architect and Structural Engineering."

The author said that an architect was necessarily a structural engineer, with the addition of the artistic sense and skill to clothe the structural forms with beauty of line and contour, and so to arrange mass and void into one harmonious whole, studying the great lessons of the past, and carrying on the architectural traditions of ancient Greece and Rome, down through the Middle Ages, and on through the Renaissance. He thought all would agree that the architects of such buildings as the Church of Santa Sophia at Constantinople; St. Peter's at Rome; the Pantheon, Rome; the Duomo, of Florence; and, to come down to more recent time, Sir Christopher Wren's masterpiece in London, and Bentley's last great work of Westminster Cathedral, were structural engineers.

Were not all our cathedrals, which were the delight of artists and lovers of the beautiful, wonderful examples of architect's engineering skill?—majestic buildings, with vaulted roofs poised on slender pillars, and held in position by flying buttresses, each thrust met by a counter-thrust, all combined so as to keep the whole structure in a stable condition.

Structural engineering included not only steelwork used in buildings, but also all forms of construction, whether in brick, stone, timber or concrete, and in designing buildings and other structures the architect was called upon not only to exercise his artistic ability, but also so to plan and arrange the various materials to carry safely, in addition to their own weight, all superimposed loads and external forces, so that the whole might remain perfectly stable.

No doubt the council of the Concrete Institute had this in mind when it was decided to enlarge the scope of the institute by adding structural engineering, and not to confine itself to one branch only—i.e., concrete and reinforced concrete. The wisdom of this, he thought, was manifest by the large increase in the membership as well as by the greater attendance at the meetings.

It was the architect, and the architect alone, who should determine the position of all main girders, stanchions and supports. In many buildings it was impossible to proceed with the design until these positions were determined. In some cases it was the roof which was the determining factor in planning a building, whether the spans should run from north to south or east to west. In others it would be such a feature as a dome. For example, how could Wren have planned St. Paul's unless he knew beforehand how he was going to support that great and glorious crowning feature of his design? That building could not have been erected had Wren simply made a drawing, and handed over the structural work to someone else to deal with. Had that course been adopted, the resulting design would have been different to that made by the architect.

There was no doubt that many people did not realise the importance of having a properly qualified professional man to advise them. They were led to believe, and fondly imagined, that they were saving a large sum in fees, until they found by experience that their folly had cost them more. It was not his intention nor wish to belittle in any way the status of the consulting engineer, who occupied a very important position in the building world; but what he did wish to emphasise was that it was the architect's duty to determine the position of all girders and supports in the buildings he designed. He should also be able to make the necessary calculations for the steelwork in, at any rate, the smaller buildings under his control. Architects often did employ consulting engineers to do the calculations for the steelwork—first, owing to lack of time to do so themselves, and often because in some modern buildings the steelwork was of so complicated a character that it was advisable and necessary to do so; but that did not alter the question of the position of the architect in the matter.

NECESSARY INFORMATION.

A good deal of stress has been laid upon the question of whether the steelwork should be designed, and quantities taken out by the consulting engineer before

being sent to the constructional firms for estimates, or whether these firms should be allowed to do the calculations themselves. For contracts involving a large amount of steelwork of a complicated character, the author agreed that a consulting engineer should be appointed by the architect; but there were many smaller works where this was not necessary, nor would the outlay on the building work warrant the expense incurred. It was quite satisfactory, given certain conditions, laid down, for the architect to send the drawings to several firms of engineers, and let them make their own calculations and quantities; but to enable the various contractors to estimate on the same basis, the following information must be given to each:—

(1) Plans of all floors showing the lines of all main girders, and the positions of stanchions and columns; also a section or sections and outline elevations must be given.

(2) The loads that each floor had to carry, and whether live or total loads.

(3) Whether British or foreign steel was to be used, and whether the London County Council Regulations under the General Powers Act, 1909, were to be complied with. If not, the stresses should be specified that were to be worked to.

(4) Whether price was to include for hoisting and fixing, or only for steelwork delivered to site.

(5) If it was to be delivered unpainted, painted or oiled, and, if painted, with what materials, and that all scale and rust must first be removed.

(6) Workmanship; whether connections were to be riveted or bolted, and, if the latter, whether ordinary bolts would be allowed.

(7) Whether the price was to include 10 per cent profit for the builders, or only 2½ per cent cash discount. The author's practice was to state the latter.

FLOOR LOADS AND LOADING.

There was a diversity of opinion as to whether dead loads and superloads on a floor should be kept separate in making the calculations, or whether a load to include the dead weight of the floor itself should be taken. The author's practice was to work to the latter, as the calculations were much simpler and the liability of error was materially reduced.

One must, of course, take into consideration the point loads which often occurred from partitions, &c. This was often neglected by competing firms of engineers, but some of the concrete partition blocks on the market weighed a considerable amount, and one was often surprised when the weight was calculated out.

Another matter that he sometimes had to argue with the steel contractors was the central loading on girders carrying walls with openings and narrow piers between. Some assumed that the loads were evenly distributed over the span through the brickwork below the window sills. If the sills are very high up, that might be so; but in many cases the sills were only 12 in. or 18 in. above the girder, and, in his opinion, the loading in such a case should be considered as a point load, or as a distributed load over a length of the girder equal to the width of the pier.

In calculating the loads on stanchions, &c., he did not take advantage of the reductions allowed by the 1909 Act. He did not think it advisable, as buildings were often loaded to a greater extent than was allowed for. How often was an architect told that the floors would never have to carry more than a certain weight, and on going over the premises when occupied he was surprised to find these loads greatly exceeded.

CHECKING ESTIMATES AND DESIGNS.

When the various estimates and plans showing the steelwork were received the architect should carefully go through each set, and compare the sections of the girders, &c., and make rough calculations to check the sizes, and ascertain if the allowable stresses had been adhered to. It was also necessary to check the depths of the joists in relation to the span, otherwise undue deflection might occur.

After the plans had been gone through the architect was in a position to determine which estimate he would accept, and when giving the general contractor instructions to accept the estimate it was important to state that all dimensions were to be taken from the site, and that the whole of the work

was to be carried out to the architect's satisfaction, detail drawings of all parts to be submitted to him for approval. The steel contractor must take his own dimensions from the site, arranging, of course, with the general foreman which portions of the steelwork were to be delivered first, and the order of delivery of the remaining consignments. When the cleared site had been measured with steel tapes and all angles carefully triangulated, it should be possible for engineers to set out and scale off the lengths of the various parts.

CONNECTIONS, WORKMANSHIP, AND SUPERVISION.

The connections and workmanship were, in the author's opinion, very important matters to be considered, and as far as his experience went they did not always receive the attention that should be given them. Of what use was it to have a strong joist or stanchion if the cleats under the joist, or the joists under the stanchion, were not properly designed; or, if the design was correct, the connections themselves were badly made? It was a regular practice to use ordinary bolts to take shear, such as the ordinary $\frac{3}{4}$ -in. bolt in a $\frac{1}{2}$ -in. hole, the shank being threaded to within $\frac{3}{8}$ in. of the head. He had examined connections made in this way, and often out of five bolts in the connection four could be taken out with the fingers when the nut was removed. What amount of bearing area did one get on the threaded end of the bolt, supposing that the bolt was bearing on the plates? The bearing surface consists only of a series of knife edges. If bolts must be used in shear then the holes must be carefully drilled concentric through all the plates without the usual amount of clearance, and bolts with plain shanks long enough to pass right through all of the plates should be driven in. In order to make sure of having no portion of the threaded end bearing on the outer plate a $\frac{3}{4}$ -in. washer should be placed under the nut. He was aware that the 1909 Act said that rivets should be used in all cases where reasonably practicable, but there were a very large number of buildings to which this Act did not apply. He thought that all steelwork should be designed in accordance with the provisions of the 1909 Act, but that the conditions for bolted work should be amplified in the Act, the only requirement now being that the bolt should extend through the nut, and the latter secured so as to avoid risk of becoming loose. Another important point, and one that was not always attended to, was that all holes through two or more thicknesses of metal should exactly coincide. If they did not coincide, how could the rivets or bolts take a proper bearing and transmit the loads from one to the other?

Filler joists in concrete floors should be bolted or cleated at least every third joist to the main beams. He had seen cases in which this was not done, but the fillers simply rested on short cleats in beams connected to stanchions running through three floors, next the street, and with no other tie than that afforded by two $\frac{3}{4}$ -in. bolts at each floor level; the end stanchion, built on the face of the party wall with only $\frac{4}{8}$ -in. brick casing round it, was not tied in at all. He believed it was becoming a common practice to place the small filler joists on a concrete haunching resting on the bottom flange of the main girder, and not tied in any way to the girder. In his opinion this method of construction should be condemned. The area of the stanchion bases should be checked to see if the concrete was not loaded more than 12 tons to the square foot. Large gusset plates should not be allowed unless properly stiffened to prevent buckling. It was a good practice to encase the whole of the stanchion base right up to the floor line with concrete. This prevented rusting, and also held the floor of the stanchion firmly in position. He did not advocate the putting of stone templates under stanchions. There was a difficulty in bedding both the template and stanchion, and, if the latter had to be grouted in, the stone might as well be absent. Girders supporting walls, as well as main floor girders, if they were formed of two or more plain I-beams, side by side, should have plates riveted on top and bottom. Simply to bolt them together was, in his opinion, not sufficient, as the load from the main floor girders was not transferred to the outer joist, though some engineers thought it was.

Caution must be observed in casting girders and stanchions with patent plasters, especially those that were stated to adhere without the intervention of any lathing. He had in mind one that corroded the steel to an alarming extent in a short time.

Stanchions and girders were best encased with fine Portland cement concrete, the steelwork having $\frac{1}{8}$ -in.

wire wound round and spaced about 12 in. apart. This held the concrete firmly in position, and it was not easily damaged, even by motors.

When he told them that he had seen specialist firms' own men sawing up timber for centering, and the sawdust and shavings and small pieces of wood all left and mixed up with the concrete, he thought one's faith in trusting to such people was rudely shaken. One required a good clerk of works, well up in reinforced concrete construction, with several smart assistants under him to look after the work.

In calculating the sizes for steel joists embedded in concrete, the author's practice was to let the steel carry the load as an independent beam, but taking the depth of the beam anything up to one thirtieth of the span, limiting the stress to $7\frac{1}{2}$ tons per square inch. This was quite enough, as he often found that these small joists, such as 3-in. by $1\frac{1}{2}$ -in., and $4\frac{1}{2}$ -in. by $1\frac{1}{2}$ -in. were of foreign make. He had also a preference for joists with 3-in. flanges over those with $1\frac{1}{2}$ -in. and $1\frac{3}{4}$ -in. flanges, for the reason that the concrete had a much better bearing on the joist.

The author uttered a warning against using breeze for floors. There was a great danger of expansion, and he knew of several cases where this had occurred and pushed walls several inches out of upright, and even when the wall was rebuilt it happened again. There was also a corrosive action between the concrete and steel, which in time might endanger the stability of the floor. The modern architect had to be a man of many parts, a jack-of-all-trades—a bricklayer, mason, carpenter, joiner, plumber, and painter, always an artist, often a lawyer, and last, but not least, a structural engineer.

ROAD BOARD GRANTS.

TAR-SPRAYING IN WILTSHIRE.

The Secretary of the Treasury was asked in the House of Commons on Monday whether the Road Board, after making a grant to the Wiltshire County Council of 50 per cent of the cost of tar-spraying the main roads of the county where they passed through the more populous villages, had recently intimated that no further grant would be made for this purpose, with the result that the whole cost of the process would be thrown upon the county ratepayers; and, if so, whether, seeing that at least two-thirds of the dust nuisance from which the villages suffered was in that county occasioned by pleasure-seeking motorists living outside the county, the Government would undertake that an adequate proportion of the total cost of abating such nuisance should continue to be defrayed out of the Motor Licence and the Petrol Duties which constituted the Road Board Fund?

Mr. Montagu said the Road Board had not intimated that no further grant would be made for tar-spraying. In January last, having regard to the sums then in course of distribution and to the grants already made and indicated to Wiltshire, amounting in all to £48,000, the board informed the county council that they were not prepared to give any further assistance to the county for some time. But at a conference between the board and representatives of the county council, the board, having in the meantime decided to make a further general distribution, intimated that certain further applications would be considered with due regard to the funds now available.

THE BOARD'S ANNUAL REPORT.

Mr. Lloyd George stated in the House of Commons on Monday that he hoped the annual report of the Road Board would be published towards the end of June.

Institution of Civil Engineers: Awards for Papers.—

The council of the Institution of Civil Engineers have made the following awards for papers read and discussed during the session 1913-14: A Telford Gold Medal to Mr. F. W. Cowie (Montreal), a George Stephenson Gold Medal to Mr. F. E. Wentworth-Shields (Southampton), Watt Gold Medals to Mr. Thos. Clarkson (Chelmsford) and Mr. Henry Fowler (Derby); and Telford Premiums to Prof. E. G. Coker (London), Mr. W. A. Seoble (London), Mr. Wm. Willox (London), and Mr. S. P. W. D'Alte Sellon (London). The awards for papers published in the "Proceedings" without discussion and for students' papers will be announced later.

Exchequer Grants in Aid of Roads.

MEMORANDUM BY SIR GEORGE GIBB, CHAIRMAN OF THE ROAD BOARD.

Being Appendix XVI. of the Final Report of the Departmental Committee on Local Taxation.

The object of this memorandum is to submit some considerations on the financial arrangements relating to the maintenance of roads and bridges in England and Wales, and to examine complaints made against the existing operation and outcome of these arrangements.

The complaints may, for the purpose of examination, be grouped under three heads:—

(1) Complaints on behalf of ratepayers in regard to the burden of road maintenance cost, and the inadequacy of Exchequer contributions thereto.

(2) Complaints in regard to the distribution among highway authorities of the Exchequer contributions.

(3) Complaints of road users in regard to the standard of road maintenance in some districts.

The mileage of roads in England and Wales in the year 1909 is shown in the following table:—

TABLE SHOWING THE MILEAGE OF ROADS IN ENGLAND AND WALES IN THE YEAR ENDING 31st MARCH, 1909 (COMPILED FROM LOCAL TAXATION RETURNS, SUMMARY, PART VIII.).

	Main.	Other than Main.	Total.
	Miles.	Miles.	Miles.
IN URBAN AREAS:—			
City of London...	—	48	—
Metropolitan Boroughs ...	—	2,125	—
Total in London ...	—	—	2,173
COUNTY BOROUGHS ...	—	—	3,106
NON-COUNTY BOROUGHS:—			
Main roads ...	1,362	—	6,038
Other roads ...	—	4,776	—
URBAN DISTRICTS:—			
Main roads ...	2,391	—	14,063
Other roads ...	—	11,692	—
Main roads maintained directly by County Councils in Urban Areas. (Mileage cannot be divided between Non-County Boroughs and Urban Districts.)	600	—	600
Total main roads in Urban Areas ...	4,253	—	—
Total Urban outside London ...	—	—	29,827
Total Urban including London ...	—	—	32,000
IN RURAL AREAS:—			
Main roads ...	23,549	—	118,692
District roads ...	—	95,143	—
Total main roads ...	27,802	—	—
GRAND TOTAL ...	—	—	150,692

The total expenditure in connection with roads and bridges in the year ending March 31, 1909 (excluding capital expenditure out of loans, but including loan charges in respect of street improvements), amounted to £14,722,295, and Table 1. in the Appendix hereto gives the component parts of that total divided so as to show the various spending authorities and the different heads of expenditure.

It will be seen from the table that outside county boroughs and London the total cost of maintaining urban roads, both main and other, was £2,312,659, and rural roads, both main and other, £3,925,590; also that the expenditure on the maintenance of 27,802 mile of main roads amounted to £2,643,044.

The existing distinction between main roads and other roads is a singularly misleading and haphazard distinction, but it has a very important bearing on the question of State assistance to road maintenance, because it was on the basis of that distinction that the first grants-in-aid were made. It will, however, be convenient to postpone the discussion of it until the history of main roads has been traced in some detail. It is difficult even to ascertain the amount of the Exchequer contributions to road maintenance, in the now existing shape of assigned revenues, without reference to that history, and that branch of the subject will therefore in like manner be postponed to a later part of this memorandum.

The distribution, as now existing, of the duties and money burdens of maintenance among the very nume-

rous maintaining authorities is the result of changes connected with the development of local government rather than the outcome of any scheme of organisation adopted after special consideration of the conditions and needs of the roads themselves. It is only recently, since new conditions have arisen owing to the introduction of motor traffic, that the defects have become so serious as to create a need for some material alterations. Under existing circumstances, those who use roads are dissatisfied with their condition, not in all, but in some districts; those who maintain roads are dissatisfied probably in all districts with the heavy and increasing burden of the cost of maintenance, while there is some ground for thinking that much, or at least some, of the dissatisfaction is due, not so much to the inadequacy of the total amount of Exchequer contributions to road maintenance, as to the defective methods of application and apportionment of these contributions.

There are 1,900 separate authorities who maintain roads, consisting in London of the Corporation of the City of London, the London County Council (Thames Embankment) and 28 borough councils, and outside London of 74 county borough councils, 61 county councils, 253 non-county borough councils, 815 urban district councils, and 667 rural district councils.

MAIN ROADS.

Outside London and outside county boroughs the expenditure on the maintenance of roads other than main roads is borne wholly by the ratepayers in the areas, either urban or rural, in which the roads are situated, and no contributions (except in the case of some district roads to which some county councils make contributions out of county rates) are made to the relief of this expenditure from any source extraneous to the local rates.

The expenditure on the maintenance of main roads, which is borne directly or indirectly by county councils (less the Exchequer contributions thereto), is paid for out of county rates, which are assessed and levied in urban districts and non-county boroughs as well as in rural districts.

In considering the real burden of the cost of road maintenance outside London and county boroughs, it is therefore necessary to take into account in each administrative county not only the nett cost of main roads payable out of the county rates, but also the cost of other or district roads payable out of the district rates, because each ratepayer pays both a district (either urban or rural) and a county rate, and comparisons between counties based on main roads only are vitiated by differences of policy in "maining" roads.

Before discussing in detail and in relation to the circumstances of the present time whether the existing Exchequer contributions are adequate, and whether they are applied and distributed in the right way, it will be useful to refer to the history of main roads and of the Exchequer contributions thereto.

It is important to remember that the distinction between main roads and other roads had not, in its origin, any reference to a division between the National Exchequer and local ratepayers of the cost of maintaining roads, nor were the first grants in aid of road maintenance based on any definite allegation or admission that road maintenance was in any proper sense of the phrase, or in relation to any class of road, a national service locally administered. The original differentiation of main roads from other roads was mainly, if not exclusively, concerned with grievances of ratepayers in individual parishes arising from the fact that the whole burden of road maintenance fell upon them without any means of apportioning some part of the burden on larger district or county areas. It was the unfair and unequal incidence of the burdens as between parishes and the larger areas of districts and counties that was then in question, and not any claim that the National Exchequer should bear any part of the costs of the roads subsequently classed as main roads. That claim was raised by a more modern ingenuity, and has, since it was raised, no doubt gained greater force and effectiveness from the changes which have taken place during quite recent years in the use of roads by motor traffic.

The liability to repair roads has from the earliest times been an exclusively local obligation. Prior to the passing of the Highway Act, 1862, the liability rested on each parish, or, in the case of roads in certain urban areas, on the council of each urban sanitary authority.

The obvious objections to the control of highway maintenance being vested in such a small unit as a parish led to successive extensions of the areas of highway administration. In 1862, under the Highway Act of that year, provision was made for the constitution of highway boards having jurisdiction over highway districts formed within county areas. The common expenses of such highway boards were to be paid for out of the district fund, such fund being chargeable on the constituent parishes; but the expenses of the highway boards in repairing the highways in each parish remained separately chargeable on each parish. In 1878 (Highways and Locomotives Amendment Act, 1878) all expenses of road repairs in each constituent parish incurred by a highway board became chargeable on the district fund. Up to that time the county had no liability for road maintenance, nor were any

new roads after they had been made. The source from which the funds for making and maintaining turnpike roads were drawn was not local rates, but payments in the shape of tolls by road users.

It appears probable that if the turnpike and toll system had not been developed it would have been impossible to compel or induce local ratepayers out of local rates to undertake the construction and maintenance of the new roads, which were, in fact, made as turnpike roads; but the necessity for the construction of these new roads to afford communication between important places was so imperative that it may fairly be assumed that if private enterprise had not undertaken the task in consideration of the right to take tolls from road users, the State would have been compelled to assume the duty. Subsequent events have tended to obscure the original position as between the State and local ratepayers. Private enterprise having stepped in to relieve the State of the duty which it would otherwise have inevitably been compelled to undertake, and ruin having fallen upon the turnpike trusts following the construction of railways, the State was then able to throw upon local ratepayers

TABLE I.—SHOWING EXPENDITURE ON ROADS AND BRIDGES, YEAR ENDING 31ST MARCH, 1909

(Compiled from Local Taxation Returns.)

	Mileage.	Maintenance.	Improvements.	Other items.	Loan charges.	Total.
	1.	2.	3.	4.	5.	6.
URBAN ROADS.						
Main roads in urban districts and non-county boroughs maintained by, or at cost of, county councils	4,253	£ 877,916	£ 51,869	£ 2,553	£ 139,115	£ 1,071,513
Other roads in urban districts	11,692	919,164	94,992	192,673	221,950	1,428,784
Other roads in non-county boroughs	4,776	515,549	42,932	226,571	253,052	1,038,101
Total urban in administrative counties outside London	20,721	2,312,659	189,793	421,802	614,117	3,538,401
County Boroughs	9,106	1,235,906	90,562	829,375	1,553,252	3,709,005
London Authorities	—	734,553	52,512	752,884	1,083,979	2,623,928
Total urban... ..	—	4,283,118	332,867	2,004,961	3,251,378	9,671,424
RURAL ROADS.						
Maintained by, or at cost of, county councils ...	23,549	1,765,098	11,293	30,832	16,747	1,823,970
Maintained by rural district councils	95,143	2,160,492	52,967	103,006	23,346	2,338,911
Total rural	118,692	3,925,590	64,360	133,938	40,093	4,162,881
Total urban and rural	—	8,208,708	396,227	2,137,899	3,291,471	11,034,305
Bridges, ferries, and tunnels	—	—	—	—	—	687,900
GRAND TOTAL	—	—	—	—	—	14,722,205
Total main roads included above	27,802	2,643,044	63,162	33,385	155,892	2,895,483

roads specially distinguished from others as main roads.

Concurrently with the enlargement of the area of highway administration from the parish to the highway district, another series of changes was in progress which ultimately led to a still further enlargement of the administrative areas, and to the transfer of part of the burden of maintenance from the parish or district ratepayer to the county ratepayer, and the movement was accelerated by the breakdown of the system of turnpike roads which followed the growth of railway construction.

THE FINAL RESULT OF THE TURNPIKE SYSTEM.

It is very important to remember, in connection with any discussion of the claim of local ratepayers to State assistance, that before turnpikes existed there was no settled policy that all roads should be made and maintained at the cost of ratepayers. The parochial system provided for the repair of such roads or tracks as did exist, so far as it can be said that any systematic provision was made, but no obligation rested either upon ratepayers or on anybody else to make roads. It was the absence of any other means whereby the making, or, in many cases, the remaking, of necessary roads could be secured that led to the introduction of turnpikes, and the introduction of the turnpike system, covering the duty of maintenance as well as construction, was a practical admission of the impossibility of getting ratepayers either to provide new roads or to maintain, at their sole cost, such

a burden which could probably not have been cast upon them—at least, to such a great extent—if in the first instance the turnpike system had not been developed.

At common law parishioners were liable to maintain all public roads. The making of a turnpike road, therefore, although the turnpike trustees undertook and intended to maintain it, created a sort of contingent liability on parishioners to maintain in the event of the turnpike trustees failing to do so. It was this contingent liability which afterwards fixed upon parishioners the burden of maintaining all roads which had been made as turnpikes, although at the time these roads were made there was probably no intention or expectation that their maintenance would ultimately fall on the parishes. The financial failure of turnpikes created a situation in which the burden of maintenance had to fall either on the State or the parishioners, and, as the conception of State aid had not been developed in those days, the result was that the burden of maintaining disturnpiked roads fell on the parishioners until, from 1882 and onwards, local authorities managed to shift that burden, to some extent, on to the State.

The steps by which the liability to maintain turnpike or disturnpiked roads was fixed by statute on local authorities may be noted. Prior to 1841 the liability rested on common law, and was not clearly defined. But in 1841 a General Turnpike Act was passed which enabled justices in case of deficiency and default of turnpike trusts to order the parish

surveyor to pay actual and necessary repairs on a turnpike road in a parish out of the highway rate.

In 1864, when there still existed 1,100 turnpike trusts and 8,000 toll bars, a Select Committee of the House of Commons recommended the abolition of all turnpike trusts. No immediate legislation followed, but by the Annual Turnpike Act of 1870 it was enacted that the cost of maintaining any highway which within seven years previous to 1870 has ceased, or which might thereafter cease, to be a turnpike road should be a charge on the common fund of the highway district in which the highway was situated. Finally, and this is the first creation of the class of "main roads," under the Highways and Locomotives (Amendment) Act, 1878, it was provided that any roads which had ceased to be turnpikes between 1870 and 1878, and any turnpike roads thereafter ceasing to be such, should be deemed to be "main roads," and that one-half of the cost of maintenance should be paid by the county authority if the roads were maintained to the satisfaction of the county surveyor.

COUNTY POWERS UNDER THE ACTS OF 1878 AND 1888.

Under the same Act powers were given to the county authority to enforce the performance by highway authorities of the duty of maintaining and repairing all the highways within their jurisdiction.

County authorities were also empowered on the

dealing with" any main roads, at the cost of county councils. (Sec. II, subsec. 4.)

(4) That a county council might contribute towards the cost of the maintenance, repair, enlargement, and improvement of any highway in the county, though not a main road. (Sec. II, subsec. 10.)

The roads classified as main roads, which are now repairable by or at the cost of county councils, are therefore—

(1) Roads which were previously turnpike roads.

(2) Roads which have been declared under the powers of the Highways and Locomotives Amendment Act, 1878, to be main roads, and this declaration, it should be noted, requires the concurrence of both the county council and the highway authority, urban or rural, as the case may be, of the district. If a district authority is unwilling to give up the control of the maintenance of any road the county council cannot "main" that road, however much it may possess the characteristics of a main road, or may need to be maintained on a higher standard than a district either can or will adopt. If, on the other hand, the county council and district highway authorities in any county agree to treat any roads as main roads, either for the purpose of placing their maintenance under the direct charge of the county surveyor or for the purpose of throwing the cost of their maintenance on the county rate instead

TABLE II.—COMPARING BURDEN OF EXPENDITURE ON MAINTENANCE OF ALL ROADS IN COUNTY BOROUGHS, METROPOLITAN BOROUGHS, AND ADMINISTRATIVE COUNTIES (INCLUDING RURAL AND URBAN AREAS).

Compiled from Local Taxation Returns, year 1909.

1.	County Boroughs, 74.	Non-County Boroughs, 253.	Urban District Councils, 815.	Rural District Councils, 667.	Administrative Counties outside London. Total of Cols. 3, 4, and 5.
1. Assessable value	£53,086,411	£22,401,757	£38,111,366	£41,922,825	£105,133,948
2. Average assessable value per district or borough	£717,384	£88,556	£46,762	£67,350	£60,771
3. Population, Census 1911	10,871,260	4,632,042	8,142,707	7,906,299	20,681,048
4. Average population per district or borough	146,909	18,303	9,991	11,853	11,919
5. Miles of road other than main roads. (Col. 6 includes main roads)	9,106	4,776	11,692	95,143	139,413
6. Average miles per district or borough	123.5	18.8	14.3	142.6	80.3
7. Assessable value per mile of road	£5,830	£4,691	£3,258	£472	£756
8. Expenditure on maintenance of roads other than main roads. (Col. 6 includes main roads)	£1,235,906	£515,549	£919,164	£2,160,492	£6,238,219
9. Expenditure per mile on maintenance of roads other than main roads. (Col. 6 includes main roads)	£136	£108	£79	£23	£45 (main roads average £95)
10. Expenditure per £ of assessable value	5.58d.	5.53d.	5.79d.	11.5d.	14.2d.
11. Expenditure per head of population	27.3d.	25.7d.	27.1d.	65.6d.	72.4d.
12. Net expenditure on maintenance after deducting £1,321,522. Exchequer contributions assumed at 50 per cent of expenditure of main roads	—	—	—	—	£4,916,727
13. Net expenditure per £ of assessable value	—	—	—	—	11.2d.
14. Net expenditure per head of population	—	—	—	—	57.0d.

application of a highway authority (which expression includes urban authorities, highway boards, and parish surveyors) to declare any road to be a main road if it appeared to the highway authority that it ought to have become a main road by means of its being "a medium of communication between great towns or a thoroughfare to a railway station or otherwise."

This power was afterwards (Local Government Act, 1888, sec. 11) qualified by a provision that the declaration of a road as a main road "should not take effect until the road had been placed in proper repair and condition to the satisfaction of the County Council." Then, under the Local Government Act, 1888, it was provided:—

(1) That every then existing main road should be wholly maintained and repaired by the county council of the county in which the road is situate. (Sec. II, subsec. 1.)

(2) That, within prescribed limits of time, any urban authority might claim to maintain any main road within its district, and that the county council should make to such authority "an annual payment towards the cost of the maintenance and repair and reasonable improvement connected with the maintenance and repair of such road," the amount of such payment being determined, in the absence of agreement, by arbitration of the Local Government Board. (Sec. II, subsecs. 2 and 3.)

(3) That district councils should, if required by county councils, undertake "the maintenance, repair, improvement, and enlargement of and other

of on the district rate, such roads become main roads, however little they may possess importance for through traffic or other features which ought to distinguish main roads.

The conclusions to be drawn from the history of the growth of main roads are (1) that the claim of highway authorities for substantial contributions to the cost of maintaining disturnpiked roads is indisputable, and (2) that the existing classification of roads into main roads and other than main roads is practically worthless as a basis for the distribution of Exchequer contributions.

The mileage of disturnpiked roads which became main roads in England and North Wales is stated in 2 Main Roads (Mileage), Returns of, 1881 (White Papers 226 and 402), as follows:—

	Disturnpiked.	Declared.	Total main roads.
Roads in rural areas	Miles. 12,553	Miles. 2,572	Miles. 15,125
Roads in urban sanitary districts	1,567	263	1,830
Totals	14,120	2,835	16,955

It will now be convenient to trace the history of the Exchequer grants in aid of road maintenance. The first grant was described as a grant in aid of disturnpiked and main roads, and the following

passage relating to it is extracted from Mr. Fowler's Report on Local Taxation, 1893, p. 83:—

PARLIAMENTARY GRANTS IN AID OF LOCAL TAXATION.

Disturnpiked and Main Roads.

This grant in aid was first made in 1882. At the beginning of the Session of that year notice was given in the House of Commons of a resolution that, "In the opinion of this House, immediate relief should in some form be afforded to ratepayers from the present unjust incidence of rates appropriated for the maintenance of main roads in England," and Mr. Gladstone engaged to propose something in conformity with the spirit of the resolution. The result was the voting of Parliament of the sum of £250,000 in respect of the cost of the maintenance of disturnpiked and main roads in England, Wales and Scotland. The expenditure out of the vote was £187,652, of which £20,487 was paid to Scotch authorities. In 1883 the sum voted for England and Wales was £200,000, and the expenditure £195,649. There was a separate vote for Scotland. The grant was paid to the several highway authorities in England and North Wales, to whom repayment of a moiety of the cost of maintenance of disturnpiked and main roads had been made by the county authority under the Highways and Locomotives (Amendment) Act, 1878, and on the basis of one-fourth of the cost of such maintenance allowed by the county authority for the preceding year. In the Metropolis and in South Wales the grant was distributed on a basis which it was estimated would allow of an equivalent payment to the road authorities there.

In the year 1887-8 the sum of £245,500 was voted by Parliament for the purpose of this grant, and in connection with Mr. Goschen's Budget of that year an additional sum of £256,000 was granted in further aid of the cost of the maintenance of disturnpiked and main roads. This additional sum was distributed to the county authorities on the basis of one-half of the sum paid by them to the local highway authorities in respect to the cost of the maintenance of disturnpiked and main roads for the previous year.

In this year, therefore, one-half of the cost of the maintenance of these roads was borne by Imperial funds, one-fourth of such cost being repaid to the county authorities and one-fourth to the local highway authorities. The amounts paid in the Metropolis and in South Wales were proportionately increased.

This grant ceased to be voted by Parliament on the passing of the Local Government Act, 1888. Provision was made by sec. 121 (2) (i.) of that Act for payments to the highway authorities during the year 1888-89 on the same basis as in the previous year, and by Section H. of the Act it was provided that, from April 1, 1889, all main and disturnpiked roads should, with certain exceptions indicated in the section, be maintained by the county councils.

The same report contains the following table showing the successive increases in the grants:—

GRANTS IN AID OF DISTURNPIKED AND MAIN ROADS,
ENGLAND AND WALES.

Year ending 31st March,	£
1883	167,165
" " 1884	195,649
" " 1885	205,965
" " 1886	229,490
" " 1887	237,123
" " 1888	498,797
" " 1889	538,679

The grant of £538,679 for the year 1889 purported to be a grant equivalent to one-half the cost of maintenance of main roads, and no distinction appears to have been drawn between the 14,120 miles of main roads which had previously been turnpike roads and the mileage (the exact figure of which, including urban mileage, cannot be given) which had been declared as main roads between 1878 and 1888. It may be inferred, therefore, that the declaration of a road as a main road was held to be sufficient to justify its sharing in the grant; but, although this may be an accurate assumption in regard to the roads declared from 1878 to 1888, it cannot with equal accuracy be applied to the 6,400 miles, or thereabouts, declared from 1888 to 1909, because in that period some counties adopted the policy of declaring as main roads most of the roads in the county, without regard to their characteristics.

THE CONTRIBUTION FROM IMPERIAL REVENUE.

Turning now to the question of what, in fact, is the amount now contributed from Imperial revenues towards the cost of maintaining main roads, it is clear, at all events, that the contribution comes from the

balance of assigned revenues, which, after 1888, took the place of Parliamentary grants, after payment thereof of the priority charges payable under the provisions of the Local Government Act, 1888. That balance, in the case of the administrative counties in England and Wales (excluding London and county boroughs), amounted to £1,438,916 in 1909. It is difficult, however, to determine what portion of that balance can be definitely assigned to the heading of main road maintenance expenditure.

Under the financial settlement of 1888 the balance of the assigned revenues, after payment of the priority charges, was available to meet any expenditure for general county purposes, including expenditure on main roads; but it was not specially provided that any part of the balance was to be earmarked or appropriated for the payment of any specified proportion of that expenditure.

It would, however, probably be a sound assumption that it was intended that the growing produce of the assigned revenues should bear (1) one-half of the increasing cost of the roads which were main roads in 1888, and also one-half of (2) the cost of maintaining such roads as might, after 1888, be declared by county councils to be main roads, provided that the roads so declared did possess the legitimate characteristics of main roads.

In the "Review of the Financial Relations between the Imperial Exchequer and the Local Authorities of England and Wales (1889-1910)," by Mr. H. E. Howard, controller of the London County Council, published in 1911 under the direction of the council of the Institute of Municipal Treasurers and Accountants (Incorporated), the above-mentioned assumption is made (though without the qualification in [2]), and in Table X11. appended to that Review, p. 15, the amount assumed to be borne by Exchequer contributions in respect of expenditure by county councils, other than London, on main roads in the year 1908 is stated as £1,282,934.

In the same table the expenditure is stated as £2,614,025, so that the contributions appear to be less than one-half of the expenditure by the sum of £24,078; but this figure appears to require some correction. The figure given by Mr. Howard is the total expenditure of county councils outside London in respect of main roads (excluding £142,120 for loan charges) in the year 1908, as stated in the Local Taxation Returns for 1908.

That figure, however, includes £63,577 for main roads in urban areas, and £10,447 for main roads in rural areas, making together £74,024 in respect of improvements and other items not classified as maintenance, the bulk of which was probably spent on widenings of urban streets for local purposes.

Moreover, the balance of £2,540,001 entered in the accounts of county councils as expenditure on maintenance may contain many items which on scrutiny would not be admitted as expenditure properly chargeable to maintenance account. Prior to the institution of the system of assigned revenues, the Parliamentary grants of one moiety of maintenance expenditure were paid after the Local Government Board had certified the expenditure on maintenance; but since 1889 it has been comparatively immaterial whether items of expenditure by county councils were entered under the heading of "maintenance" or under the headings of "improvements" or other headings, and there can therefore be no assurance that the expenditure described as for maintenance does not include items which on scrutiny would not be admitted to be expenditure properly chargeable to maintenance.

ROADS MAINTAINED SINCE 1888.

In addition to this, 6,400 miles, or thereabouts, have been declared by county councils as main roads since 1888, and it is impossible to determine from any materials now available what proportion of that extra mileage should be treated as consisting of roads in respect of which Imperial subventions could be sought on the basis of a proper classification. It is practically certain that in some counties roads are classified as main roads which would not be admitted to be roads in respect of which State assistance could be fairly claimed. This consideration might not substantially affect the net total, because the deduction to be made on this account from the additional mileage of main roads since 1888 might be balanced or even more than balanced by the mileage of roads still treated as district roads in some counties which, if their characteristics and conditions were properly considered, would be classified as roads fairly entitled to share in Imperial subsidies.

The only conclusion that can be arrived at in regard

to this matter on the materials available is, therefore, that if it be assumed that the sum of £1,282,934, as stated by Mr. Haward, is the amount of Exchequer contributions which should be regarded as attributable

more than sufficient, to cover one moiety of the maintenance expenditure of the county councils in that year. It is probable, however, having regard to the increase which has taken place in the cost of main-

TABLE III.—TABLE SHOWING FOR EACH COUNTY (OUTSIDE LONDON) THE EXPENDITURE IN THE YEAR 1911 ON ROADS AND BRIDGES BY (1) THE COUNTY AND (2) THE DISTRICT AUTHORITIES, AND (3) THE TOTAL FOR BOTH AUTHORITIES; THE AMOUNT OF THE EXCHEQUER CONTRIBUTION AVAILABLE FOR ROADS IN EACH COUNTY, AND THE PERCENTAGE THAT SUCH CONTRIBUTION IS OF THE TOTAL EXPENDITURE.

(Prepared from returns obtained from each county and district council. In a few cases in which district councils have failed to send in returns the figures for the year 1908-9—as given in the Local Taxation Accounts—have been interpolated.)

County.	Expenditure on roads and bridges by		Total.	Exchequer contributions.	Percentage exchequer contribution is of total expenditure.
	County.	District Authorities.			
1	2	3	4	5	6
ENGLAND.					
Bedfordshire ...	57,734	6,610	64,344	15,322	24
Berkshire ...	57,403	54,306	111,709	21,503	19
Buckingham ...	55,713	49,535	105,248	26,219	25
Cambridge ...	36,305	30,175	66,480	13,294	20
Cheshire... ..	97,637	105,757	203,394	43,483	21
Cornwall	44,989	67,144	112,133	23,703	21
Cumberland ...	37,385	39,123	76,508	22,783	30
Derbyshire	92,339	98,138	190,477	44,668	24
Devonshire	91,637	107,282	198,919	46,224	23
Dorsetshire	58,915	41,237	100,152	21,839	22
Durham	60,907	138,252	199,159	41,477	21
Essex	170,496	155,635	326,131	14,138	4
Gloucester	89,446	75,225	164,671	34,000	21
Herefordshire ...	34,219	35,432	69,651	15,952	23
Hertfordshire ...	114,230	29,601	143,831	22,210	15
Huntingdon	25,934	3,099	29,033	6,700	23
Isle of Ely	22,256	22,215	44,471	9,000	20
Isle of Wight	19,772	5,615	25,387	9,489	37
Kent	<i>118,311</i>	242,570	390,884	65,810	17
Lancashire	200,406	191,892	392,298	45,122	12
Leicester	<i>29,043</i>	46,515	75,558	22,547	30
Lincolnshire (Holland)	20,361	38,501	58,862	12,918	22
" (Kesteven)	24,628	39,529	64,157	12,796	20
" (Lindsey)	<i>27,219</i>	88,831	116,050	24,093	21
Middlesex	104,682	206,256	310,938	Nil.	—
Monmouth	44,036	44,311	88,347	24,000	27
Norfolk	71,874	52,252	124,126	38,384	31
Northampton ...	30,314	55,684	85,998	21,249	25
Northumberland ...	66,639	90,205	156,844	28,527	18
Nottingham	39,851	57,696	97,547	24,349	25
Oxfordshire	42,894	31,620	74,514	17,025	23
Peterborough (Soke of)	3,775	11,494	15,269	4,282	27
Rutlandshire	4,132	7,757	11,889	3,315	28
Salop	47,808	48,773	96,581	29,476	30
Somerset	99,906	104,695	204,601	47,440	23
Southampton	72,031	74,787	146,818	39,771	27
Staffordshire	71,083	107,434	178,517	43,150	24
Suffolk (East)	35,183	49,316	82,499	15,583	19
" (West)	3,841	41,603	45,449	11,275	25
Surrey	89,113	207,571	296,684	24,565	8
Sussex (East)	73,630	84,737	158,667	25,942	16
" (West)	27,083	55,560	82,643	17,217	21
Warwickshire	63,614	74,585	138,199	25,744	19
Westmorland	14,190	12,222	26,412	8,516	32
Wiltshire	77,444	52,546	129,990	25,000	19
Worcestershire	61,787	70,247	132,034	27,568	26
Yorkshire (E.R.)	9,231	82,603	91,834	15,021	16
" (N.R.)	42,017	89,739	131,756	29,799	23
" (W.R.)	221,307	296,050	517,357	82,917	16
Total	3,032,753	3,721,967	6,755,020	1,245,375	19
WALES.					
Anglesey	1,550	10,573	12,123	3,366	27
Breconshire	15,610	11,244	26,854	6,755	25
Cardigan	10,204	10,950	21,154	3,714	17
Carmarthen	25,625	30,004	55,629	10,897	20
Carnarvon	16,494	17,901	34,395	6,902	20
Denbigh	23,301	23,904	47,205	11,897	26
Flintshire	17,617	14,277	31,894	8,824	28
Glamorgan	66,719	143,792	210,511	26,795	13
Merioneth	12,180	4,298	16,478	2,444	15
Montgomery	16,166	8,319	24,485	6,486	26
Pembroke	10,595	23,774	34,369	6,661	19
Radnorshire	4,435	5,995	10,430	2,003	19
Wales	220,496	305,031	525,527	96,744	18
England	3,032,753	3,721,967	6,755,020	1,245,375	19
Total, England and Wales	3,253,249	4,026,998	7,280,547	1,342,119	18.5

Note.—Col. 2, Expenditure by county council; figures in italics refer to year 1910.

to expenditure on the maintenance of main roads in the year 1903, and if it be further assumed that the greater part of the main road mileage added since 1883 should be treated as falling within the category of roads which should be subsidised, the Imperial contributions in 1903 were sufficient, and probably

tenance, that the available balance may now be insufficient to cover half the cost.

ACTUAL COSTS OF MAINTENANCE.

Turning now to the question of what is the present burden on local rates of maintaining roads, it is pro-

ably better in the first instance to look at the figures of maintenance cost not for main roads only, but for all roads. This burden can best be measured by the expenditure per £ of assessable value.

In the year 1909—the latest year for which local taxation returns are available—the expenditure on road maintenance per £ of assessable value was 3.24d. in metropolitan boroughs, 5.58d. in county boroughs, and 14.2d. in administrative counties; but if £1,321,522, being the assumed portion of the Exchequer contributions available to cover 50 per cent of the main road expenditure, is deducted from the gross expenditure, then the figure for administrative counties is reduced to 11.2d. (See Table 2 in Appendix hereto.)

The first point to notice on these general figures is that the actual burden in county boroughs is only about one-half of what it is in administrative counties.

The next point is that the burden, when measured in the aggregate and on the average, is not so excessive as to create any grievance. It is really in connection with the division or distribution of the burden that legitimate grievances and complaints arise.

County ratepayers, as a whole, have only to pay 3d. per £ on the aggregate county assessable value for the maintenance of all main roads (after allowing for Exchequer contributions), and this sum, added to the expenditure in the various constituent areas of administrative counties, makes up in respect of all roads, main or other, a total of 8.53d. per £ for the non-county borough ratepayers, 8.79d. per £ for the urban districts, and 14.5d. for the rural districts.

But, although the average burden is as stated above, the actual burden varies widely in different areas. In rural districts, for example, the rates vary from under 2d. to over 3s. per £, and in those districts, taken as a whole, the expenditure on the maintenance of roads other than main roads is 69 per cent of the total receipts from public rates.

The inequalities between the different counties can be followed in detail from Table 3 in the Appendix hereto. That table has been prepared from information applicable to the year 1911, which the highway authorities have been good enough to supply to the Road Board. But it must be noted that the expenditure shown does not distinguish between maintenance and improvement, and the figures must be taken with that qualification.

INSTANCES OF INEQUALITIES.

One or two concrete instances may be given in illustration of the inequalities as between districts taken from the above table and from the Local Taxation Returns for 1909.

Farnham Urban and Farnham Rural are adjoining highway districts, both forming part of the administrative county of Surrey. In Farnham Urban the expenditure on the district roads represents about 4d. per £ of the assessable value. In Farnham Rural the expenditure is equivalent to about 20d. per £ of the assessable value. Both districts have to pay for the county main roads, and the expenditure on these roads is about 4d. per £ of the assessable value. Thus, the total burden on the ratepayers in Farnham Urban for roads, both main and district, is equivalent to an expenditure of 8½d. per £ of the assessable value, and in the Farnham Rural to 24d. per £ of the assessable value. Thus, in two adjoining districts the total burden of the highways is three times as great, although it cannot be said that the value to Farnham Rural residents of the roads in their district is any greater than the relative value to Farnham Urban of their roads.

The practical effect of this difference is that in heavily-rated districts the ratepayers and their representatives, the district councils, consider that they are taxed up to the hilt for highway expenditure, and they are unwilling or unable to face the additional burden which the maintenance of their roads to meet the additional requirements of traffic imposes upon them, and thus the roads are not maintained up to the standard that modern traffic requires.

The above is an example of the differences that prevail in the burden of highways in the same administrative county.

A further category of inequalities is to be found in the difference that exists between the burden in a county borough and the adjoining county. An example may be furnished from the county of Southampton (Hampshire). The total expenditure on highways in the administrative county on main and district roads is equivalent to an average of 1s. 4½d. per £ of assessable value. In the county boroughs of Portsmouth and Southampton the expenditure on

the roads, including loan charges, works out at 11d. and 10d. respectively per £ of assessable value. Thus, the total burden in the county is about 50 per cent greater than in the county boroughs which have been formed out of the ancient county.

If particular districts are taken for purposes of comparison instead of the general county average, it will be found that even greater variations than that indicated above exist. In the Havant rural district, which adjoins Portsmouth, the expenditure on main and district roads together works out at 1s. 5d. in the £, and in the neighbouring rural district of Petersfield the expenditure represents no less than 2s. 8½d. in the £, or three times greater than in the county boroughs of Portsmouth and Southampton, and the ratepayers in these districts are able to point out that many of their roads are used to a greater extent by the inhabitants of the county boroughs than by the resident ratepayers themselves.

There is a third class of inequalities—viz., those which exist between counties in different parts of the country. In Table 4 the average expenditure on roads and bridges in the year 1911 is worked out at 16d. per £ of assessable value. In the following counties the expenditure per £ of assessable value on all roads and bridges in the county is above 2s. in the £—viz.:—

	d.
(6) Gloucestershire	24.2
(4) Herefordshire	24.7
(1) Isle of Ely	32.4
(2) Lincolnshire (Holland) ..	28.3
(5) Lincolnshire (Kesteven) ..	24.4
(3) Oxfordshire	24.7

In the following counties the expenditure per £ of assessable value is less than 1s.:—

	d.
(3) Durham	5.7
(1) Lancashire	11.5
(2) Middlesex	11.0

If the expenditure per head of population is taken as the measure of the burden it will be found that the average expenditure per head of population is 6s. 2d. In the following counties the expenditure is above 12s. per head—viz.:—

	s.	d.
(4) Herefordshire	12	3
(3) Isle of Ely	12	9
(1) Lincolnshire (Holland) ..	14	2
(2) Sussex (East)	13	1

and in the following counties it is below 6s.:—

	s.	d.
(1) Cumberland	5	9
(12) Durham	4	4
(2) Isle of Wight	5	9
(11) Lancashire	4	6
(6) Middlesex	5	6
(3) Monmouth	5	8
(4) Nottingham	5	8
(8) Staffordshire	4	10
(10) Worcestershire	4	9
(9) Anglesey	4	9
(7) Carnarvon	5	6
(5) Glamorgan	5	8

Several causes contribute to the conversion of a moderate average burden in all administrative counties into an almost intolerable burden in some counties and many districts. For example, the policy of limiting the mileage of main roads in some counties may throw a heavy burden on particular districts in those counties; the mileage of roads in some counties or districts may be abnormally large; the climate or the subsoil, or other physical conditions in some areas may cause abnormally high cost in maintenance; the price of suitable stone for road making may vary from 3s. to 15s. per ton, or even over a wider range, owing to differences in distance from stone supplies, or the cost may be affected by differences in the efficiency of the local organisation and administration in connection with road maintenance. But unless the principle of equalisation of burdens in rating areas were adopted most of the differences which exist are inevitable, and their economic effects are adjusted in the rents and values of land and buildings in the different areas. Such differences therefore cannot be directly taken into account in distributing Exchequer contributions to road maintenance, but a most practical difficulty does arise from the inequality of the burdens, because in the heavily-rated districts there is naturally great reluctance to spend the amounts needed to maintain the roads in the condition of efficiency that modern traffic requires.

The constant demand of road users in recent years has been that a higher standard of efficiency shall be secured in the maintenance of the roads. The standard has been gradually rising. With the abolition of the stage coach and the introduction of the railways the main roads of the country fell very

largely into disuse and were often neglected. The introduction first of the bicycle and later of the motor car has brought about "the return of the road," and with it a demand for smooth and dustless tracks for vehicular traffic.

THROUGH TRAFFIC AND THE RATEPAYER.

The latest development in road traction (the heavy motor vehicle, the motor tractor, and the motor de-

time, leaving it to the traffic to work it in, and it may be expected, if financial arrangements in respect of roads remain as at present, that it will be many years before a large number of the rural authorities will, on their own initiative, carry out the strengthening and improving of the roads which the user insistently demands. It is indeed difficult to see how they could do so without increasing rates to quite impossible figures.

TABLE IV.—TABLE SHOWING THE COST OF MAINTAINING ROADS AND BRIDGES IN EACH COUNTY (OUTSIDE LONDON) IN 1910-11, MEASURED BY THE (1) EXPENDITURE PER HEAD OF THE POPULATION, AND (2) PER £ OF ASSESSABLE VALUE.

County.	Population.	Assessable value.	Total expenditure	Expenditure.	
				Per head of population.	Per £ of assessable value.
1.	2.	3.	4.	5.	6.
ENGLAND.					
		£	£	s. d.	s. d.
Bedfordshire ...	191,625	929,520	64,344	6 7	1 5
Berkshire ...	195,814	1,251,989	111,709	11 5	1 9
Buckingham ...	219,583	1,100,816	105,248	9 7	1 11
Cambridge ...	128,325	717,883	66,480	10 5	1 10
Cheshire ...	676,356	3,689,616	203,394	6 0	1 1
Cornwall ...	328,131	1,129,939	112,133	6 10	2 0
Cumberland ...	265,780	1,518,948	76,505	5 9	1 0
Derbyshire ...	560,129	2,558,037	190,477	6 10	1 6
Devonshire ...	157,343	2,402,828	198,919	8 8	1 8
Dorsetshire ...	223,274	1,062,544	100,152	9 0	1 11
Durham ...	929,340	8,249,438	199,159	4 1	0 6
Essex ...	1,062,000	4,871,580	326,131	6 2	1 4
Gloucester ...	329,037	1,631,656	164,671	10 0	2 0
Herefordshire ...	114,269	675,156	69,651	12 3	2 1
Hertfordshire ...	311,321	1,874,381	143,831	9 3	1 6
Huntingdon ...	55,583	320,257	29,033	10 5	1 10
Isle of Ely ...	69,759	328,979	44,471	12 9	2 8
Isle of Wight ...	88,193	500,723	25,387	5 9	1 0
Kent ...	1,041,033	5,974,585	390,884	7 8	1 4
Lancashire ...	1,739,544	8,267,150	392,298	4 6	0 11
Leicester ...	249,361	1,263,550	75,558	6 1	1 2
Lincolnshire (Holland) ...	82,860	499,680	58,862	14 2	2 4
" (Kesteven) ...	111,328	629,605	64,157	11 7	2 0
" (Lindsey) ...	237,864	1,278,092	116,050	9 9	1 10
Middlesex ...	1,126,649	6,747,156	310,938	5 6	0 11
Monmouth ...	312,078	1,282,765	88,347	5 8	1 4
Norfolk ...	321,748	1,482,548	124,126	7 8	1 8
Northampton ...	213,751	1,188,523	85,998	8 0	1 5
Northumberland ...	371,521	1,944,225	156,844	8 5	1 7
Nottingham ...	344,135	1,555,848	97,547	5 8	1 3
Oxfordshire ...	146,228	724,273	74,524	10 2	2 1
Peterborough (Soke of) ...	44,722	229,250	15,269	6 10	1 4
Rutlandshire ...	20,347	144,241	11,859	11 9	1 8
Salop ...	246,306	1,409,672	97,581	7 11	1 5
Somerset ...	407,345	2,255,392	204,601	10 1	1 10
Southampton ...	433,604	2,145,680	146,818	6 9	1 4
Staffordshire ...	739,105	3,155,773	178,517	4 10	1 1
Suffolk (East) ...	203,227	857,600	82,499	8 1	1 10
" (West) ...	116,914	492,874	45,449	7 10	1 10
Surrey ...	675,985	5,320,436	296,684	8 10	1 1
Sussex (East) ...	294,697	2,187,761	158,667	10 9	1 5
" (West) ...	176,323	1,045,588	82,643	9 5	1 7
Warwickshire ...	408,291	2,175,232	138,199	6 9	1 3
Westmorland ...	63,575	452,588	26,412	8 4	1 2
Wiltshire ...	286,876	1,386,529	129,990	9 1	1 10
Worcestershire ...	427,064	2,001,707	122,034	4 9	1 3
Yorkshire (E.R.) ...	154,780	1,022,817	91,834	11 11	1 10
" (N.R.) ...	314,814	1,898,791	131,756	8 5	1 5
" (W.R.) ...	1,585,135	7,979,547	517,357	6 6	1 3
Total ...	23,609,065	103,813,271	6,754,720	5 8	1 3
WALES.					
Anglesey ...	50,943	223,895	12,123	4 9	1 1
Breconshire ...	59,298	279,163	26,854	9 1	1 11
Cardigan ...	59,877	231,888	21,154	7 1	1 10
Carmarthen ...	160,430	598,307	55,629	7 1	1 11
Carnarvon ...	125,049	635,135	34,395	5 6	1 1
Denbigh ...	144,796	627,054	47,205	6 6	1 6
Ffintshire ...	92,720	444,317	31,894	6 11	1 5
Glamorgan ...	743,110	3,409,988	210,511	5 8	1 0
Merioneth ...	45,573	223,644	16,478	7 3	1 6
Montgomery ...	53,147	295,744	24,485	9 3	1 8
Pembroke ...	89,956	346,874	34,369	7 8	2 0
Radnorshire ...	22,589	203,580	10,430	8 11	1 0
Wales ...	1,647,488	7,519,589	525,527	6 5	1 5
England ...	23,609,065	103,813,271	6,754,720	5 8	1 3
TOTAL—ENGLAND AND WALES ...	25,256,553	111,332,860	7,280,247	5 9	1 4

* Including Eastbourne (made a county borough April 1st, 1911).
NOTE.—Col. 3. Assessable value; figures in italics refer to 1910.

livery van) has created a demand for stronger roads and stronger bridges.

The demand has been met to some extent, but, speaking generally, the demand of the user is always in advance of the willingness of the local authorities to satisfy it. There are still rural districts in England which obstinately refuse to steam roll their roads, and repair them as they were repaired a century ago by throwing down metal from time to

The user says: "The condition of the road should not be entirely dependent upon local standards; that there should be some central authority to secure a certain minimum standard of maintenance on all roads used by through traffic, even if it is necessary for that central authority to adjust by financial grants the additional burdens which its standards may impose."

The user argues that it would be just as reason-

able to leave to the graziers on the Westmorland Fells the responsibility of determining the standard of the railway line from London to Carlisle over Shap, or to the Devonshire farmers the responsibility of determining the standard of the railway line through Devonshire, as to leave to the selfsame graziers and farmers the responsibility of determining whether the main road from London to Scotland and the road from London to the West should be maintained in a condition sufficient for their requirements as graziers and farmers, or should be made suitable for the needs of through traffic.

The attitude of the user is natural and inevitable. He wishes to take his vehicle with the maximum of comfort and the minimum of wear and tear over any road upon which he wishes to travel.

The attitude of many local authorities is equally natural, and is both logical and strong. They say: "Our roads are quite good enough for us; they carry the agricultural and local traffic of the district, and we will not raise the standard of maintenance to meet the demands of 'alien' traffic at the expense of our local ratepayers. We have no objection to raising the standard if it is at their expense and not at ours, but we point blank refuse to spend more money out of our own pockets." To this position, when taken up and maintained, the law supplies no answer, and the existing system of administration no remedy.

THE RELATION OF GRANTS TO EXPENDITURE.

These considerations indicate that, in order to adapt State assistance as far as practicable to the varying cost of the main roads in each county, grants in relief of road maintenance should take the shape of definite proportions of actual expenditure, and also that some provision should be made for making special grants in special cases.

As regards the proportion of expenditure which should be paid, it would probably be generally admitted that if grants are made to roads to be classed as subsidised county roads as well as to subsidised main roads in the proportions and manner indicated in a later part of this memorandum, and if these grants are properly distributed, grants covering half of the cost of subsidised main roads would be adequate. But under the present system of distribution of Exchequer contributions the actual share of each maintaining authority has no proper relation to their expenditure in maintaining those roads towards which they can fairly claim national assistance. The amount of the expenditure on such roads in any county cannot be ascertained with any approach to accuracy until there has been a reclassification of roads, but dealing only with the expenditure on the maintenance of main roads as now classified, it will be seen from Table 3 in the Appendix that some counties receive considerably more than half the cost of their main road expenditure, including improvements, while other counties receive only a small percentage of that expenditure.

In Table 3 the assumed Exchequer contributions are shown in the shape of a percentage of the total expenditure of all highway authorities in each county on all roads, because, although the Exchequer contributions are paid to the county councils, and applied directly in relief of county rates, the total burden for road maintenance borne by the county and district ratepayers includes the expenditure on other roads as well as main roads. It will be observed that the range of the percentages varies from *nil* in the county of Middlesex and 4 per cent in the county of Essex up to 31 per cent in Norfolk and 32 per cent in Westmorland, and it is obvious from the table that many counties have a legitimate grievance in regard to the share of the Exchequer contribution which they receive.

It seems therefore to be essential in order to remedy the grievance of the local authorities in regard to the distribution of the Exchequer contributions that there should be a return to the system of earmarked grants.

It is now generally admitted that the substitution of unallocated assigned revenue for earmarked grants was a most unfortunate step as regards the road system.

The receipt of any county in respect of main roads is not in any way affected by, nor does it influence, the actual expenditure on maintenance. This is unfair to the counties, because the expenditure on main roads has increased, and is increasing, in greater ratio than the revenue.

It is unfair to district highway authorities, because, however good a case they may have for some share

of the grants to assist the maintenance of any road used to a material extent by non-local traffic, no assistance can be obtained unless the county council is willing to "main" the road. It is true that county councils have power to contribute to roads other than main roads, but this power has only been exercised to a limited extent. The total amount so contributed in the year 1911 was £122,631.

It is unfair to road users, because, although the counties receive money from Imperial sources for the purpose of enabling them to keep the more important roads in good condition, no precautions are taken that the money is in fact spent on the important roads and not on roads which are "district" in character though "main" in name, or that the important main roads are efficiently maintained. Neglect of maintenance is not followed by either the withdrawal or diminution of the grants made.

The expenditure to be incurred in any year on the maintenance of a road must necessarily be determined by expert opinion. Sufficient material must be laid down to strengthen the road crust if it is too weak for the traffic it has to bear and to replace the wear due to traffic and weather, and sufficient money must be spent on the renewal of surface coatings to keep the road in good condition. But under the present system the recommendations of expert surveyors in charge of roads may be set aside, and the expenditure recommended by them may be cut down, not because their judgment as to the expenditure necessary for efficient maintenance is impugned as inaccurate, but simply for financial reasons due to considerations quite apart from road maintenance. When this is done the result is that the roads deteriorate, and road users have to put up with roads in bad condition, but the ratepayers are also placed at disadvantage because the deterioration allowed to occur has to be made good by still larger expenditure in some future period.

CLASSIFICATION A NECESSITY.

If grants for main roads were earmarked instead of being open, as they now are, to diversion to any other head of expenditure to which for the moment it may be financially convenient to divert them, there would be less danger of roads being imperfectly or wastefully maintained, and whatever may be the amount of future grants it is strongly recommended that they should be grants of definite proportions of expenditure on roads selected as possessing more than local importance.

But before the Exchequer contributions can be made as earmarked grants it is evident that there must be a reclassification of roads in order to determine what roads can fairly be classified as roads of which the maintenance can be regarded as to some extent a national service locally administered.

The Majority Report of the Royal Commission on Local Taxation, 1901, contained the following references to this matter:—

Page 12. "The maintenance of main roads we also consider, on the whole, to be to some extent a national service, and likely to become more so, owing to the increasing mobility of the population and the development of new means of locomotion."

Page 29. "Since 1888 the cost of maintenance of main roads has greatly increased, and they have become from year to year increasingly a national service owing to the increase of population and the development of new means of locomotion. We fully recognise the fact that the changes in locomotion which have taken place during the last quarter of a century, and the different policies which have prevailed in different counties as to the making and dismaying of roads, and the technical definition of 'main roads,' which excludes main roads in county boroughs and roads disturnpiked prior to December 31, 1870, unless the latter have since been made main roads, have rendered it eminently desirable that some authoritative and impartial body should revise the distribution of the main road grant and decide what roads should be main roads alike in counties and county and quarter sessions boroughs. This is a task involving minute local investigation and the taking of detailed evidence on the part of those locally interested, which it has not been possible for us to undertake; but we trust it may hereafter be undertaken by some duly authorised tribunal."

Lord Balfour of Burleigh, in his "Separate Recommendations," said:—

Page 72.—"It will be seen, in the scheme of allocation for the grants towards national services which I put forward in the following section, I have sug-

gested a contribution from central funds towards the maintenance of main roads. It is less easy to forecast the effect of the scheme in this respect than in others. For under the existing statutes the policy of all the counties in regard to their roads has not been of a uniform character.

"The main roads which are now maintained at the expense of county funds were never selected upon any well-defined principles, the only condition originally imposed being that they should have been disturnpiked since 1870, and as the raising of highways to the status of main roads in any county rests entirely with the county council, the additions which have been made to the number of main roads in recent years have not been determined with uniformity.

"Accordingly, for the purposes of the distribution of the grant proposed for main roads, we have recommended that the determination of the roads to be deemed main roads shall rest with an independent authority to be specially appointed."

And again at p. 81:—

"It is probable that the determination of the roads to be deemed main roads would entail special inquiry by a small expert commission."

The separate report by Sir Edward Hamilton and Sir George Murray, in referring to the claims that the assistance from national funds should be given towards the cost of roads now classified as district roads, stated:—

Page 118.—"There is, however, one particular feature in which the indiscriminate relief to agricultural ratepayers appears to us to be specially open to objection. We find that the relief given under the Agricultural Rates Act is not confined to national services in any possible definition of that term. Under that Act, for instance, the Exchequer defrays a large part of the cost of maintaining highways in rural districts—i.e., those district roads which are not of sufficient importance to be considered main or county roads."

Again, in assigning main roads and county bridges to the category of national services, the assignment is made with the following qualification:—

Page 124.—"Main roads and county bridges (which, though they may have lost some of their former national character, are likely to regain it by the development of new means of locomotion)."

And, in referring to the application of the scheme for grants in aid recommended by the separate report, it is said that, so far as the suggested grant for main roads is concerned, the scheme "could hardly be worked out without local inquiry in each case."

The members of the Royal Commission, therefore, unanimously concurred in the view that no new scheme for grants in respect of main roads could be adopted and applied until the roads for which grants should be made had been selected and classified by some central authority, but they gave no indication as to the principles on which the selection should be made.

The Departmental Committee on Highways reported in 1903 that the maintenance of trunk roads was a matter for "national rather than local or county provision," and that the selection of the roads which should be regarded as forming part of such trunk roads should be left to some tribunal. It is, perhaps, better to avoid the use of expressions such as national road, trunk road, or arterial road, as these embody conceptions which are too vague to be of any practical use.

It is suggested, therefore, that the roads and the portions of road in respect of which State subsidies should be paid should first of all be selected, described, scheduled and delineated on an official plan, and this should be done by some expert and central authority on applications from county councils as regards roads in administrative counties outside London and outside county boroughs.

Power should be given to any highway authorities within the area of a county to request the county council to make application in respect of any road or part of a road maintained by such highway authority, and in the event of refusal of the county council to do so power of appeal to the central authority should be given.

Provision should be made in the classification for main roads of first importance, and also for main roads or county roads which, although not of first importance, are of more than county importance and carry a sufficient volume of through traffic to justify a claim for some assistance from State revenues.

The proposal that Exchequer contributions, based on percentages of actual expenditure, should be given needs some justification in detail. This question of

State contribution has been materially affected by the introduction of motor traffic. Before motor traffic arose, the case for State assistance to any considerable mileage of roads, other than disturnpiked roads, was very weak, but now the case is very strong.

The claim for maintenance grants is based on the following among other considerations:—

(1) That the maintenance of certain roads is a national service locally administered for which the present payments are inadequate.

(2) That the cost of maintaining roads has largely increased.

(3) That the growth of motor traffic has introduced a new factor, which causes (a) destruction and wear of road surfaces, (b) the need for increased expenditure not only on ordinary annual maintenance, but also on reconstruction and strengthening of roads, and in securing a higher standard of maintenance than was previously required.

(4) That it is unfair to throw on local rates the burden of providing roads of the standard required for motor traffic.

As regards the first of these considerations, it is generally admitted that the maintenance of certain roads is a service towards which the State should contribute, and that, at least in certain counties, there is a considerable road mileage in respect of which increased State aid should be given. What that mileage is cannot be determined until a reclassification has been made.

It does not follow from this that the aggregate of the existing State contributions need be largely increased. Reapportionment of grants is required as much as reclassification of roads.

THE BASIS OF CLAIMS FOR SUBSIDIES.

It cannot be, nor is it alleged, that State subsidies should be given to any roads other than those which are used to a material extent for traffic extending beyond the locality in which the road is situated. The claim cannot be based wholly on volume of traffic; indeed, the greater the volume the weaker the claim may be for national aid, as high density of traffic generally indicates that the traffic is mainly local. The local ratepayer has no grievance calling for remedy unless he is bearing some burden of maintenance not required for his local needs, and not balanced by the burden which his traffic throws upon roads in adjoining districts. In other words, he must show that the burden from which he seeks partial relief is to some material extent a national service. The difficulty lies in selecting the test for determining whether the maintenance of any road is to a greater or less extent a national service. Probably the test is to be found in data drawn from several sources. The location and function of the road must be taken into consideration. If it connects places which ought, in the national interest, to have superior road communication with each other, then it must be maintained at a high standard throughout, and although it is required and is used for local traffic on its several parts, its utility as a means of through communication between distant places is a legitimate ground for claiming that some part of the cost of maintenance should be borne from non-local sources, provided that the standard of maintenance required for the through traffic is higher than the standard which may be sufficient for local traffic. For example, no one would deny that one or more roads connecting London and Brighton should be regarded as main roads, entitled to State subsidies on the maximum scale, and that at least one road passing between Perth and Inverness should be similarly regarded. The test must largely depend on the character and sources of the traffic. The volume of traffic on Piccadilly is much greater than that on the Maidstone-Tonbridge road, and the parts of London served by Piccadilly are more populous and of greater importance than the sources of the through traffic which uses the Maidstone-Tonbridge road; but probably no one would contend that the Maidstone-Tonbridge road should be excluded from, or that Piccadilly should be included in, a schedule of subsidised roads. The percentage of local traffic to the total traffic on Piccadilly is so great as to render the addition of a small percentage of through traffic wholly negligible, while the through traffic on the Maidstone-Tonbridge road probably forms a large percentage of the total, and materially affects the cost of maintaining the road.

The traffic on any road may be divided into the following classes:—

(1) Local—i.e., traffic between termini, of which one or both are situated within the boundaries of the district in question.

TABLE V.—EXPENDITURE ON MAINTENANCE OF ROADS OUTSIDE LONDON AND OUTSIDE COUNTY BOROUGH, 1890—1902—1909.
(Compiled from Local Taxation Returns.)

Year.	Main roads						Other than main.						Main and other.					
	Rural.	Standard- ised.	Urban.	Standard- ised.	Total main.	Standard- ised.	Rural.	Standard- ised.	Urban.	Standard- ised.	Total other than main.	Standard- ised.	Total rural.	Standard- ised.	Total urban.	Standard- ised.	Grand total rural and urban.	Standard- ised.
1890	£ 781,430	100	£ 165,743	100	£ 947,182	100	£ 1,290,322	100	£ 720,475	100	£ 3,019,797	100	£ 2,050,751	100	£ 886,218	100	£ 2,906,970	100
1902	1,501,694	192	729,968	440	2,231,662	236	1,989,540	152	1,285,261	178	3,254,801	161	3,171,534	167	2,015,282	227	5,486,766	188
1909	1,765,098	225	877,916	529	2,643,011	279	2,160,482	166	1,437,552	199	3,598,041	178	3,925,590	189	2,315,498	261	6,241,088	210
1890	Miles. 18,146	100	Miles. 3,370	100	Miles. 21,516	100	Miles. 100,159	100	Miles. 11,000	100	Miles. 115,059	100	Miles. 118,605	100	Miles. 17,970	100	Miles. 136,575	100
1902	23,110	127	4,014	119	27,124	126	95,206	94	15,285	105	110,491	96	118,316	99	19,299	107	137,615	101
1909	23,588	130	4,253	126	27,841	129	95,143	94	16,468	113	111,611	97	118,731	100	20,721	115	139,452	102
1890	£ 43.2	100	£ 49.2	100	£ 44.1	100	£ 12.9	100	£ 49.4	100	£ 17.5	100	£ 17.5	100	£ 49.3	100	£ 21.7	100
1902	65.0	150	182.0	370	84.1	187	20.7	161	84.0	170	29.6	169	29.5	169	105.5	214	39.8	183
1909	74.8	173	207.0	429	95.1	216	22.8	177	87.1	176	32.1	183	32.6	186	112.0	227	44.5	205

(2) Regional—i.e., traffic between termini, of which both are situated outside the boundaries of the district in question, but in which the district has some direct and proximate interest.

(3) Through traffic—i.e., traffic originating and terminating at places beyond the range of any direct or proximate interest of the locality, and which merely uses the road as a means of through communication.

All roads doubtless carry some through traffic. The question must always be one of degree. If the local and regional traffic on any road is so great that the road must in any case be maintained on such a high standard of strength and efficiency as to render practically inappreciable the effect of the percentage of through traffic upon it, then the case for State assistance to the maintenance of such a road seems to be very weak. No additional burden which appreciably affects the cost of maintenance is thrown upon the road by a small percentage of through traffic, and the local interest in maintaining the road is a sufficient guarantee that it will be kept in good condition.

As regards the increase which has taken place in the cost of maintaining roads and the effect of motor traffic, there is a general impression that the increase has been due to motor traffic; but, although motor traffic undoubtedly will cause a very large increase in the cost of maintenance, it is doubtful whether the increase due to this cause has yet affected the figures to as large an extent as it will do in the future.

The increase in the maintenance expenditure on all roads during a period of nineteen years—from 1890 to 1909—is shown on Table 5 in the Appendix hereto. The figures are divided between two periods—twelve years, from 1890 to 1902, and seven years, from 1902 to 1909—because in the former period practically no motor traffic existed, and in the latter period the motor traffic was a constantly growing factor.

The figures shown by Table 5 are very remarkable. The total maintenance expenditure on all roads, rural and urban, outside London and outside county boroughs, increased 108 per cent, but of that increase 85 per cent accrued in the first twelve years, or at the average rate of 7 per cent per annum, while in the second period the further increase was only 23 per cent on the original figure, or at the rate of 3.28 per cent per annum.

The expenditure on main roads (rural and urban) increased 179 per cent in the nineteen years, the increase in the mileage being 29 per cent, and the increase in the cost per mile 116 per cent, of which 87 per cent, or at the rate of 7.25 per cent per annum, accrued in the first period, and 29 per cent, or at the rate of 4.14 per cent per annum, in the second period.

But, as has already been pointed out, the figures for all roads are the best measure of the actual burden on ratepayers. If attention is confined to main roads paid for out of county rates the burden borne by the district ratepayer, who is also the county ratepayer, in maintaining district roads is left out of account, and the transfer of roads from the class of district roads to main roads obscures the significance of the figures. The total burden may be badly distributed among ratepayers, but that distribution is within the control of the authorities themselves, and it is therefore the nett increase of the total burden which must be dealt with. An increase in main road expenditure due to transfer of mileage involves a decrease in district road expenditure.

The abnormal increase in urban main roads which occurred almost wholly in the first period must be noticed. The cost of these roads per mile rose 270 per cent, or 22.5 per cent per annum, in the first period, and only a further 50 per cent, or 7.14 per cent per annum, in the second period. This was probably due to the great increase in urban traffic, which is mainly local traffic, in regard to which the question of State assistance does not arise, and to the consequent necessity of reconstructing the roads, so that the figures express the cost of reconstruction rather than the recurring cost of ordinary renewals of surface coatings.

The comparative figures for rural main roads show an increase of 50 per cent, or 4.1 per cent per annum, in the first period, and a further 23 per cent, or 3.28 per cent per annum, in the second period.

The increase in the expenditure on rural main roads per mile since 1902 has not, therefore, been so large as might have been expected. It is, however, almost certain that a very large additional expenditure has yet to be faced in order to bring important roads up to the standard of strength and efficiency required for motor traffic.

(To be concluded.)

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

The premium for April is awarded to—

Mr. F. NICHOLSON,

Golspie,

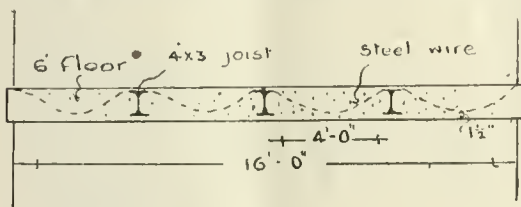
Sutherlandshire.

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

QUESTIONS.

This week answers are invited to the following questions:—

391. Concrete Floor.—A concrete floor is to be constructed as shown in the sketch, with 4-in. by 3-in.



R.S. joists, and woven mesh steel wire with a 3-in. lap. The R.S. joists have a $\frac{1}{2}$ -in. wall hold, and the floor a 2-in. wall hold. The size of the room is 16 ft. by 13 ft. Calculate the safe distributed load per super. foot, also the breaking load. (Assistant.)

392. Sewage Purification.—The sewage of a college is to be treated as follows: The liquid is first admitted to a septic tank, then to a vertical upward filter filled with agricultural pipes; thence it flows through a clinker filter to the sewer of the city. The population of the college is about 300 people. (1) Give dimensions of each of the tanks, in order that the liquid effluent may be good. (2) Does the vertical upward filter act as an oxidising filter or merely as a second settling tank? (3) How often will the vertical upward filter have to be cleaned in order to keep the effluent good? (Deleatur.)

393. Surveying.—In carrying out a large survey (by triangulation) describe in full detail how you would use the centre of a tower or shaft as a station on the ground without actually setting up the theodolite inside. Give proofs of any formulæ involved. (T. W. P., *Bechill-on-Sea*.)

394. Building Inspection.—In carrying out the duties of a building inspector, state what are the common errors to be looked for when inspecting a deposited plan, and also the chief faults that are met with on the actual building. (T. W. P., *Bechill-on-Sea*.)

395. Plumbing.—A lead pipe has to convey both hot and cold water in horizontal and vertical directions. Show by a sketch how it should be fixed, and give reasons. (B. W., *Tadcaster*.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

390. Removal of House Refuse.—A new urban district has just been formed in the neighbourhood of London of which the following are particulars: Area, 3,500 acres; population, 9,000, increasing at rate of 700 per annum; number of houses, about 2,300; length of district, north to south 3 miles, east to west $1\frac{1}{2}$ miles; mileage of roads, 17; character of district, flat in northern part, hills up to 1 in 16 in southern part;

distribution of population, 2,000 at north end in £40 villas, shops, &c., 500 in north-east in large houses with long approach drives, 1,000 in south and south-west in small villas and workmen's cottages. The refuse for the present will be utilised at brickfields on the southern boundary of the district. It is desired to organise the removal of house refuse on the most up-to-date methods compatible with economy. Describe fully the methods of collection and transit, the organisation of the staff, the plant required, and give an estimate of the capital and annual charges for this work. Trade refuse is negligible, and no plant has been taken over from the rural authority who formerly had control of the area. (Togun.)

Owners should be compelled to provide galvanised iron dustbins for the storage of house refuse pending the visit of the scavengers; this can be enforced under sec. 36 of the Public Health Act, 1875.

The bins should be fitted with ventilated lids and handles, and should rest upon a bed of concrete to prevent rusting. The collection can be best carried out by the local authority themselves, the work being better done than by employing contractors. The district should be divided into sub-districts, and the refuse collected systematically once a week, so that all the people know the day of collection in their respective districts, and the workmen do not have to travel over the same ground twice. By this method one set of workmen will be able to carry out the work in this district. The bins should be carried out to the cart, which should be a properly constructed cart (the old "tip cart" with high sides is not suitable). This method prevents paper, &c., being blown about the streets.

When the refuse has been collected, the ultimate disposal must be considered. The method, of course, depends upon the district. If it is a sea port, it is better to take it out to sea; but for inland towns no method is so safe as the destruction by furnace.

Many firms instal refuse destructors, but it is necessary to obtain the best type to ensure effectual disposal without nuisance, and minimise the cost of maintenance. The cost of destruction by fire varies in most towns, but the average may be taken as 1s. per ton. Of course, it greatly depends upon the wages paid to workmen. This sum does not include interest and sinking fund. The destruction by fire, however, can be carried out at little extra cost to carting to tips, as there will be a revenue from clinker, which can be sold for mortar, or used for the foundation of footpaths, country roads, &c., and also from the sale of tins, &c.

However, the little cost will be well spent. The destructor need only be worked for, say, fourteen hours per day; but care should be taken to provide for the addition of extra cells as required.

There is usually no charge for maintenance for the first two years, as the contractors usually carry out the necessary repairs during that time. (Sanitas.)

NOTES.

Mr. H. Conyers Kirby, town engineer of Potchefstroom, Transvaal, writes:

In the "Assistants' Section" of your issue of March 13th, 1914, there appears a reply to a question (No. 379) *re* testing pipes.

May I suggest that your correspondent "T. W. P." has omitted a very good test, that of absorption, which is an extremely useful guide both to the quality of glaze and to the vitrification of a stoneware pipe? A first-class quality stoneware pipe will absorb from $\frac{1}{2}$ to 1 per cent of its initial dry weight after being immersed in water for twenty-four hours, whereas an inferior quality clay or fireclay will absorb anything up to 10 per cent.

In the Transvaal we have two very excellent stone-

ware pipe works, which have so much improved in the past six years that they produce an article equal to the best. The standard of absorption which is generally accepted in the Transvaal is 3 per cent, which was found to be the minimum that local clays would stand without undue distortion in burning.

Another very useful test is that of the insertion of a circular mandril into every pipe, which mandril should be of a diameter $\frac{3}{16}$ in. less than the nominal internal diameter of the pipe under test. This will be found to be more rapid than and equally efficacious to the caliper test.

Your correspondent "T. W. P." does not refer to the annular space for jointing material between the outside of the spigot end and the inside of the socket shoulder, which is rather an important item.

The following extracts are from my specification for stoneware pipes which were made in South Africa and used upon the Pretoria sewerage scheme, where stoneware pipes to the value of about £25,000 were laid. I trust that this communication may be of interest to some of your readers.

EXTRACTS FROM PRETORIA MUNICIPALITY SPECIFICATION FOR STONEWARE PIPES.

DESCRIPTION.

The pipes shall be spigot and socket, made of the very best stoneware clay procurable, and in accordance with the dimensions hereafter specified. They must be straight, truly cylindrical, the thickness uniform, and the outside and inside faces concentric, the whole to be well burned and vitrified, salt glazed internally and externally (except inside sockets, and $2\frac{1}{2}$ in. outside the spigot end). The body and socket are to be in one piece, the clay is to be of a fine grain, and the whole free from air blows, blisters, fire cracks or any other imperfection.

Junctions, bends and specials are to be equal in quality to the above in every respect.

TESTS.

All pipes may be subjected to the following tests:—

(a) A circular mandril 2 ft. in length and in diameter $\frac{3}{16}$ in. less than the nominal internal diameter of the pipe shall be passed through each pipe.

The internal diameter of any pipe shall in no part exceed or be less than its nominal size by $\frac{1}{16}$ in.

(b) They may be subjected to a test pressure of 30 ft. head of water, and under this pressure shall be perfectly sound, watertight and free from weeps or flaws of any description.

(c) They may be weighed, completely immersed in water for twenty-four hours, and then weighed again. Previous to this test, however, the outside of the spigot and the inside of the socket shall, if the contractor so desires, be carefully varnished with shellac in order that those portions of the pipe which will not be exposed in actual work may be protected. No pipe shall, after immersion, weigh more than 3 per cent in excess of its weight before immersion.

(d) The pipes may be tested by crushing in the following manner: The pipe to be bedded firmly throughout its length in sand, the socket being free; on the top of the barrel of the pipe will be placed a wooden bar 1 in. square and 12 in. long; this bar will be loaded with a bridge or platform, upon which will be a weight of approximately 1,000 lb., which will be applied suddenly, but without undue shock; a further weight will be applied by means of bricks, and no pipe shall crush, or show any deformity or sign of failure whatever with a less weight than 2,000 lb.

Any pipe failing to satisfy any of the above tests will be rejected, and shall be immediately broken up or removed to another part of the works by the contractor.

Should 10 per cent or more of the pipes in any one consignment fail to satisfy any of the above tests, the engineer may reject the whole consignment without further testing.

Of the above tests, that marked (a) shall be applied to every pipe, and the remainder at the discretion of the engineer.

All pipes which have been passed by the engineer must immediately have the word "passed" and the date painted thereon.

DIMENSIONS.

The thickness of barrel, depth of socket and length of pipe for all straight pipes and specials will be as

given in the table below, and contractors must tender for the supply of pipes in exact accordance with this table.

Internal diameter of pipe.	4"	6"	8"	9"	12"	15"	18"
Thickness of barrel ...	$\frac{5}{16}$ "	$\frac{3}{8}$ "	$\frac{7}{16}$ "	1"	$1\frac{1}{16}$ "	$1\frac{1}{4}$ "	1 $\frac{1}{2}$ "
Depth of socket ...	$2\frac{1}{4}$ "	$2\frac{3}{4}$ "	$2\frac{3}{4}$ "	3"	$3\frac{1}{2}$ "	$3\frac{1}{2}$ "	3 $\frac{1}{2}$ "
Length of pipe ...	2' 0"	2' 6"	2' 6"	2' 6"	2' 6"	2' 6"	2' 6"
Annular space for jointing material	$\frac{1}{8}$ "	$\frac{1}{8}$ "	$\frac{1}{8}$ "	$\frac{1}{8}$ "	$\frac{1}{8}$ "	$\frac{1}{8}$ "	$\frac{1}{8}$ "

The length of pipes for the specials will be the same as for straight pipes of the same diameter, unless otherwise shown on the drawing which accompanies this specification. The thickness of barrel and depth of socket will be exactly the same as for ordinary pipes of the same diameter.

IRISH LABOURERS' COTTAGES.

DELAYED SCHEMES.

In the House of Commons on Thursday of last week Mr. Vincent Kennedy asked the names of the rural district councils in Ireland whose schemes had been lodged with the Local Government Board and delayed owing to money shortage, giving the number of representations in each case and date of lodgment; also would inquiry be made as to how many schemes were ready for lodgment with the Local Government Board by rural district councils throughout Ireland.

Mr. Birrell said the following was a list of the rural district councils which had submitted schemes for the erection of labourers' cottages which had not yet been inquired into:—

Rural District.	Number of cottages in scheme.	Date of lodgment of scheme.
Bellymena, No. 1 Scheme ...	106	31st March, 1914
" No. 2 " ...	39	"
Ballymoney ...	81	7th March, 1914
Bandon ...	114	30th October, 1911
Borrisokane ...	63	11th October, 1913
Carlow ...	51	11th April, 1914
Cork ...	643	7th December, 1911
Croom ...	150	23rd March, 1911
Delvin ...	101	19th October, 1910
Fermoy ...	256	10th June, 1911
Gortnahoe, No. 1 Scheme ...	20	11th September, 1912
" No. 2 " ...	8	"
Kanturk... ..	305	11th November, 1911
Kells	117	1st June, 1912
Killadysert	41	30th April, 1912
Kilmallock	243	12th December, 1910
Kinsale	169	21st March, 1911
Limerick, No. 1 Scheme ...	257	31st January, 1913
Listowel	397	12th July, 1912
Mallow	249	11th October, 1912
Manorhamilton	51	18th February, 1914
Michelstown, No. 1 Scheme ...	99	23rd November, 1913
" No. 2 " ...	28	2nd September, 1911
Mullingar	185	15th February, 1912
Newcastle	132	15th April, 1913
Rathkeale	304	28th July, 1913
Slievemary	55	7th March, 1913
Thomastown, No. 1 Scheme ...	82	19th December, 1913
" No. 2 " ...	23	"
Tulla	28	7th June, 1911
Urburford	7	11th February, 1911
Wexford	145	23rd August, 1911
Youghal, No. 1 Scheme ...	59	6th February, 1912
" No. 2 " ...	28	21st November, 1912

The Local Government Board had no reason to suppose that any schemes which were ready for lodgment had been kept back.

The Removal of Shingle.—The East Lancing Sea Defence Commissioners have referred to the Local Government Board a report by the engineer in reference to the removal of shingle from the foreshore between certain points within the commissioners' district. As the result of a survey made by him between Ferry-road and the Shoreham Harbour entrance, he found that high-water mark had advanced landwards from between 20 ft. to 50 ft. since 1909. This encroachment had been most marked to the east of the spot from where the spoil had been removed. There could be no doubt, he considered, that the removal of spoil accelerated the encroachment. Before very long it would be necessary, in order to ensure the future safety of the bungalows on the shore, to erect groynes.

The Surveyor

And Municipal and County Engineer.

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WIGTOWNSHIRE ROADS.

MACHARS DISTRICT SURVEYOR'S REPORT.

In his annual report as surveyor of Machars, Wigtownshire, district roads and bridges, Mr. D. H. Robb mentions that those roads under his control which are not used by heavy motor traffic, although not strong, show continued improvement of surface. The roads which are subject to heavy motor traffic, however, show increased wear in the way of tracking and potholes.

Mr. Robb considers that many of the roads are too narrow, and through excessive paring have become too deep at the water tables to permit of vehicles passing in comfort, or even with safety. There is, in his opinion, pressing need for the raising and widening of the sides of these roads, and a considerable quantity of metal should be allowed annually for this purpose.

For the repair of potholes, machine-broken gravel was used on several roads, but with indifferent success, as the heavier classes of motor vehicle tend to scatter these gravel patches before they become consolidated. It is pointed out that, in order to secure a proper repair, the gravel would require to be treated with an adhesive binder of a tarry or bituminous nature. It is proposed to patch one or two of the main roads with tarred gravel during the summer months, and for this purpose a "Midget" tar-boiler is included in the estimates. This method of repair, Mr. Robb mentions, has proved successful in some of the English counties.

The quantity of metal, including 1,420 cub. yds. for improving sides, is increased this year to 15,000 cub. yds. This gives an average of 59 cub. yds. per mile, or a quantity sufficient to coat a road of average width for a distance of 200 lin. yds. "To coat a mile, therefore," adds Mr. Robb, "requires a period of over eight years, and as the average life of a road in an agricultural district like the Machars may be taken as six years, the estimated quantity still falls short of that required for proper maintenance."

A Town Planning Conference at Hull.—The National Housing and Town Planning Council will hold a conference at Hull, on the 21st and 22nd inst., to consider the practical administration of the Housing and Town Planning Act, 1909, and especially the subjects of cottage building in urban and rural areas.

ASSOCIATION OF SOMERSET SURVEYORS.

MEETING AT STREET.

A meeting of the Association of Somerset Surveyors was held at Street on Saturday afternoon last, those present including the president (Mr. W. Alexander Collins, Bridgwater), Messrs. F. Parr (Bridgwater), H. Sunderland (Midsomer Norton), T. Orchard (Clutton), C. Durie (Williton), R. Davey (Clutton), G. Hunt (Watchet), W. R. Lamacraft (Williton), J. K. Dunster (Axbridge), E. H. Padfield (Wells), E. J. Padfield (Wincanton), E. A. Wadmore (Bridgwater), D. Hinchcliffe (Shepton Mallet), G. Alves (Glastonbury), W. H. Cousins (Street), H. Hayman (Bridgwater), G. Ponsford (Bridgwater), W. G. Berry (Bridgwater), E. T. Howard (Wellington), C. Pursey (Wells), C. B. Borthwick (Wincanton), H. B. Rogers (Wells), G. Stevens (Somerset County), R. Nicholls (Somerset County), J. Lovell (Axbridge), L. F. N. Blake (Wincanton), E. H. Vallis (Langport), Edward Stead (Somerset County), R. Stephens (Chard), D. Edwards (Taunton), hon. secretary, together with the chairman of the urban council, Mr. A. W. Stacey, J.P., and other members, Mr. S. T. Clothier, clerk of the urban district council, and Mr. J. Pursey (late surveyor to the Street Urban District Council).

At the kind invitation of the chairman and members of the Street Urban District Council, the association met at lunch at the Bear Hotel, Mr. A. W. Stacey, J.P., chairman of the council, presiding.

The association were heartily welcomed to Street by the chairman.

A hearty vote of thanks to the chairman and members of the Street Urban District Council was proposed by the president and seconded by Mr. Parr, and carried with acclamation. The members then visited the recently completed houses erected by the Street Urban District Council, Mr. Pursey and the architect, Mr. Clothier, acting as conductors to the party. A return was then made to the Vestry Room, where a business meeting was held.

The minutes of the last meeting were read and confirmed.

Apologies for non-attendance were received from Messrs. J. Johnson (Keynsham), F. W. Jones (Frome), G. W. Warry and T. G. Crump (Taunton).

The president reported the action of the executive committee in their proposal to inaugurate a premium scheme for the best papers read during the year, and the conditions and rules regarding the competition were read. For the present year a prize to the value of £2 2s. is to be presented by Mr. H. T. Chapman, county surveyor of Kent, and a prize to the value of 10s. 6d. by Mr. F. Parr, borough surveyor, Bridgwater, for the best paper by associates or junior members of the association.

The president reported that the steps taken by the executive committee had resulted in the association becoming affiliated with the National Association of Local Government Officers at an annual fee of 10s. 6d. The association are entitled to two representatives on the National Council. It was proposed by Mr. E. Stead, county surveyor, and seconded by Mr. T. Orchard, Clutton Rural District Council, that the president and secretary be appointed as representatives on the National Council.

The president also reported that, at the invitation of Mr. Chas. Durie, surveyor to the Eastern Division of the Williton Rural District Council, the executive committee had arranged a meeting of the association at Williton for July 18th next.

A paper—reproduced on another page of this issue—on the "Financial and other Aspects of Housing," was then read by Mr. W. H. Cousins, P.A.S.I., surveyor to the Street Urban District Council, an animated discussion following.

A hearty vote of thanks to Mr. Cousins, proposed by the president and seconded by the hon. secretary, was carried unanimously.

The following took part in the discussion—namely, Messrs. Collins, Edwards, Parr, Stevens, Clothier and Pursey, and Mr. Cousins replied to the questions put to him.

A vote of thanks to the chairman and members of the Street Urban District Council for the use of the vestry hall for the meeting, proposed by Mr. Parr and seconded by Mr. Stead, was passed, Mr. Stacey responding on behalf of the urban district council.

The members were entertained to tea at the Bear Hotel by the president, Mr. W. A. Collins, who ex-

pressed, on behalf of the association, the pleasure it afforded the members at seeing among them Mr. Stead, the new county surveyor.

Mr. Stead responded.

A vote of thanks was afterwards accorded to the president for his hospitality.

Royal Sanitary Institute.—The annual dinner of this body will take place at the Langham Hotel, W., on Wednesday, the 13th inst.

PERCO-FILTERS FOR SEWAGE.

DIAGRAM FOR ASCERTAINING THEIR DIMENSIONS.

By R. O. WYNNE-ROBERTS, Regina, and L. W. WYNNE-ROBERTS, B.Sc.(HONS., ENG., LONDON), Regina.

The designing of sewage filters may appear a simple matter, but it often occurs that there are certain conditions which govern their arrangement, dimensions, &c. For instance, in one district the fall may be very slight, and deep filters are not possible without pumping operations; in another district the fall may be great, and reasonably deep filters will economise the area of land required. Between these extremes there are numerous conditions to be considered.

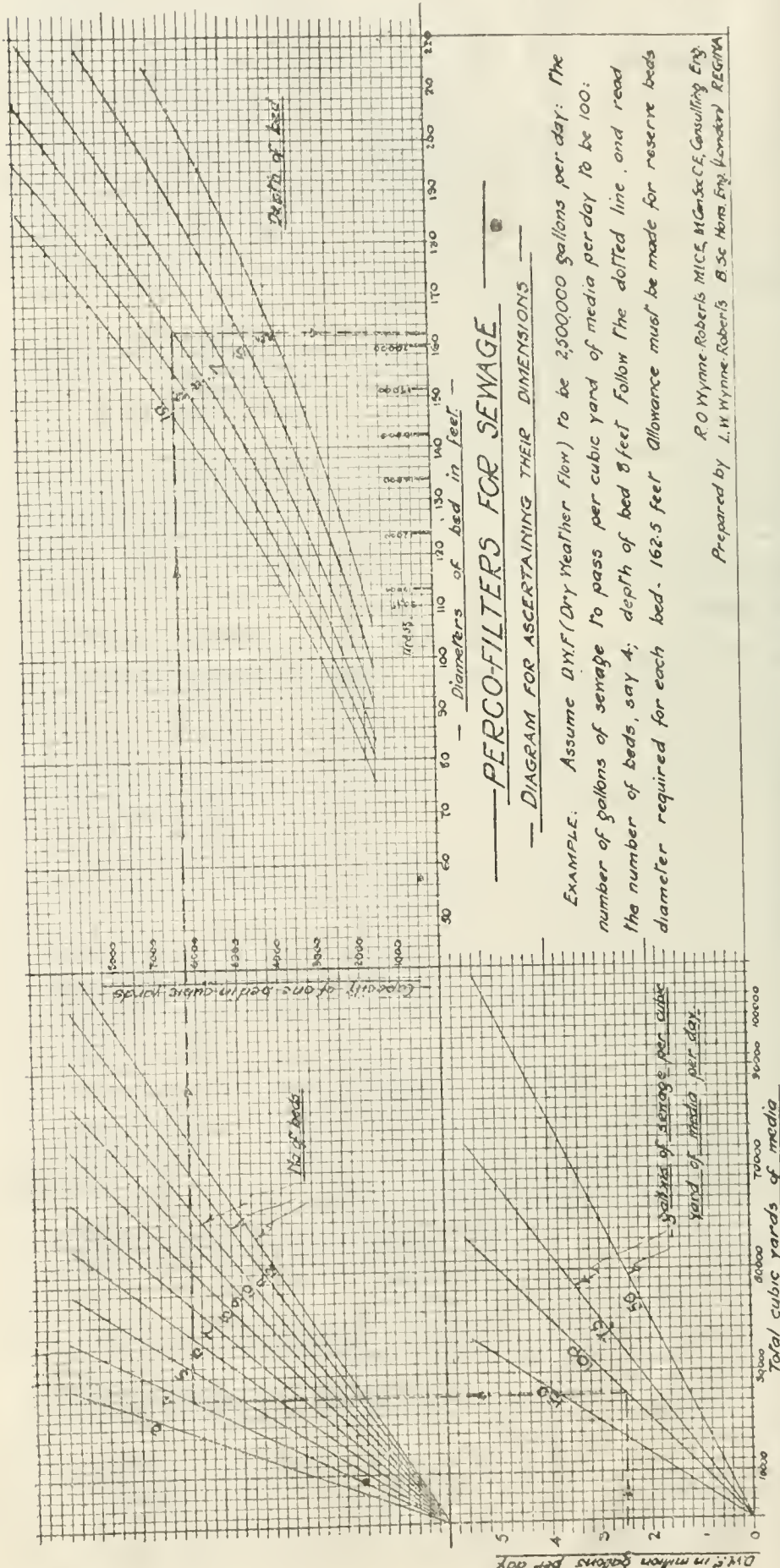
In this article it is not proposed to discuss the advantages and disadvantages of deep and shallow filters; these may be dealt with in a future contribution. There is, nevertheless, a minimum and a maximum depth of filters to obtain the most efficient results, both financially and bacteriologically, and the engineer will be well advised, when designing sewage filters, to consider this matter fully.

The question is often asked what size filters are required to perform a certain work. Before an answer can be made, due consideration must be given to, and much will depend upon, the strength of the sewage, and the efficiency of the settling tank, and the size and material of the filtering media.

The diagram accompanying this short article has been designed to meet practically every condition, and for all dry-weather flows up to 6,000,000 gallons a day. The capacity of any filter per cubic yard of filtering media may be anything from, say, 50 to 150 gallons a day; there may be any number of filter beds, say, from three to twelve, and their depth may range from 5 ft. to 10 ft.

When the engineer has selected any one of these factors, he has simply to trace a line from the dry-weather-flow column clockwise, as described in the diagram, and the final figure will be the diameter of a circular percolating filter. The engineer may reverse the procedure, however, and arrive at the daily dry-weather flow. The diagram is simple and self-explanatory.

Smoke Abatement. The President of the Local Government Board announced in the House of Commons on Tuesday that he was about to appoint a committee to consider the question of smoke abatement, and that the names of the members would be announced in a few days.



Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in BLACK ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

QUERIES AND REPLIES.

In order to avoid confusion queries are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

HOUSING, TOWN PLANNING, &c., ACT, 1909.—"Ynys" writes: (1) In my district are five cottages leased on life interest to A, the owner proper B being in Australia. A letter on the form approved by my council (copy enclosed), drawing attention to the defects found in the houses and requesting to have such defects remedied within a period of three months, was sent to A as the person who receives the rents of the houses. In reply, A states that he holds the houses on lease, which may expire at any moment, having only one life interest on it, and suggesting that the question of repairs should be deferred until something is heard from B. I observe that "owner" is defined in sec. 49 of the Housing, Town Planning, &c., Act, 1909, as including all lessees or mortgagees of any premises, except persons holding, or entitled to, the rents and profits of such premises under a lease, the original term whereof is less than twenty-one years. But as A is not covered by this definition, and as B is in Australia, I shall be glad if you will kindly advise what course to pursue under the circumstances. (2) On another matter. At the last meeting of my Health Committee my suggestion that where defects found can be remedied under the Public Health Act, 1875, notices should be served thereunder was adopted, and I have accordingly been instructed in future to proceed with the house-to-house inspection, including the preparation of records on cards, as before and as required by order of the Local Government Board, dated September 2, 1910, but in all cases where the defects can be met by the application of the Public Health Act, 1875, to include such cases in my ordinary journal. My difficulty in this case arises from the fact that my inspections under the Housing, Town Planning, &c., Act, 1909, include several items which I doubt are covered by sec. 94 of the Public Health Act, 1875—*c.g.*, walls very rough require plastering, floors uneven and require cementing of joints, ceilings of calico require to substitute lath and plaster, windows not opening, and absence of windows on top of stairs, garret approached by unprotected ladder, exterior paving required to avoid lodgment of water, &c. I believe that the Housing, Town Planning Act, 1909, covers such defects by the word "fit" for habitation in sec. 15; but in cases where the houses are still occupied by the tenants in occupation previous to the passing of the Act there does not appear to be any remedy. Will you also kindly advise how to get over this difficulty? I am a constant reader of your answers to questions in the "Notes and Queries" column, and find them most useful and instructive.

(1) "A" being a lessee for life is undoubtedly "owner" of the premises within the statutory definition. A lease for life is not a lease, the original term whereof is less than twenty-one years, and a lessee for life is a freeholder. The council should proceed against "A" as "owner." (2) If the houses are in a state so dangerous or injurious to health as to be unfit for human habitation, the council can proceed under sec. 17 of the Act of 1909.

WATER SUPPLY FOR STREET WATERING, &c.: DISAGREEMENT.—"Inspector" writes: The waterworks in this urban district is in the hands of a company which, for a lump sum payment, has for many years supplied my council with water for the purposes mentioned in sec. 37 of the Waterworks Clauses Act of 1847. My council has adopted the practice of tarring its principal streets, and consequently do not use so much water as hitherto, but the company refuses to reduce its charge. My council is desirous of taking the water by meter at a rate per 1,000 gallons. Under the above section of the Waterworks Clauses Act it would appear that the matter in dispute has to be settled by two justices until an "inspector" has

been appointed. From the definition of "inspector" contained in the Act it would appear that I, as surveyor to the urban district council, am that official, and therefore should fix the rate and manner in which the water should be supplied. Will you please say if you consider this interpretation of an "inspector" in sec. 37 of the above Act to be the right one? There is no special Act in the district relating to the appointment of an inspector.

"Inspector" is defined in sec. 1 of the Act of 1847 as "an officer appointed under any local Act relating to the town or district supplied with water under the special Act for the purpose of inspecting or superintending works connected with the paving, drainage, or supply of water of such town or district, or an officer appointed under any general Act for executing the like duties with respect to such town or district together with other towns or districts." It would appear, therefore, that a surveyor appointed under a general Act for one town or district only is not an "inspector" within the statutory definition, and consequently that unless an appointment has been made under a special Act the terms and conditions of supply under section 37 must be settled by two justices.

BUILDING BY-LAWS: APPROVAL OF PLAN CONTRAVENING BY-LAWS.—"Hockey" writes: A property owner in an urban district submitted plans for converting certain buildings into cottages. The plans contravened the by-laws in many respects, more particularly with respect to the open space about the buildings, but the council approved the plans, and the work was carried out. This occurred over twenty years ago, but the present by-laws were then in force. The council now threaten to put in a closing order under the Housing, Town Planning, &c., Act, unless certain alterations are made to increase the air space. Will you kindly say (1) if they can issue a closing order in these circumstances? (2) In the event of the answer being in the affirmative, if the owner cannot recover the expense of the alterations and the value of depreciation of property on the score of negligence of the council?

(1) The council cannot make a closing order merely on account of the contravention of the by-laws. But they can (and must) do so if, on the representation of the medical officer of health, or any other officer of the council, or other information given, the cottages appear to them to be in a state so dangerous or injurious to health as to be unfit for human habitation (Housing, &c., Act, 1909, sec. 17). (2) In my opinion he cannot.

HIGHWAY: SURFACE WATER.—"Subscriber" writes: Alongside the public highway a district council have made openings through the wall so as to take off the surface water from the roads. These discharge on to the adjoining fields, and have been in existence several years. The owner of the field has asked the council to stop up these openings and lay a drain to the stream, as he alleges damage is done to his land through the road water flowing thereon. The council consider that, these openings having been in existence so long, they have a perfect right to turn the surface water on to his land. I shall be glad of your opinion thereon.

The council are not entitled to discharge surface water from the roads on to adjoining lands, unless they have acquired an easement by continuing to do so for a period of twenty years at least.

OFFICER OF LOCAL AUTHORITY: INSURANCE AGENCIES.—"Salvo jure" writes: A borough accountant, who has held office as such for about fifteen years, and is agent for several assurance companies, has all the town's officials and workmen insured under the Workmen's Compensation Act, and a large amount of corporation property and effects insured against fire, in the offices of which he is a commissioned agent, and it occurs to me he is acting illegally. I shall be glad of your opinion.

By sec. 193 of the Public Health Act, 1875, officers employed under the Act by a local authority must not in anywise be concerned or interested in any bargain or contract made with the authority for any of the purposes of the Act. Assuming that the insurances in question are made for the purposes of the Act, the borough accountant, in my opinion, in taking commission from the insurance companies is concerned or interested in the insurance contracts made with the council within the meaning of the section.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Burnley T.C. (April 16th. Mr. W. M. Cross).—£7,179 and £2,902 for the provision of a recreation ground and refuse tip in Barden-lane (including the execution of works of street improvements in connection therewith), and £500 for the erection of a lodge at Ightenhill Park. The borough surveyor, Mr. A. R. Pickles, supplied the inspector with the details of the scheme, and, in reply to Mr. Cross, said that the corporation bowling greens were not only popular, but also remunerative.

Bury T.C. (April 23rd. Mr. R. C. Maxwell).—This was an application for a Provisional Order for the repeal of sec. 141 of the Bury Corporation Act, which provides that no street shall be laid out for building purposes exceeding 100 yds. in length without at least one intersecting street in every 100 yds., except in the case of sites for any one building or works. The deputy town clerk, Mr. R. Battersby, said that, when in 1909 the Bury Corporation were seeking to obtain their Act of that year, the Local Government Board reported against the inclusion of the sections which the town council now asked to be repealed. The council, however, persisted in their desire to have the section, and it was eventually included. Very soon afterwards they found they had made a mistake. In 1910 they applied to the Local Government Board for their approval to a municipal housing scheme, and the board insisted upon the scheme being carried out in compliance with sec. 141, with the result that they had to make at least one cul-de-sac street which was practically of no use at all. The council now wanted to carry out another housing scheme in the Walmersley district, and they found themselves up against a similar difficulty. The borough engineer, Mr. J. A. Settle, stated that if the section were repealed the cost for street works in the Walmersley scheme would be reduced by about £800, and that would enable them to reduce the rents of the houses by 2½d. and 3d. per week.

East Grinstead U.D.C. (April 16th. Major J. Stewart).—£3,700 for a refuse destructor, £470 for a public sanitary convenience in Cantelupe-road, and £630 for the purchase of the Mounty Noddy allotments.—The engineer, Mr. W. E. Woolham, stated that the council collected about 40 load of refuse a week, ranging in weight from 13 to 22 cwt., with an average of 17 cwt. per load. The actual site of the destructor was selected because it was by the side of an already raised road, only the surface of which would require making up. With reference to the proposed public convenience, it was stated that the cost of the actual works was estimated at £250.

Herne Bay U.D.C. (April 15th. Major J. Stewart).—£2,620 for the extension of the East Cliff Pavilion.—The surveyor, Mr. F. W. J. Palmer, gave details of the proposed scheme. Explaining the increased cost of certain items, he said, as to the hydrants, that, as this was a ferro-concrete building, he thought there would be no need for them; but afterwards he thought that, as this was an important public building, they should be put in, more especially as they had rooms adjoining, ladies' and gentlemen's lavatories, and refreshment rooms. With regard to the radiators, he did not know at the time that the hall would be used for dancing and other things in the winter time as it had been used. Mr. Palmer also explained that they had put in a lath-and-plaster ceiling instead of the material at first proposed, because they had come to the conclusion that that material would rust easily and would be noisy.

Honiton T.C. (April 24th. Mr. A. W. Brightmore).—£4,000 for sewerage and sewage disposal.—It was explained that it was proposed to purchase 15 acres of land for the scheme, and the borough surveyor, Mr. A. Tillotson, said it was intended to make provision for a dry-weather flow of 40,000 gallons per day.

Liverpool T.C. (April 27th. Mr. Courtenay Clifton).—£34,500 for the purchase of lands in the Gore-street, Sparling-street, and Jordan-street areas, in the southern part of the city, for the erection of working-class dwellings, and for the appropriation of corporation lands for the same purpose.—It was

stated that all the land other than that owned by the corporation had been purchased by agreement for £8,500, including costs. It was estimated that the buildings would cost £22,000. On the principle of rehousing 50 per cent of the people dispossessed there there was a balance of accommodation for 600 due from the corporation, in addition to half of the 156 people dispossessed in the Gore-street and Sparling-street areas. The plans showed accommodation for 492 people. Only persons actually dispossessed would be allowed to occupy the new houses. The deputy surveyor, Mr. Turton, stated that in the Gore-street area and in the Jordan-street area a third and a fourth respectively of the land would be set aside for playgrounds.

Manchester T.C. (April 24th. Mr. F. H. Tulloch).—£3,310 for purposes of the city parks and recreation grounds.—The proposals were explained by the deputy town clerk (Mr. Heath), who stated that £3,000 of the amount was required for the purchase of land to extend the Delamere-street Recreation Ground, Ashton Old-road, and the remainder was for carrying out various works at Heaton Park, Platt Fields, Sunny Brow Park, and Prussia-street Blackley estate, and Debdale Recreation Grounds.

Rotherham T.C. (April 29th. Mr. T. C. Ekin).—£19,956 for additional plant, and an extension of the electricity works.—Evidence was given showing that in the first year of the works (1911-2) 87,174 units were sold. For the year just closed (1913-14) 4,797,222 units were sold—an increase of 1,100,000 units on the previous year. The borough electrical engineer, Mr. E. Cross, estimated that within the next three years, owing to the price of coal and the popularity of electric driving in local industries, the undertaking would be required to supply 10,000,000 units per annum, or more than twice the quantity supplied last year.

Walton-on-the-Naze U.D.C. (April 14th. Mr. Edgar Dudley).—£315 for the purchase of land at Southcliff for the purpose of public walks and pleasure grounds, and £200 for land situate between old Pier-street and Portobello-road for the purposes of a town yard.—The surveyor, Mr. H. W. Gladwell, stated that the land at Southcliff had slipped on an average of 2 ft. during the last six months. The distance by road to Frinton was now about 1½ miles, and by the cliffs it would be only about ¼ mile. It would be necessary to build a sea-retaining wall, and to build another stone breakwater, and there would have to be a main drain at the back of the wall, with cross drains, while the whole of the cliffs would require levelling. The construction of a promenade at the foot of the cliff, and a main road on the top, would have to be considered, and he estimated that the whole work would cost about £50,000, which was a fair estimate based on his experience of local work. The inspector: If you had carried out this work of protection, do you think it would prevent the cliffs slipping? The surveyor said he thought there would be something necessary for maintenance. With reference to the proposed purchase of land for a town yard, Mr. Gladwell was asked if he considered the site was large enough for the council's stores, stables, offices, fire engine, escape, council room to seat fifteen councillors, the public, and the Press, public lavatories and caretaker's room. The surveyor said that, candidly speaking, he did not think the site was large enough, as he had told the committee of the council when they inspected it.

APPLICATIONS FOR LOANS.

Barrow T.C.—£31,000 for new schools.

Bournemouth T.C.—£1,911 for public conveniences, £5,600 for road improvement, and £5,400 for school enlargements.

Darlington U.D.C.—£600, supplemental loan for sewerage.

Haslingden T.C.—£375 for paving works.

Llandudno U.D.C.—£930 for improvements at the gasworks.

Longbenton U.D.C.—£5,000 for private street improvement.

Southend T.C.—£2,675 for the purchase of a recreation ground.

Stirling T.C.—£3,000 for electricity extensions.

Winchcombe R.D.C.—£325 for the purchase of a site for cottages.

Woking U.D.C.—£3,319 for road improvement.

Wycombe R.D.C.—£1,350 for sewage disposal works.

LOANS SANCTIONED.

Barnet U.D.C.—£945 for a motor fire engine and appliances.

Bournemouth T.C.—£3,590 for laying out a cemetery (repayable in twenty years), and £1,410 for the erection of a lodge and drainage (repayable in thirty years).

Bridlington T.C.—£3,750 for workmen's dwellings and street improvements.

Buckhurst Hill U.D.C.—£850 for street improvement.

Carlton U.D.C.—£675 for making up a street.

Congleton T.C.—£600 for gas mains and services.

Denbigh T.C.—£10,000 for new municipal buildings.

Dover T.C.—£2,665 for repaving footpaths.

Exeter T.C.—£312 for a handicraft centre, and £1,110 for public conveniences.

Hemsworth R.D.C.—£375 for road improvement.

Holbeach U.D.C.—£2,500 for the erection of twelve working-class dwellings.

Londonderry C.C.—£2,500 for a new courthouse.

Mansfield T.C.—£2,000 for the purchase of gas stoves, and £3,600 for open spaces.

Redditch U.D.C.—£7,128 for building thirty-six workmen's cottages.

FORTHCOMING INQUIRIES.

	MAY.	£
4.— Barnes. For the purchase of land for housing purposes (Mr. C. H. Eyles) ...		1,230
5.— Abingdon. For works of water supply (Mr. W. M. Cross) ...		3,991
5.— Barnsley. For works of sewage disposal (Mr. A. G. Drury) ...		1,370
5.— Bournemouth. For the purposes of a pavilion and sewer outfall extension (Mr. H. Shelford Bidwell) ...		66,500
5.— Castle Ward. For works of sewage disposal (Mr. F. O. Stanford) ...		550
5.— Crewe. For private street works (Mr. W. O. E. Meade-King) ...		276
5.— Dewsbury. For the purposes of the gas undertaking and a recreation ground (Mr. R. H. Bicknell) ...		21,850
5.— Grantham. For the purposes of a burial ground (Mr. F. H. Tulloch) ...		—
5.— Hampton. For the provision of a public bath (Mr. M. K. North) ...		1,150
5.— Hendon. For street works and the provision of a public convenience (Major J. Stewart) ...		6,477
5.— Skelmersdale. For works of sewage disposal (Mr. A. W. Brightmore) ...		12,200
6.— Bacup. For works of sewerage (Mr. W. O. E. Meade-King) ...		1,200
6.— Mansfield. For street improvement and sewerage (Mr. F. H. Tulloch) ...		8,550
6.— Poole. For the erection of a pavilion (Mr. H. Shelford Bidwell) ...		250
6.— Reigate. For road improvement (Mr. M. K. North) ...		4,400
6.— Rotherham. For works of sewerage (Mr. R. H. Bicknell) ...		967
6.— Sunderland. For works of sewerage (Mr. F. O. Stanford) ...		2,110
6.— Tunstall. For works of sewerage (Mr. F. O. Stanford) ...		2,250
6.— Westhoughton. For works of sewage disposal (Mr. A. W. Brightmore) ...		3,070
7.— Annfield Plain. For the provision of a refuse tip and sewage disposal works (Mr. F. O. Stanford) ...		1,391
7.— Earby. For the provision of a depot and public conveniences, and road widening (Mr. W. O. E. Meade-King) ...		1,670
7.— Gravesend. For street improvement (Mr. M. K. North) ...		1,950
7.— Sleaford. For works of water supply (Mr. R. H. Bicknell) ...		1,110

8.— Eccles. For street improvement and re-creation ground purposes (Mr. A. W. Brightmore) ...	2,380
8.— Foleshill. For private street works (Mr. F. H. Tulloch) ...	1,067
8.— Rothley. For works of sewage disposal (Mr. A. G. Drury) ...	14,650
8.— West Ham. For the provision of a re-creation ground (Mr. M. K. North) ...	10,275

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain; Each man's opinion freely is his own Concerning anything, or anybody.

—MASSINGER: "The Fatal Dowry," Act. ii., 2

ROAD TERMINOLOGY.

To the Editor of THE SURVEYOR.

SIR,—With reference to Mr. J. Hutchinson's letter appearing in your issue of the 17th inst., I quite agree that a lot of confusion and misunderstanding would be saved by dropping the word "bituminous" altogether.

Such terms as "bituminous," "asphaltic," &c., are generally attached to materials that are inferior to either bitumen or asphalt, and require "puffing."

Tar and pitch treated roads are invariably described as "bituminous roads," but this is a most misleading term, and there is no need for it whatever. The correct term, of course, for a road grouted with bitumen is a bitumen-macadam or bitumen-grouted road, and it is not necessary to refer to natural bitumen as "bituminous," as this is the genuine article itself.

Mr. Hutchinson is of the opinion that possibly coal-tar products and bitumens "will find a place together in the making of British roads, the more powerful (according to de Smedt) being used in the form of tar or pitch-grouted macadam as a sub-crust, and the other as a wearing surface."

This is not likely to come about for several reasons, one being that pitch-grouted macadam has failed terribly, and it is obvious that this will always be so as pitch and all artificial products are affected by atmospheric conditions.

Again, bitumen—*i.e.*, the natural material itself—should never be mixed or laid in connection with any coal-tar product, as the latter destroys the good properties of the bitumen.

I fail to see how tar or pitch, having no "body" or strength, can be said to be "more powerful" than bitumen. A fluid material like tar, and a brittle substance such as pitch, has no strength whatever; but natural bitumen, being of a rubbery nature, and containing a good proportion of natural mineral matter, is considerably stronger than any other known material. On the other hand, a road grouted with *natural* bitumen does not deteriorate, and is suitable for constructing both a sub-crust and a wearing surface combined.

I do not think much responsibility, as Mr. Hutchinson says, rests with the Standardisation Committee, "who have the nomenclature of bitumens in hand," as, in view of the statement made by Colonel Crompton some time back that "it was his intention, and that of those associated with him, to confer with certain American engineers, and, as the result of their united action, and, presumably, the co-operation of the Engineering Standards Committee, to obtain the classification of petroleum pitch as bitumen," no weight or importance is to be attached to any definitions this committee publishes. It would, of course, be necessary to correct these if they were not in accordance with past practice.

Bitumen, &c., have been known almost since the days of Noah, and were used many years ago for preserving mummies, &c., so I do not think it can be said that bitumen and asphalt are new materials that now require defining. I contend it would be as absurd for a few manufacturers of bitumen to inform Colonel Crompton that in future the definitions of the words "volts," "amperes," and other electrical terms were to be revised as it is for Colonel Crompton to give out, as he did, that he and those associated with him propose to draw up fresh definitions of bitumen, asphalt, &c.

No! I do not think there is anything to fear from these private meetings behind closed doors.—Yours, &c.,

ENGINEER.

April 28, 1914.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works, of which particulars appear below: Buildings—Bournemouth, Pudsey; housing and town planning—Edinburgh; refuse collection and disposal—Bridlington; roads and materials—Birmingham, Musselburgh; sewerage and sewage disposal—Kiveton Park; water, gas and electricity—Chester, Hemel Hempstead, Walsall. Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Aberdeen T.C.—It has been agreed to erect a shelter at the bathing station, at an estimated cost of £450.

Bacup T.C.—The borough surveyor, Mr. W. Elce, has submitted a report in which he estimates the cost of the conversion of the Mechanics' Institution into municipal offices at £2,036. The building, he stated, did not lend itself readily, and at a reasonable cost, to adaptation. Stubbyloe Hall, another building upon which he was instructed to report, could be adapted at a cost of £384.

Bournemouth T.C.—The borough engineer, Mr. F. W. Lacey, has been instructed to report on the provision of swimming baths upon land belonging to the council.—A resolution that the borough engineer should be instructed to prepare plans for the extension of the Boscombe Pier landing-stage at a cost of £5,000, the cost to include an experimental groin under the pier, constructed of the old piles, has been referred to the Pier Committee to consider and report. The borough engineer informed the council that he could not carry out his scheme with respect to this pier for less than £7,500, but if the proposal for £5,600 was carried by the Pier Committee, he would have to do the best he could.

Carlisle T.C.—The tender of Messrs. J. & R. Bell, Carlisle, at £5,918, has been accepted for the building of the new council school at Newtown.

Cleethorpes U.D.C.—The surveyor, Mr. C. H. Waithman, has received instructions to prepare a revised scheme for a public hall.

Folkestone T.C.—The council are recommended by the General Purposes Committee to erect a band pavilion on the Leas promenade.

Hendon R.D.C.—The council have approved the plan of the surveyor, Mr. J. A. Webb, for the construction of a concrete invert at a section of the river Pinn, at an estimated cost of £240, a moiety of which will be met by the Middlesex County Council.

Monmouthshire C.C.—The Health and Housing Committee have come to an agreement with the seven urban councils in the west of the county for the erection of two isolation hospitals.

Pudsey T.C.—At the last meeting a motion that plans for a fire brigade station and public swimming baths, to cost £10,000, be referred back for reconsideration was defeated.

Scarborough T.C.—A large bathing pool is to be constructed in the South Bay, at an estimated cost of £5,000.

HOUSING AND TOWN PLANNING.

Barry U.D.C.—A decision has been reached to erect ten houses in Salisbury-road and ten in Jewel-street at a cost of £200 each.

Diss U.D.C.—A committee has been appointed to prepare the details of a housing scheme, with power to engage the services of an architect.

Edinburgh T.C.—The council have approved the recommendations of the Streets and Buildings Committees for the inclusion in the town planning scheme of an area at Fountainbridge, at an estimated cost of £19,000.

Evesham T.C.—The council resolved on Wednesday to ask the Local Government Board to grant a loan of £1,800 for the purchase of land at Bengeworth for the erection of workmen's dwellings.

Evesham R.D.C.—Plans and estimates for the erection of sixteen cottages at Harvington under the Housing Act have been approved by the council.

Frimley U.D.C.—The council have accepted from Major-General Dalrymple a model cottage he has built at the isolation hospital. Major-General Dalrymple stated that he had fixed the rent at 3s. 3d. per week inclusive, the council to pay rates, insurance, income-tax, water and repairs, and, subject to the approval of the Sanitary Committee, he had selected the first tenant. The total cost of the cottage, including plans and fencing, was £127 1s. 3d., and the following figures showed how the rent was calculated: Poor and general district rate, at 6s. 6d. per annum, £1 4s. 6d.; water rate, 11s.; insurance, 2s.; income-tax, 6s. 8d.; repairs (estimated one-sixth gross rent), £1 8s.; nett rent, £4 16s. 10d.; gross rent, £8 9s. He suggested that the nett rent should be deposited in the savings bank, and allowed to accumulate there at compound interest until it aggregates the initial cost of the cottage, which it should do in twenty-one years, and then the council, if they so desired, could build another without any charge on the rates. Major-General Dalrymple expressed an earnest hope that a decision on the proposed modification of the building by-laws would be arrived at shortly. The council decided, if practicable, to deal with the nett rent in the manner suggested.

PARKS AND OPEN SPACES.

Blackburn T.C.—It has been agreed to lay out Roc Lee Park with two bowling greens, a tennis court, and a recreation ground for children, at an estimated cost of £7,000. In addition, it has been decided to develop the recently acquired land at the Aqueduct, Ewood, by constructing a couple of bowling greens and a playground, at the estimated cost of £3,500.

REFUSE COLLECTION AND DISPOSAL.

Bridlington T.C.—The Sanitary Committee have been authorised to prepare a scheme for a dust destructor, and, if necessary, send a deputation to inspect installations.

Poole T.C.—The council have approved a report by the Sanitary Sub-committee appointed to consider the desirability of employing motor conveyance for the removal of house refuse, stating that the General Purposes Committee had arranged under contract for the conveyance of road material by traction in lieu of horse-drawn vehicles, and that the committee thought it would be wise to allow the further consideration of the present question to stand over for a year to see the result of this experiment.

ROADS AND MATERIALS.

Birmingham T.C.—The Public Works Committee recommend the widening and improvement of Harborne-road, Metchley-lane, and Somerset-road, at an estimated cost of £2,050.—A scheme for the widening of Park-street, at an estimated cost of £5,124, is also recommended for acceptance, and the council are advised to borrow £10,078 for widenings and improvement in Peddings-lane, Shaftmoor-lane, Forman's-road, and Weston-lane.

Cardiff T.C.—The city engineer, Mr. W. Harpur, has prepared a scheme for the widening of Duke-street, which the Public Works Committee have sent to the Parliamentary Committee with a request to consider the advisability of including the scheme in a Provisional Order or in their next Bill.

Dulverton R.D.C.—The clerk has been authorised to interview the Road Board with reference to a proposed grant and loan for the improvement of the Brendon-road on Exmoor, which is estimated to cost £2,000.

Hove T.C.—The council have agreed to the making up of a road 55 ft. wide on the east side of the recreation ground on the Stanford estate.

Leeds T.C.—A long discussion took place at a recent meeting of the General Purposes Committee on the scheme for reorganising the highways and cleansing departments, and consideration was adjourned. The suggestion is that the former department should be done away with altogether and the work put out to contract.

Loftus U.D.C.—It has been agreed to approach landowners and other interested parties with a view to consideration being given to the project of a new

road across the valley between Loftus and Carlin How, and thus avoiding the troublesome banks which have now to be traversed.

Musselburgh T.C.—The council have adopted a scheme prepared by the burgh surveyor, Mr. George Landale, for the renewal of the whole of the surface of the main street, together with certain widenings, at an estimated cost of £25,000, and has made an application to the Road Board for a grant in aid.

Richmond (Surrey) T.C.—The council have accepted the tender of Messrs. Johnson Bros., at £76, for the supply of a machine for tarring road surfaces.—The tender of Messrs. Mowlem & Co., at £736, has been accepted for making up Leyborne-park.—The Surveyor's Committee has been authorised to sell a steam roller that has been in use for twenty-two years, and to purchase a lighter roller, either steam, petrol, or paraffin driven, at a cost not exceeding £450.

Scarborough T.C.—A provisional scheme has been approved for dealing with insanitary areas in the old part of the town, and the construction of a new roadway running through its centre. It was indicated at the recent council meeting that the work would extend over several years.

Shoreditch B.C.—A resolution has been adopted offering to contribute £5,000 towards the scheme of the London County Council for widening Old-street and Kingsland-road.

Woodford U.D.C.—Estimates for tar-paving and tar-dressing amounting to £350 have been passed.

SEWERAGE AND SEWAGE DISPOSAL.

Aberystwyth T.C.—The council have adopted the scheme of sewerage prepared by Messrs. James Diggle & Sons, and the Local Government Board is to be asked to sanction a loan for the work.

Belper R.D.C.—The surveyor, Mr. Robert C. Cordon, has received instructions to construct a new filter and reconstruct the existing filter at Holbrooke sewage disposal works, at an estimated cost of £130. The filtering media at the sewage disposal works for Darley Abbey and Duffield is to be taken out and washed. The council have decided to pay the surveyor one half his fee for preparing a scheme for dealing with Crich sewerage.

Birmingham T.C.—The Public Works Committee recommend the borrowing of £5,910 for the extension of sewers in Cole Bank-lane, Swanshurst-lane, and surface-water sewerage in the Billesley district.

Chippenham R.D.C.—The tender of Mr. A. Skull, Corsham, at £257, has been accepted for sewerage work.

Kiveton Park R.D.C.—It is proposed to carry out sewerage works at an estimated cost of £3,400.

Nottingham T.C.—Stoke farm, where the sewage of the city is dealt with, and which has hitherto proved unremunerative, yielded on last year's operations a profit of about £180.

WATER, GAS, AND ELECTRICITY.

Ballycastle R.D.C.—Arrangements have been completed for the Cushendun water supply, and an engineer is to be appointed to superintend the scheme.

Banff C.C.—It has been agreed to construct a new reservoir on a higher site, at an estimated cost of £1,050, in order to augment the Gardenstour water supply. Negotiations are also in progress for carrying out the Blairmaud water scheme for Whitemills.

Bantry R.D.C.—The Local Government Board have written calling the attention of the council to the unsatisfactory nature of the Glengariff water supply.

Bathgate T.C.—The estates of Kirkton and White-law, containing 457 acres, have been purchased for £6,860, in order to secure the water rights.

Belper R.D.C.—The surveyor, Mr. Robert C. Cordon, has been instructed to prepare a scheme for the water supply of Allestree.

Chester T.C.—The Electricity Committee recommend the extension of the electricity cables, at an estimated cost of £3,282, and also extensive conversions to metallic filament lamps in the street lighting.

Chirk R.D.C.—Consideration is to be given to alternative schemes for a water supply for Glyn and Dolywern.

Frodingham U.D.C.—The tender of Messrs. Smith & Sons, of Grimsby, at £94, has been accepted for the sinking of a new bore at the waterworks.

Hemel Hempstead R.D.C.—The surveyor, Mr. T. H. Lightbody, has prepared a scheme for a water tower and hydrants in connection with a water supply scheme for Flamstead and Trowley.

Howden R.D.C.—The water supply question has been the subject of an interview between the representatives of the council and Mr. H. H. Law, deputy chief engineering inspector to the Local Government Board. No definite result was reached, but at the meeting on Saturday the council resolved that the supply of water in the Ings, at South Newbald, and the right to take the water, be investigated at a cost of £100.

Inverurie T.C.—A scheme is being prepared for a supply of electric light for the burgh.

Walsall T.C.—It is proposed to effect extensions at the electricity works, at an estimated cost of £3,000.

Wolverhampton T.C.—It has been agreed to provide a stock pattern pump capable of raising 2,000,000 gallons per day, at Cosford works, at an estimated cost of £1,500.

MISCELLANEOUS.

Hove T.C.—The Watch Committee have appointed a sub-committee to go into the whole question of the fire brigade and to report as to whether they consider it advisable to recommend the formation of a municipal fire brigade.

Leeds T.C.—At a meeting recently of the General Purposes Committee, instructions were given that the recommendations of the former Special Committee (now merged in the General Purposes Committee) for the control of the labour employed by the corporation should be given effect to by establishing an office in Swinegate, at which all applications for work under the municipality will be received and considered.

PERSONAL.

Mr. H. C. Parkinson has been appointed surveyor to the Armagh Rural District Council.

Mr. J. J. Estridge, surveyor to the Dorchester Rural District Council, has received an increase of salary.

Mr. F. J. Dixon, borough engineer of Ashton-under-Lyne, has been elected a member of the Royal Sanitary Institute.

Mr. J. Urban Smith, son of the Hertfordshire county surveyor, has been elected an associate-member of the Institution of Civil Engineers.

Mr. W. A. Doig, of the borough engineer's office, Taunton, has been admitted as a student of the Institution of Civil Engineers.

Mr. E. O. Hilyard, a member of the Scarborough borough engineer's department, has accepted an appointment at Birmingham.

Mr. A. Percy Harcourt, of the borough surveyor's department, Deptford, has been elected an associate-member of the Institution of Civil Engineers.

Mr. H. W. Bowen, county surveyor, West Sussex, has been transferred from the class of associate-member to that of member of the Institution of Civil Engineers.

Mr. S. K. Gibson, surveyor to the Cockermonth Rural District Council, is to receive an allowance of £30 per annum towards the upkeep of a motor cycle provided by himself.

Mr. George Rodley, clerk of works on road schemes under the West Suffolk County Council, is the selected candidate for the position of district main road surveyor, Downham district, under the Norfolk County Council.

Mr. Harold Sanderson, chief assistant to the borough surveyor of Keighley, has been appointed to a similar position in the office of the Accrington borough surveyor, and Mr. J. Kay, of the Ulverston surveyor's department, has been appointed general assistant at Accrington.

Mr. J. H. Brett, who recently retired from the office of county surveyor of Antrim, was at Tuesday's meeting of the county council presented with a solid silver salver. The presentation was made by Mr. McCance, who observed that Mr. Brett had always been found to be a good friend and a zealous official. Mr. Greer, speaking for the officials, also expressed appreciation of Mr. Brett's merits. Mr. Brett, in reply, said he had always met with much kindness from the members of the council and their predecessors, the grand jury.

ARTERIAL ROADS.

THE QUESTION OF GOVERNMENT GRANTS.

The President of the Local Government Board was asked on Wednesday whether, for the information of local authorities and sectional committees constituted at the recent conferences who would have under consideration the question of the proposed new arterial roads in relation to town planning schemes, he was in a position to make a definite statement as to the proportion of the cost of such roads which the Government would be prepared to bear.

Mr. Herbert Samuel said that one of the main objects of the conferences referred to had been to ascertain how far what was necessary in the direction of additional or improved through roads could be secured by means of town planning schemes. So far as this can be done, any large immediate expenditure might be avoided, and he was very hopeful that this would be found possible. With respect to grants in aid of maintenance, he could not anticipate any statement which the Chancellor of the Exchequer might have to make in introducing the Budget.

FOR OTHER ADVERTISEMENTS

See End of Paper.

WANTED, a thoroughly qualified Architectural Assistant in the County Surveyor's Department, Flintshire, North Wales. Salary, £3 per week. None but thoroughly qualified men, especially experienced in School and Hospital Design, need apply. For full particulars apply to the undersigned.

SAML. EVANS,

County Surveyor, Bridge Master,
and Architect.

County Buildings,
Mold, Flintshire.
April 29, 1914.

(1,576)

**THE URBAN DISTRICT COUNCIL OF
HINDLEY.
SURVEYOR'S (TEMPORARY) GENERAL
ASSISTANT.**

Applications are invited for the appointment of a Temporary General Assistant in the Surveyor's Office for a period of not less than 12 months. Salary £78 per year.

Candidates must have had experience in a Municipal Engineer's Office.

Applications, enclosing three recent testimonials, endorsed "General Assistant Surveyor," to be sent to the undersigned not later than Saturday, the 16th May, 1914.

(By order)

THOMAS ROBEY,
Clerk to the Council.

Council Offices,
Hindley,
Wigan.

April 29, 1914.

(1,577)

**BOROUGH OF BRIDLINGTON.
BOROUGH SURVEYOR.**

The Corporation invite applications for the post of Borough Surveyor, at a salary of £275, rising by annual increments of £25 to £350 per annum.

Particulars and Forms of application may be obtained from me on receipt of stamped addressed foolscap envelope.

Applications, stating age, experience, and qualifications, together with copies of not more than three recent testimonials, must be received by me before 5 p.m. on Thursday, the 14th of May.

Canvassing Members of Council will disqualify candidates.

(By order)

A. E. MATTHEWMAN,
Town Clerk.

Town Hall, Bridlington.
May 1, 1914.

(1,578)

FOR SALE.—Complete set of coaching papers for Stud.Inst.C.E., £3.—Box 1,418, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,579)

NOTTINGHAMSHIRE MAIN ROADS.

EXTENSIVE RECONSTRUCTION SCHEME.

At a meeting of the Notts County Council on Tuesday the Highways Committee submitted a report stating that for some time they had been in communication with the Road Board with a view to a more complete scheme for the reconstruction and improvement of the county main roads, so as to enable the county council to proceed with the work at a more rapid pace than had been possible under the old system of annual grant. A provisional scheme had now been approved by the Road Board dealing with the reconstruction of 24 miles of main road in the urban districts, and 90 miles in the rural districts of the county. This mileage, added to the 23 miles of urban and 70 miles of rural main roads already reconstructed, would make a total, when the scheme was completed, of 207 miles of reconstructed main roads, capable of carrying the present ordinary traffic of the county. The total cost of reconstructing 90 miles of rural main roads will be £95,040, and in respect of that amount the Road Board will make a grant of £36,000, and advance a loan of £39,500 free of interest, leaving £19,540 to be contributed by the council.

The cost of reconstructing the 24 miles of urban main roads will be £34,364, the grant from the Road Board being £13,000, and the loan which the board will advance amounting to £31,000, leaving £3,364 to be provided by the county council. The proposed loan of £39,500 will be repaid by the council by 1922, and the smaller loan by 1920.

The committee recommended the council to approve of the scheme, and to apply to the Local Government Board for sanction to borrow the necessary money. It will only be necessary to borrow £11,000 in respect of the rural main roads in the current financial year, as the advancing of the loan of £39,500 will be spread over three years; but the whole of the £18,000 for the urban roads will be required to be raised at once.

The contracts with the urban authorities are affected by the new scheme, and the grant would be handed over to them as it was received. In some cases the work would be spread over one and a-half years, in others two years, and in other cases two and a-half years. The committee recommended that sums amounting to £1,529 should be paid in respect of the grant-in-aid roads in the county, and contracts sealed for the next year.

The Road Board have agreed to pay half of the further expenditure, to the amount of £2,000, for additional work in connection with the Nottingham and Bawtry road. The Newark Town Council had made a further application for an improvement on the Great North road at the corner of Lombard-street and Castle-gate in Newark, but the Road Board declined to make a grant in respect of the improvement, and consequently it was not possible for it to be carried out.

The report was adopted with the exception of that part of it referring to the Great North road, with respect to which it was resolved that the Road Board be asked to reconsider their decision.

Birmingham Gas Profits.—The report of the Birmingham Gas Committee, published on Monday, states that £70,000 will be handed over to the city treasurer in relief of the rates.

Royal Institute of British Architects.—The annual general meeting of this body will take place on Monday evening next. On the 11th inst. a special general meeting will be held to resume consideration of the draft revised schedule of professional charges.

Loans for Private Street Works.—The Warrington Town Council have adopted a resolution urging upon the Local Government Board the necessity of granting an extension, from seven years to twenty years, of the time allowed for the repayment of loans taken up by local authorities to meet the cost of making and paving private streets.

A Use for the Brighton Aquarium.—The special committee appointed by the Brighton Town Council to consider the provision of a permanent home for the municipal orchestra, have recommended that the Aquarium should be the site. Instead of the elaborate £100,000 scheme, defeated by the ratepayers, an expenditure of about £10,000 is contemplated in the enlargement of the present Winter Garden and improvements on the terrace, enabling outdoor orchestral performances to be given. Eventually it is hoped to link up the terrace with the Madeira-road terrace.

ROADS IMPROVEMENT ASSOCIATION.

ANNUAL GENERAL MEETING.

In the unavoidable absence of Prince Arthur of Connaught, the Hon. Arthur Stanley, M.P., presided at the annual general meeting of the Roads Improvement Association held at the Institution of Civil Engineers, Westminster, London, S.W., on the 23rd ult. Lord Montagu of Beaulieu (vice-president), Mr. Robert Todd (chairman), Colonel R. E. Crompton, C.B., and Mr. H. Percy Boulnois (vice-chairman), Mr. E. S. Shrapnell-Smith (hon. treasurer), and a number of members of the council supported the chairman.

The adoption of the annual report—a summary of which appeared in *THE SURVEYOR* of the 17th ult.—was moved by Mr. ROBERT TODD, who reviewed the various activities of the association during 1913, and especially drew attention to the successful results attending the association's frequent conferences with the local authorities and their executive officers. In the main local authorities were making strenuous efforts to improve their roads, and it was essential that road users, who place traffic of various types, weights and speeds upon the roads, should co-operate with and support them in every way. He noted with pleasure the approval that had been expressed for the need for the reclassification of the roads in this country, so long advocated by this association. The promise of State assistance for road maintenance was also a cause for satisfaction, as the time had now fully arrived for a more equitable distribution of this burden.

LORD MONTAGU OF BEAULIEU, who seconded the report, referred to the large field of usefulness before the association, and to the wide measure of success that attended its extensive activities. He drew attention to the limited powers of the Road Board to initiate road improvement schemes, and stated that the board were always anxious to receive and consider well-thought-out proposals put forward by the Roads Improvement Association in the interests of road users, in addition to those submitted by the local authorities. Lord Montagu deprecated the present destructive use of the roads. A small proportion of heavy vehicles frequently did not make fair use of the highways; they often exceeded the regulations regarding speed and weights, and caused abnormal damage to the roads. Hints had already been given that these regulations would shortly be revised and more stringently enforced. Referring to the rounding-off of dangerous corners and the trimming of obstructive hedges, Lord Montagu said it was sometimes suggested that motorists merely wanted roads denuded of all hedges, and similar features. This was quite wrong; motorists were more and more touring the country for pleasure, and were most appreciative of the beauties of the countryside. Anything savouring in the slightest degree of vandalism would be most abhorrent to them; they only asked that hedges should be trimmed, and roads altered where necessary, for the safety of the general road user.

Colonel R. E. CROMPTON, who supported the report, specially emphasised the great importance of the association's campaign for special facilities to be provided for the training of road engineers. He gave examples of how essential it was that road engineers of the future should have a thorough knowledge of the scientific principles underlying good road making, and expressed himself as strongly in favour of a movement being initiated here, as in the United States, to establish Chairs of Highway Engineering at certain of our large universities and colleges. Cyclists were greatly benefiting from the improved roads campaign, the modern smooth surface in the country enabling them to travel quite 30 per cent more than formerly without additional fatigue.

The report was unanimously adopted.

Mr. E. S. SHRAPNELL-SMITH, in moving the adoption of the accounts, stated that the association's income for the first time had exceeded £1,000; it was £1,126. He thanked Lord Montagu for the special gift of £99 5s., being the balance of *The Car Dustless Roads Fund*. This had enabled the association to hold its first conference of the members of the provincial branches, and publish various papers in connection therewith. Last year's expenditure was, roughly, £1,069. Although the association's individual subscribers numbered only 700, the Roads Improvement Association represented, with the constituent bodies, nearly 250,000 of all classes of road users. The work

the association was able to do had cost less than 1d. per head of its supporters.

Mr. H. PERCY BOULNOIS, in seconding the adoption of the accounts, remarked upon the pleasant relations that existed between the association and the Government departments, local authorities, and other bodies concerned with the administration and use of the roads.

The accounts were unanimously adopted.

In moving a vote of thanks to the Institution of Civil Engineers for placing their rooms at the disposal of the association, the chairman, Mr. ARTHUR STANLEY, referred to the establishment of the Road Board and the funds at its disposal. He thought that in this case the Chancellor of the Exchequer, Mr. Lloyd George, was deserving of thanks. In a year when there was a large deficit, when motorists were undoubtedly unpopular, and when it was recognised that to raise a large sum of money from motorists—who were supposed to be the idle rich—would be a popular move, it did require great strength and courage to raise that large sum of money, and to insist that the whole of it should be spent upon the roads of England. He did think that in this particular case they who were dealing simply and solely with the improvement and maintenance of roads, had every reason to be grateful for the fact that Mr. Lloyd George was at that time Chancellor of the Exchequer. They who travelled over country roads which had become subject to heavy motor traffic, like lorries and motor omnibuses, would realise that an enormous amount of money would have to be spent in fitting those roads for the traffic which was being put upon them. It would be unfair to expect the particular localities to bear the entire cost, and the whole question of road improvement and maintenance had now passed into the sphere of national matters, and must be dealt with as a national question.

A vote of thanks to the chairman concluded the meeting.

At the subsequent council meeting the following officers were re-elected:—

President—H.R.H. Prince Arthur of Connaught, K.G., G.C.V.O.

Vice-presidents—The Hon. Arthur Stanley, M.V.O., M.P.; The Right Hon. Lord Montagu of Beaulieu; W. Joynton-Hicks, M.P.; E. Manville, M.I.E.E.

Chairman—Mr. Robert Todd.

Vice-chairmen—Colonel R. E. Crompton, C.B., M.I.N.S.T.C.E.; H. Percy Boulnois, M.I.N.S.T.C.E.

Hon. Treasurer—E. S. Shrapnell-Smith.

Secretary—Wallace E. Riche.

The various committees for the ensuing year were reappointed.

The committee appointed by the council to consider various questions connected with the weights now carried by heavy motor vehicles, and the regulations appertaining thereto, reported that they had obtained considerable data, and hoped shortly to issue a comprehensive report. A number of other matters of general importance were also dealt with.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times*.

King's Lynn and Vancouver.—Mr. J. H. Kerner-Greenwood, King's Lynn, writes: "A subscription has been set on foot at King's Lynn to place a portrait of Vancouver in the town hall. The cottage where Vancouver was born still exists in the Quakers' Meeting House yard. It is a half-timbered, tiled house with a Mansard roof. Vancouver was baptised in St. Margaret's Church at Lynn (as recorded in the register), on March 16, 1761, but he was buried at Petersham. If any architect or surveyor visits Lynn this summer, I shall be very pleased to show them not only Vancouver's cottage, but several other interesting houses, also the churches, ancient gateways, and relics of the old monasteries which exist in Lynn."

* *A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities.* By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

Institution of Municipal Engineers.

NORTHERN DISTRICT MEETING AT DARLINGTON.

At a meeting of the Northern District of the Institution of Municipal Engineers held at Darlington on April 18th, there were present Messrs. John Davison (chairman of the district), J. W. Plewes (Ripon), R. Atkinson (Durham), H. W. Marsden (Richmond), L. Simpson (Middleton-in-Teesdale), L. Holbrook (Houghton-le-Spring), W. J. Pallister (Darlington), P. W. Byles (Darlington), G. Packer (Northallerton), E. J. Emberton (Redcar), John R. Johnson (Darlington), M. Turnbull (Shildon), E. C. Tomkins (Darlington), John Heslop (Bishop Auckland), J. W. Holbrook (Houghton-le-Spring), W. Wallin (Newcastle-on-Tyne), W. M. Stephenson (Darlington), W. W. Davison (Darlington), H. S. Sutherland (Darlington), W. Noble (Darlington), and John Robinson (hon. district secretary).

THE DARLINGTON FORGE COMPANY'S WORKS.

Members and their friends assembled at Bank Top Station at 11 o'clock, and at 11.15 proceeded by special tramcar to the Darlington Forge Company's works, where, by the kind permission of Mr. Thos. Putnam, J.P., managing director, they were received by Messrs. Pearson, Hogg and Patterson, members of the staff, and were taken first through the large new pattern shop, where a number of patterns were being made for heavy ship's castings. The members then passed into the "fettling shop," and saw castings of all descriptions being cleaned and dressed. Special interest was manifested in several huge castings which, it was stated, were ships' propeller brackets for the Admiralty.

Proceeding next to the small foundry, which is served by two stock patent oil-fired converters, the party were shown how moulds were made for what were termed "small castings," weighing from a few pounds up to 6 tons. The Stock process of steel manufacture was fully explained, though, unfortunately, it being after 12 o'clock, the men had left work, and no steel was actually being produced at the time. When, however, it was explained how each of the furnaces could produce about 3 tons of steel every two hours, starting from the cold pig iron, the value of the process was very evident.

The large foundry was the next department visited, and here were seen huge castings for which the firm are famous. The furnaces used in this foundry are two Siemens open-hearth furnaces, one capable of turning out 70 tons and the other 50 tons. In this building are ingot pits where solid ingots, weighing up to 100 tons, are cast. On the floor of the foundry were moulds in all stages of making and for all classes of work, including stern frame castings, a large spur wheel 18 ft in diameter, loco. wheels, and many other types of castings.

In the press shop the members were met by Mr. Blaylock, who explained to them the working of the two hydraulic presses, one capable of exerting a pressure of 4,000 tons, and the other one of 3,000 tons. The cranes in this department are of great interest, there being three 75-ton electric cranes and one capable of lifting 200 tons. All these cranes are controlled from ground level. The members were shown several heavy tubes for the largest naval guns.

The last department to be visited was the machine shop, and here most of the work from the other departments comes to be finished before despatching. Here are machines of all kinds, all electrically controlled, including one huge 93-in. lathe capable of taking up to 15 ft. in diameter, and with an available length of 65 ft. This is probably the largest lathe of its kind, and is specially designed for large turbine rotors, and was, in fact, turning a large rotor drum for a battleship at the time of the inspection. Another notable machine was the trepanning machine for boring large ingots and billets. In the same shop were seen several very large rotor wheels cut out by specially designed band saws from solid steel discs made under the hydraulic presses previously described. In the erecting shop were seen several large stern frame castings in the finished state, notably that for H.M.S. "Resolution," weighing about 80 tons.

The members were finally shown through the company's power station, where the electricity for the whole works is generated by a large low-pressure Parsons turbine driven by waste steam. This turbine

has replaced three Allan engines, which are, however, kept in reserve.

DARLINGTON CORPORATION GASWORKS.

The members next visited the Darlington Corporation gasworks, where they were met and shown over the works extensions by Mr. Tarratt, gas-works engineer and manager, and Mr. Ruffhead, assistant engineer and manager. The extensions consist of a new vertical retort-house of a capacity of 2,000,000 cub. ft. per diem, and coal and coke handling plant. The extensions are expected to be completed within the next two months. The coal is brought in from overhead railway sidings and gantries, and stored in a huge brick and concrete building to a height of 20 ft. to 25 ft. The coal is drawn from the store into an underground feeder hopper, from which it passes through crushers to an elevator boot, and is elevated to a height of about 60 ft. above the storage house floor. It is next conveyed by a push-plate conveyor into a range of bunkers, from which it is fed into receiving hoppers over the retorts. The coke is discharged into skips travelling on bogies by means of a ropeway, to a position under the telpher, where it is picked up and deposited into the coke yard or on to screens, being then graded into bunkers for local sale. The telpher, which runs at a height of about 50 ft. above the yard, can also be used to load coke into railway wagons for shipment, or for unloading any other material delivered to the works.

NORTH-EASTERN RAILWAY OFFICES.

Through the courtesy of Mr. Vincent L. Raven, chief mechanical engineer to the North-Eastern Railway Company, the members were permitted to inspect the magnificent and up-to-date offices which the North-Eastern Company erected two or three years ago on their land at Stooperdale for the chief mechanical engineer and his immediate assistants and headquarters staff.

From this building some 19,000 or 20,000 men are controlled, and the designing, building and upkeep of the company's locomotives, carriages and wagons, and the hydraulic and electric appliances at the company's numerous docks, wharves, &c., are supervised.

The members were also shown over all the offices, including the locomotive drawing office, where Mr. Heppell laid before them the general drawings of the smallest engines up to the heaviest goods and most modern passenger engines. Both this drawing office and the carriage and wagon drawing office adjoining are splendidly arranged and lighted. In the building there is also an up-to-date laboratory for the testing of stores and other material used by the company, also for the testing of articles which might be dangerous for railway conveyance. The party then visited the test-house—where samples of manufactured material are subjected to tensile, bending, &c., tests to ensure that they are up to the company's specification—and the Stooperdale boiler shop, this latter being 513 ft. long and 219 ft. wide, and its turn-out amounting to 150 locomotive boilers per year. In addition, they were fortunate enough to see there also under course of construction a number of the new electric locomotives which Mr. Raven has designed, and which will be put to work between Shildon and Newport, Middlesbrough. These engines will be able to deal with a train of as much as 1,400 tons. Finally, an inspection was made of the company's dynamometer car, with its store of wonderful mechanism. From its records, when it is attached to a train, the following, among other data, can be obtained: Speed of train, pull exerted by engine, water used, coal consumed, strength of wind blowing, distance of run. As an example of the wonderful accuracy of the car, the recorded measurement of the distance from Darlington to King's Cross made by it did not vary from the actual distance to the extent of a yard. Mr. Weatherburn, who has charge of the dynamometer car, gave a lucid and able explanation of what the car does, and the purposes its records are put to.

Mr. HOLBROOK, on behalf of the members, proposed a hearty vote of thanks to Mr. Raven for enabling them to spend such an interesting afternoon, similar compliments being paid to Messrs. Heppell, the chief

locomotive draughtsman, Mr. Pettifor, chief clerk, and Mr. Weatherburn.

DINNER.

The members afterwards adjourned to the Bull's Head Hotel for dinner. Mr. JOHN DAVISON (Morpeth), who occupied the chair in the unavoidable absence of the chairman, Mr. Finch, county surveyor, Carlisle, stated that they had had a programme that day that was certainly worthy of a better attendance. It had been one of the most interesting days that he had ever experienced with the members of the institution. At the Darlington Forge Works, the Corporation Gasworks, and the North-Eastern Railway Company's new offices and boiler shops, they had seen a great deal that had been very instructive, and most of them, he was certain, were greatly indebted to the gentlemen who had so kindly given up their Saturday afternoon to explain the workings in the various departments.

Mr. W. WALLIN (Newcastle-on-Tyne) moved a vote of thanks to the gentlemen who had so kindly given them the opportunity of getting over the various works that day. He quite agreed with the chairman that the programme was one that deserved a better attendance. Every member present that day should try and impress upon the other members the work entailed in obtaining the privileges that they had had. It was not only a pleasure, but he submitted it was a duty, to attend the meetings and make them a success.

Mr. J. W. HOLBROOK (Houghton-le-Spring), in seconding the vote of thanks, said that it had been one of the red-letter days in connection with their meetings. He also referred to the somewhat small attendance, and stated that it may have been largely due to the fact that the meeting had been held so soon after the Easter holidays. They were undoubtedly indebted very much to the friends at the Darlington Forge Company, the gasworks, and to the North-Eastern Railway Company and the Slag and Tar Macadam Company, Limited (for light refreshments), for the very interesting day they had had. The vote of thanks was carried with acclamation.

Mr. HEPPELL, chief draughtsman for the North-Eastern Railway Company, replied on behalf of that company, and Mr. H. S. SUTHERLAND replied on behalf of the Slag and Tar Macadam Company, Limited.

Votes of thanks to the hon. secretary (Mr. John Robinson) and Mr. Johnson (streets superintendent), Darlington Corporation, for making all the arrangements, closed the proceedings.

SOME RECENT PUBLICATIONS.*

INVESTIGATING AN INDUSTRY. By William Kent. Price 4s. 6d. nett. London: Chapman & Hall, Limited.

A good deal has been written of late regarding the necessity of efficient labour if a business is to succeed. In the book before us, the author views business prosperity from the standpoint of efficient management, and expounds the principles of scientific management as applied to all industrial problems, including those of distribution and selling. The subject is dealt with in a series of articles which will cause every reader—even those who may disagree on points of detail—to think. It is clearly shown that it is not only upon undertaking a new enterprise or starting a new business that problems of management should be considered, but that a constant watch should be kept upon the methods adopted in old-established concerns to ensure that they are kept thoroughly abreast of the times. Mr. Kent has produced an arresting book, which will prove an excellent investment by reason of the economies to which it introduces the reader.

Chicago's Sanitary Problems.—Three well-known sanitary experts in the persons of Dr. George A. Soper, president of the Metropolitan Sewerage Commission of New York, Mr. John D. Watson, chief engineer to the Birmingham, Tame and Rea District Drainage Board, and Mr. A. J. Martin, Westminster, are in consultation at present in Chicago with a view to determining the proper future policy in regard to the drainage and water supply of that city.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

STREET REPAIRS IN LONDON.

(From a Correspondent.)

The question of the ever-increasing problem of the metropolitan traffic is exercising the minds of the public and of the Press, and various suggestions are frequently made as to the manner in which this congestion of the traffic can be remedied. There can be little doubt that before very long some drastic measures will be necessary for the further regulation of the traffic, but, in addition to this, before any great improvement can be made, it will be necessary to consider the question of the manner in which our streets are now broken up for gas, water mains, electric conduits, and so forth, and also the manner in which surface repairs are executed.

To anyone who has lived in a great provincial city like Liverpool, Glasgow or Manchester it must be evident, if he is at all observant, that the work in the streets of these towns is carried out in a much more expeditious manner than is the case in London.

In the provinces it is realised that obstruction to traffic means loss of money to the community, and consequently all street work is carried out as expeditiously as possible. It is usual to work night and day with gangs of men of three shifts of eight hours. The work is carefully organised so that there shall be sufficient men, but not too many. There is no "running over each other," and the men keep steadily to work under the eye of an experienced foreman. There are no night watchmen to pay at 5s. a night, with expensive fires to warm them and lights to keep off the traffic; there is no delay in starting the work in the morning and no similar delay before knocking off in the evening. The work in the provinces goes like clockwork, and it is a pleasure to see the men's activity and the interest they take in their work.

What do we find in London? A few men working so leisurely that one would think that time was no object; whereas in such a job as this it is of paramount importance. No wonder that a policeman once said to the writer of this article, when he was watching a street-repairing job in which the "stiff" backs of the men were a very prominent feature, "I'll tell you what it is, sir, there's a new trades union order just come out: 'If any man is found sweating while at work, he will be fined five shillings.'" It certainly looked like it.

One cannot but observe that in many works of street opening there is an absence of judgment as to the lengths and widths which should be disturbed at once. A little forethought in this direction would often save an infinite amount of traffic disarrangement. Another point is that the barricades, or temporary enclosures, of such work are clumsy and quite out of date, and take up a great deal more room than is necessary.

It is surprising that in a great city like London (said to be the largest city in the world) the inhabitants should be content to allow their streets to be under repair for weeks where days should suffice, and that they should not insist that such work should be carried out night and day until finished. Unfortunately, London is so big that what is everybody's business is nobody's business, and we suffer from having no London newspaper, all our own, in which such grievances can be aired and discussed.

It is useless to try and grapple with the traffic question until this anomaly of street disturbance has been removed and a remedy discovered. It is too late now to talk of subways for the numerous pipes and cables, which so often have to be "got at" for repairs or connections. We have to take things as we find them, and surely it should not be a difficult matter to devise some scheme by which the work in our streets could be carried out more expeditiously, and with less disturbance of the traffic.

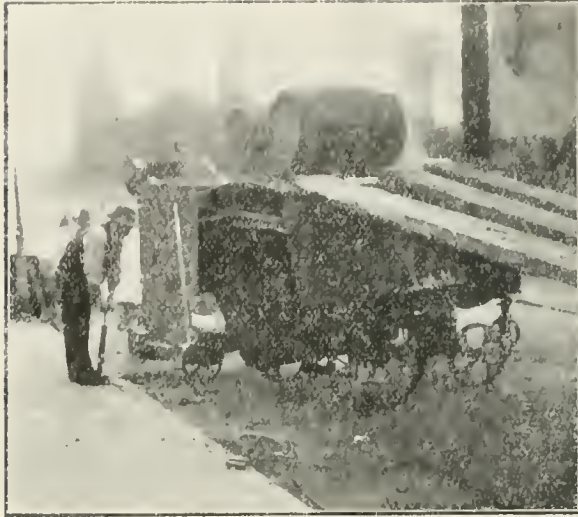
The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

Scavengers' Pay in Liverpool and Manchester.—Answering a question in the House of Commons on Tuesday, Mr. Herbert Samuel, President of the Local Government Board, said he was informed that in Liverpool the rates of pay of scavengers ranged from 25s. to 27s. per week. The men were employed fifty-one hours per week and were entitled to six days' holiday annually with pay. In Manchester a uniform rate of 26s. per week was paid.

SPRAYING "FLUXPHALTE."

"FLAPPER" MACHINE DEMONSTRATION AT PUTNEY-HILL.

Since the introduction, about two years ago, of Fluxphalte—the liquid Mexican bitumen for road spraying—considerable progress has been made in its use on the roads of this country. This progress is likely to be distinctly accelerated by the introduction



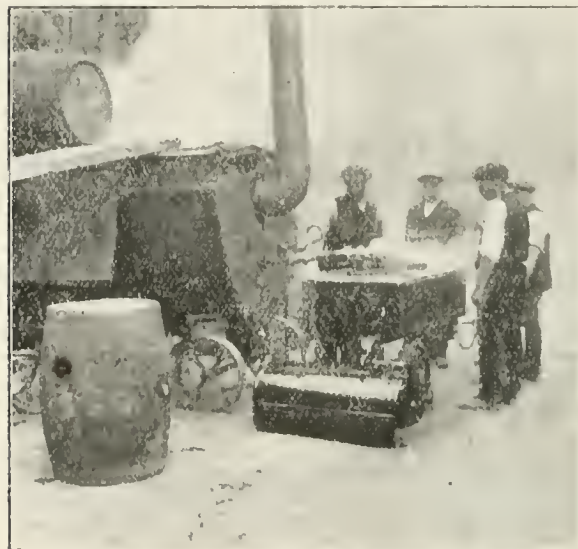
EMPTYING FLUXPHALTE BARRELS INTO BOILER.

(A small air pump supplies air at a pressure of 10 lb. through a spigot in each barrel to facilitate discharge.)

of the new spraying machines for which the Anglo-Mexican Petroleum Products Company, Limited, have registered the word "Flapper," which describes the principle of its action.

The new machine was used on Wednesday and Thursday of last week for the first time at Putney-hill, where the Wandsworth Borough Council sprayed about 1,000 yds. super.

In connection with the machine, boilers fitted with the company's anti-frothing tray were used for heat-



FILLING THE "FLAPPER" MACHINE WITH HOT FLUXPHALTE FROM THE BOILER.

ing the material, and a temperature of over 400 deg. Fahr. was readily attained. The Flapper machine, which is filled from these roadside boilers, contains 50 gallons of the liquid bitumen, and, as will be seen from the accompanying photographic views, is drawn by hand. Immediately the valve was released the Fluxphalte was sprayed on the road by means of the blades of a rapidly rotating "flapper," and a very fine even film was laid. This was followed by an application of 1/2-in. granite chippings, and it says much for the process that after this top dressing the portion of the road treated was at once thrown open to the

traffic, which includes a frequent service of motor buses. The improvement this machine effects over the ordinary spraying machines is seen in the fact that the bitumen appeared to set hard within an hour or so of its application.

A number of surveyors and others inspected the work on Wednesday and Thursday, and were favourably impressed by the simplicity of the operations and the rapidity with which the work was carried out.

The Anglo-Mexican Petroleum Products Company, Limited, the proprietors of Fluxphalte, have arranged to loan these "Flapper" machines to all municipal engineers spraying Fluxphalte during the ensuing season.

Preliminary Studies in Bridge Design.—This little book,* a reprint of articles which appeared in THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, is intended as the first of a series of similar volumes



THE 50-GALLON HAND-DRAWN "FLAPPER" MACHINE.

which, taken together, will form a treatise on the design of ordinary highway bridges of moderate spans. This first volume goes further back in the evolution of the bridge than do most treatises, and considers the bridge in its essential elements, that is as the means of providing a crossing for man and beast across a watercourse. The bridge engineer is apt to forget this primary purpose and to consider his bridge merely as a framework or a carrier of stresses. Mr. Ryves, in a refreshingly original manner, has emphasised the necessity for studying



COMPLETED ROAD OPEN TO TRAFFIC AFTER APPLICATION OF GRANITE CHIPPINGS.

natural and economic predispositions, one might say, of the bridge site, with a view toward producing, not the best type of bridge, but the best method of getting the river and the traffic across one another. . . . —*Engineering News*, New York.

* By Reginald Ryves, ASSOC. M. INST. C. E. London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.

ROAD MAINTENANCE IN SHANGHAI.*

By CHARLES H. GODFREY, M.INST.C.E.,
Engineer and Surveyor.

In my reports of the three previous years the maintenance of roads has been discussed at length, more particularly as an engineering question; but after three years' experimental work it can safely be claimed that the matter is no longer a question of engineering, but of finance and public interest. The past year has been a busy one so far as work in connection with improved methods of maintenance is concerned.

It might be pointed out that with the exception of the paving of the Szechuen-road, all experimental work has been carried out with the funds allocated for the ordinary maintenance of roads, and, if full advantage is to be taken of the results obtained, it is absolutely essential that considerably more money be allocated for the purpose of improvement. If public opinion demands a higher standard of roads than we possess at present, the public must be prepared to find the money. The increasing number of self-propelled vehicles using the roads is a factor not to be neglected, and I would advocate the consideration of regulations governing the construction and maintenance of handcarts and wheelbarrows, which at present constitute the most injurious class of traffic so far as road maintenance is concerned. A few simple regulations regarding the widths of tyres and diameter of wheel with regard to the load could be introduced without causing any undue hardship on those concerned.

In most countries road construction and maintenance has been considered of such importance as to constitute a national question. The magnitude of the question is difficult to realise, but it was impressed upon me at the International Road Congress held in London last June. In Shanghai we can, of course, look for no outside assistance, and it is consequently the more important that special financial provision should be made to deal with the question. I think it is admitted on all hands that permanent paving is necessary, particularly in the more congested streets in the settlement, and at first sight it would appear advisable to raise a large loan and carry out the work at once. I would certainly recommend this course if I were satisfied that the best systems are at present available.

At the Road Congress I was particularly struck with the number of new systems of permanent paving which are coming to the front. To commit ourselves now to any one system would, in my opinion, be unwise. A more sound policy would be to raise a loan each year . . . for the purpose of carrying out permanent paving in the more congested streets. We should then be in a position, year by year, to profit by experience gained not only locally, but in other cities. For bituminous (and other improved) treatment of the less heavily trafficked roads, the yearly grant for the maintenance of roads should be considerably increased, bearing in mind that such work as tar-painting and tar-macadam roads cannot be considered as permanent paving, and consequently any additional expense should be met out of current revenue. Under this heading also provision should be made for providing new foundations for a number of the present macadam roads.

The length of roads under the control of the Shanghai Municipal Council is 117 miles, over 70 miles being macadamised, nearly 29 miles paved, and nearly 27 miles unmetalled. Of the 97 miles of footways, 84½ miles are paved.

The Rating of Sewers.—The Sewers (Exemption from Rating) Bill, which has been introduced into Parliament by Sir J. S. Harwood-Banner, has for its object, as the title implies, the exemption of underground sewers from rating. It was always understood that such sewers were not rateable until the recent decision to the contrary in the case of West Kent Main Sewerage Board *v.* Assessment Committee of the Dartford Union. Since that decision many municipal and local authorities have directed their attention to the matter. At a conference of representatives of the metropolitan rating authorities, which was held at the Westminster City Hall on March 13th last, this question was considered, and the conference expressed the opinion that it was inexpedient that sewers in the administrative county of London should be rated. A similar view is being adopted generally.

* Extracts from annual report for 1913.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

NORTH-EASTERN DISTRICT.

A meeting of the North-Eastern District of the Institution of Municipal and County Engineers is to be held at Sheffield to-morrow (Saturday).

PROGRAMME.

- 2 p.m. Meet at the town hall to inspect the plans of the town planning scheme.
- 2.30 p.m. Leave town hall for Wincobank to inspect the sewage disposal works.
- 4.30 p.m.—Leave sewage disposal works to view the High Wincobank Corporation model dwellings.
- 5.30 p.m.—Return to town hall, where tea will be provided by the kind invitation of the Right Hon. the Lord Mayor (Colonel G. E. Branson, J.P.).
- 6.30 p.m.—District business.

J. P. WAKEFORD, M.I.C.E., F. MASSIE, M.I.C.E.,
Hon. District Secretary. *District Chairman.*
Wakefield. Wakefield.

DOVER MEETING.

A meeting of the institution is to be held in the South-Eastern District at Dover on Saturday, May 9th.

PROGRAMME.

- 11.30 a.m.—Members will assemble at the town hall. Welcome by His Worship the Mayor (Mr. Councillor E. W. T. Farley, J.P.). District business (council chamber).
- 1 p.m.—Members will partake of luncheon at the Grand Hotel, facing the Granville Gardens. (Tickets 3s. per head.)
- 2 p.m.—Start from Grand Hotel and proceed:
 - (1) To inspect the ferro-concrete viaduct and workmen's dwellings, in course of construction in the pier district (W. C. Hawke, Assoc.M.INST.C.E., borough engineer).
 - (2) To inspect the new Marine Station, in course of construction on the Admiralty Pier, by the kind permission of Mr. P. C. Tempest, M.INST.C.E., engineer, S.E. and C. Rly.
 Mr. A. T. Walmisley, engineer, Dover Harbour Board, will briefly explain the provision of a site for this station in the area reclaimed by the Harbour Board.
- 3 p.m.—The Dover Harbour Board have kindly granted the use of one of the tugs for an inspection of the National Harbour works (Captain Iron, harbour master).
- 5 p.m.—Members will partake of tea at the town hall as guests of the mayor.

Other works of interest to surveyors and engineers in Dover: The waterworks, pumping station, Castle Hill; slipper and Turkish baths and electricity station adjoining the town hall; swimming baths, sea front; sewage pumping station, pier district.

Arrangements can be made for any members who desire to do so to inspect any of the above works of interest.

H. W. BOWEN, ASSOC.M.INST.C.E.,
Hon. District Secretary.

County Surveyor,
West Sussex, Horsham.

SALISBURY MEETING.

A meeting of the institution is to be held in the Southern District at Salisbury on Saturday, May 16th.

PROGRAMME.

- 11.30 a.m.—Reception in the council chamber by the Right Worshipful the Mayor of Salisbury, Mr. Councillor J. Macklin, J.P.
- Papers by Mr. W. J. Goodwin, Assoc.M.INST.C.E., city engineer, "Some Notes on the Municipal Works of Salisbury"; and Mr. J. H. Blizard, Assoc.M.INST.C.E., on

"The Bemerton and Wilton Pumping Station for Sewage Disposal."

Discussion.

- 1.15 p.m.—Lunch in the banqueting room at the invitation of the Right Worshipful the Mayor.
- 2.15 p.m.—Leave council house in motor char-a-banc to visit the following works—viz., Salisbury sewage disposal works and refuse destructor.
- 3.15 p.m.—Leave for Salisbury waterworks, chief pumping station.
- 3.45 p.m.—Leave for Bemerton pumping station.
- 4.15 p.m.—Return to council chamber, where tea will be provided, at the invitation of Mr. Alderman C. J. Woodrow, J.P., chairman of the Salisbury Sanitary Committee. (Cost of conveyance, 2s. each.)

By the kind consent of the chief officer of the fire brigade, the fire station will be open all day for inspection.

DISTRICT MEETING.

Members of the Southern District are asked to assemble in the council chamber at 11.10 a.m., to elect the Executive Committee and to consider any other district business.

P. R. PHIPPS, ASSOC. M. INST. C.E.E.
Hon. District Secretary.

Town Hall,
Basingstoke.

WEST MIDLAND DISTRICT.

A meeting of the West Midland District is to be held at Birmingham on May 23rd.

SCOTTISH DISTRICT.

The annual Scottish meeting of the institution will be held in Dunfermline on June 5th and 6th.

The following papers will be read—viz.:—

"A Town Planning Scheme: Its Effects on Housing and Architecture," by Mr. Raymond Unwin.

"Edinburgh and Its Early Examples of Town Planning," by Mr. A. Horsburgh Campbell.

"Town Planning from a Lawyer's Point of View," by Mr. John L. Jack.

"The Advantages of Steam Tractor Haulage over Team Labour for Road Material," by Mr. W. L. Gibson.

On the first day the members are to be entertained to luncheon by the corporation of the city of Dunfermline. On the second day, by the courtesy of the Admiralty and Messrs. Easton, Gibb & Co., the members are to be permitted to visit the works at Rosyth.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on Saturday, June 13th.

ANNUAL MEETING.

A town planning, housing and road conference and the forty-first annual general meeting are to be held at Cheltenham from June 24th-27th.

The following is a preliminary list of the papers to be read and discussed at the conference:—

- (1) "Town Planning Large Areas," by Mr. W. A. Clarry, borough surveyor, and Mr. R. A. Reay-Nadin, town clerk, Sutton Coldfield.
- (2) "The Housing, Town Planning, &c., Act, 1909 (Part 2) as Applied to Commercial and Industrial Districts," by Mr. J. C. Midgley, deputy city surveyor, Newcastle-upon-Tyne.
- (3) "Town Planning and Architectural Issues," by Prof. S. D. Ahead, Liverpool University.
- (4) "The Abnormal Development of Coventry and some of its Town Planning and Housing Problems," by Mr. J. E. Swindlehurst, city engineer, Coventry.
- (5) "Town Planning Amended Procedure Regulations," by Mr. H. E. Stilgoe, city engineer, Birmingham.
- (6) "Town Planning Procedure," by Mr. Fred. W. Pearce, engineer to the Twickenham Urban District Council.
- (7) "Town Planning Practice in America," by Mr. C. M. Robinson, Rochester, N.Y.
- (8) "Some Notes on Highway Law as Affecting the Municipal Engineer," by Mr. S. G. Turner, Barrister-at-Law, London.

- (9) "The Training of the Highway Engineer of the Future," by Mr. H. Percy Boulnois, London.
- (10) "The Control, Management and Maintenance of Roads," by Mr. J. Fred. Hawkins, county surveyor, Berkshire.
- (11) "The Prevention of Sub-Crust Movement in Roads," by Mr. E. S. Sinnott, county surveyor, Gloucestershire.
- (12) "The Economics of Modern Methods of Road Construction," by Mr. Francis Wood, borough engineer, Fulham.
- (13) "Some Notes on Grouting and Penetrating Methods of Road Surfaces," by Mr. Geo. Green, borough engineer, Wolverhampton.
- (14) "The Organisation of a Municipal Engineer's Department," by Mr. E. Willis, surveyor to the Chiswick Urban District Council.
- (15) "The City of Worcester Sewage Disposal Works," by Mr. T. Caink, city engineer, Worcester.
- (16) "Notes on the Protection of the Foundations of Chepstow Bridge over the river Wye in Ferro-Concrete," by Mr. E. S. Sinnott, county surveyor, Gloucestershire.

The conference will be opened on Wednesday afternoon June 24th (when the delegates will be welcomed by the Mayor and Corporation of Cheltenham), and continued during the two following days. Visits will be made on Thursday afternoon, June 25th, and Saturday morning, June 27th, to the corporation new sewage purification works, waterworks, destructor, concrete slab factory, &c.

An important exhibition of plans, maps and models of town planning and housing schemes, &c., will be held during the four days of the meeting. A large number of local authorities, engineers, architects, and others interested in the town planning and housing movement, both in this country and abroad, have kindly undertaken to forward exhibits, and it is believed that the collection will be one of great educational and practical value.

PROGRAMME.

Wednesday, June 24th (Morning).—General business of the institution.

Presidential address and presentation of premiums.

Afternoon.—Conference—Town planning and housing; conference—Roads, &c.

Evening.—Exhibition of town planning and housing schemes, &c.

Thursday, June 25th (Morning).—Conference—Town planning and housing; conference—Roads, &c.

Luncheon given by mayor to members of the institution and delegates.

Afternoon.—Drive to inspect planned areas of town. Visit to refuse destructor, concrete slab factory and new sewage purification works.

Evening.—Annual dinner.

Friday, June 26th (Morning).—Conference—Town planning and housing; conference—Roads, &c.

Afternoon. Conference—Town planning and housing; conference—Roads, &c.

Evening.—Open-air concert—Montpellier Gardens.

Saturday, June 27th (Morning).—Visit to corporation waterworks at Tewkesbury, &c.

J. W. DUDLEY ROBINSON, B.Sc.(LOND.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF WATER ENGINEERS.

SUMMER MEETING AT STOCKPORT.

The annual summer meeting of the Institution of Water Engineers will be held this year on June 11th, 12th and 13th at Stockport (headquarters at Midland Hotel, Manchester). Candidates for election at the council meeting to be held on June 11th should see that their proposal forms (duly filled in and signed) are received by the secretary, Mr. Percy Griffith, 20 Victoria-street, Westminster, S.W., not later than June 1st.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

NORTHERN DISTRICT.

Meetings will be held in Cumberland in June, at Alnwick on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Hull on Saturday, May 16th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

The Hexham meeting arranged for to-morrow (Saturday) has been postponed.

GENERAL MEETINGS.

A meeting will be held at the Institution of Electrical Engineers, Victoria Embankment, W.C. (corner of Savoy-street, Strand), on Monday, May 11, at 7.30 p.m., for the discussion of a paper,

GREATER NEW YORK'S WATER SUPPLY SCHEME, which has been presented for that purpose by Mr. William T. Taylor, Fellow A.M.I.E.E., M.I.E.E., M.A.M. SOC.M.E., A.M.I.MECH.E., F.R.G.S. (Member).

The meeting is being held jointly with the Society of Engineers.

A visit will be paid to the works of the General Electric Company, Limited, Witton, Birmingham, on Thursday, May 21st.

Members will meet at the offices of the company at Witton at 1.45 p.m. proceeding at 2 p.m., on the kind invitation of the company, on an inspection of the engineering works, small motor, switchboard and switchgear departments, foundry, test-house, and conduit works. The works are among the first and best equipped in the country, and the visit will be one of extreme interest, and should command a large attendance.

EASTERN AND NORTH-EASTERN DISTRICTS.

A joint Eastern and North-Eastern District meeting will be held at Finedon and Kettering on Thursday, May 7th, when a visit will be paid to the works of the Excelsior Stone Company at Finedon, and certain municipal works inspected at Kettering.

PROGRAMME.

12.20 a.m.—Meet at the works of the Excelsior Stone Company at Finedon, and inspect the manufacture of patent stone slabs, kerbs, channels, architectural dressings, &c.

Proceed thence by motor 'bus to Kettering for lunch at the Royal Hotel, at the kind invitation of the Excelsior Patent Stone Company, when a short paper will be read by Mr. W. B. Mortimer, managing director of the firm.

An inspection will afterwards be made of works in Excelsior stone at Kingsley-avenue, the new Co-operative Clothing factory, and the county police station.

G. BELSON CHILVERS,
Hon. District Secretary.

Council Offices,
Oundle.

A joint Eastern and North-Eastern District meeting will be held at Hunstanton in July.

NORTH-WESTERN DISTRICT.

A visit will be paid by the members of this district on Saturday, May 16th, to the "grease extraction plant" at the Oldham sewage works. The plant was dealt with in a paper read recently before the institution by Dr. Grossmann, and great interest attaches to it. Full programme will be published later.

R. J. McKENN,
Hon. District Secretary

Heywood.

WESTERN DISTRICT.

A Western District meeting will be held at Tisbury on Saturday, June 13th, when the municipal works of the town will be inspected and a paper, "Wiltshire Roads, Past and Present," will be read by Mr. E. Plummer Davies (member).

B. WYAND,
Secretary.
39 Victoria-street, S.W.

CONCRETE INSTITUTE.**FORTHCOMING MEETINGS.**

The next meeting of the Concrete Institute will take place at Denison House, Vauxhall Bridge-road, S.W., on Thursday, May 14th, at 7.30 p.m., when a paper on "Sand and Coarse Material and Proportioning Concrete" will be read by Mr. John A. Davenport, M.Sc.(VICT.), B.ENG.(LIVERPOOL), ASSOC.M. INST.C.E., A.M.I.MECH.E., M.C.I., and Prof. S. W. Perrott, M.A.I.(DUBL.), M.INST.C.E., Professor of Engineering at Liverpool University, M.C.I.

The fifth annual general meeting of the institute will take place on Thursday, May 28th, at 4.30 p.m., and the fourth annual dinner will take place on the evening of the same day at 8 p.m., at the Connaught Rooms, Great Queen-street, W.C., Prof. Henry Adams presiding.

H. KEMPTON DYSON,
Secretary.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

CLERK OF WORKS.—May 4th.—West Suffolk County Council. £2 15s. per week.—Mr. W. Lionel Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

INSPECTOR OF NUISANCES.—May 4th.—Rugeley Urban District Council. £90 per annum.—W. L. Orgill, clerk.

CLERK OF WORKS.—May 4th.—Featherstone Urban District Council. £3 3s. per week.—Mr. J. A. Haigh, clerk.

CLERK OF WORKS.—May 4th.—Ashington Urban District Council. £2 10s. per week.—Mr. F. Beaty, surveyor.

CEMENT TESTER.—May 4th.—Corporation of Dublin. £3 3s. per week.—Mr. Charles Power, secretary to the Waterworks Committee, City Hall, Dublin.

INSPECTOR OF NUISANCES.—May 4th.—Corporation of Birkenhead. 35s. per week.—Mr. J. Fearnley, town clerk.

ASSISTANT SURVEYOR.—May 6th.—Cavan County Council. £130—£150.—Mr. W. Finkay, secretary, Courthouse, Cavan.

GASWORKS ENGINEER AND MANAGER.—May 6th.—Leek Urban District Council. £20—£250 per annum.—Mr. H. Henshaw, clerk.

CLERK OF WORKS.—May 6th.—Lampeter Town Council.—Mr. J. Ernest Lloyd, town clerk.

CLERK OF WORKS.—May 6th.—Llantrisant Parish Council. £2 10s. per week.—Mr. W. Mordecai, parish officer.

BOROUGH ARCHITECT'S ASSISTANT.—May 6th.—Corporation of Swansea. £150 per annum.—Mr. H. L. Coath, town clerk.

SURVEYOR AND INSPECTOR.—May 7th.—Norton Urban District Council. £100 per annum.—Mr. W. Botterill, clerk, Norton, Malton, Yorks.

CLERK OF WORKS.—May 9th.—Horsforth Urban District Council.—Mr. J. Davidson, clerk.

CLERK OF WORKS.—May 9th.—Guildford Rural District Council. £3 10s. per week.—Mr. John Anstee, engineer, Commercial-road, Guildford.

SURVEYOR OF MAIN ROADS.—May 12th.—Monmouthshire County Council. £190—£230 per annum.—Mr. H. Stafford Gustard, clerk, Newport, Mon.

ARCHITECTURAL ASSISTANT.—May 13th.—Bolton Town Council. £120 per annum.—Mr. Samuel Parker, town clerk.

SEWAGE WORKS MANAGER.—May 13th.—Bilston Urban District Council. £2—£2 5s. per week, with house, rates, and water free.—Mr. Joseph L. Arldige, clerk.

SURVEYOR.—May 18th.—Kingswood (near Bristol) Urban District Council. £150—£180 per annum.—Mr. Percy Baldwin, clerk.

CITY SURVEYOR AND SANITARY ENGINEER.—May 18th.—Corporation of Lichfield. £200 per annum.—Mr. Herbert Russell, town clerk.

SURVEYOR'S GENERAL ASSISTANT.—May 18th.—Whitley and Monkseaton Urban District Council.

£101 per annum. Mr. Augustus Whitehorn, clerk, 60 Saville-street, North Shields.

SURVEYOR.—June 15th.—Board of Trustees for the Improvement of Calcutta. 600—800 rupees per month (rupee valued at 1s. 4d.). Chairman, Calcutta Improvement Trust.

ASSISTANT ENGINEER.—Public Works Department of the Gold Coast Government. £300—£350.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

ASSISTANT ENGINEERS.—Public Works Department of the Government of Nigeria. £300—£400.—Crown Agents for the Colonies, 4 Whitehall-gardens, London, S.W.

SURVEYOR'S GENERAL ASSISTANT.—Blackwell Rural District Council. £75—£90 per annum.—Mr. H. Silecock, surveyor, 67 Westgate, Mansfield, Notts.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

MANCHESTER.—May 23rd.—Plans, specifications, and estimates for semi-detached cottages, for the Manchester Sanitary Committee.—Sanitary Department, Civic Buildings, Mount-street.

HYTHE.—May 30th.—Designs for a concert hall and public shelter, for the Hythe Corporation. Premiums, 50, 25 and 10 guineas.—Mr. B. C. Drake, town clerk.

SUNDERLAND.—June 23rd.—Designs for a secondary school for 600 scholars, for the Corporation of Sunderland. Premiums, £100, £50, and £25.—Mr. J. W. Moneur, borough engineer and surveyor, Town Hall.

MIDDLETON.—July 16th.—Designs for a town hall, the cost of which must not exceed £18,000. Premiums £100, £50, and £25.—Town Clerk.

LONDON.—September 7th.—Designs for elementary schools, for the London County Council.—Education Officer, Education Offices, Victoria-embankment, W.C.

BELPER.—Designs and estimates for the erection of a bridge over the River Derwent, for the Belper Rural District Council.—Mr. Robert C. Cordon, surveyor, Duffield, near Derby.

CHESTER.—Designs for working-class dwellings, for the Corporation of Chester. Premiums, £50, £25, and £10. Mr. Patrick Abercrombie, M.A., Liverpool University School of Civic Design, has been appointed assessor.—Mr. J. H. Dickson, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

KIDSGROVE.—May 4th.—For the erection of a urinal, for the urban district council.—Mr. F. C. Crimes, engineer and surveyor.

HULL.—May 4th.—For the construction of chalk and earthwork embankments, for the Humber Conservancy Board.—Mr. A. W. Franklin, secretary, Hull.

CARLOW.—May 4th.—For the erection of fifty-three artisans' dwellings, for the urban district council.—Mr. Peter P. Carbery, surveyor.

COVENTRY.—May 4th.—For additions to certain premises, for the corporation.—Mr. J. E. Swindlehurst, city engineer and surveyor.

HUDDERSFIELD.—May 5th.—For the erection of thirty workmen's houses, for the corporation.—Mr. K. P. Campbell, borough engineer and surveyor.

BRADFORD.—May 5th.—For the erection of a cartshed, for the corporation.—City Architect.

FEATHERSTONE.—May 5th.—For the erection of 149 working-class dwellings and laying sewers, for the urban district council.—Mr. S. Chesney, engineer.

FOOTS CRAY.—May 5th.—For the erection of council offices, for the urban district council.—Mr. W. A. Farnham, surveyor.

PAIGNTON.—May 7th.—For laying cast-iron water mains, with connections, for the urban district council.—The Water Engineer, Town Hall.

HERTS.—May 7th.—For the erection of a school, for the county council.—County Surveyor, Hatfield.

PENYBONT.—May 8th.—For laying steel tubes and auxiliary works, constructing a service reservoir, and laying stoneware pipe collecting drains, for the rural district council.—Mr. E. W. Davies, engineer, Bryn-road, Tondy, Bridgend.

CORNWALL.—May 9th.—For the erection of new offices, boundary walls, and enlargements of playgrounds, for the Education Committee.—Mr. B. C. Andrew, architect, Biddick's-court, St. Austell.

GLASGOW.—May 9th.—For the building of tenement houses, for the corporation.—Mr. J. Lindsay, town clerk.

CARLISLE.—May 11th.—For alterations to buildings, for the corporation.—Mr. H. C. Marks, city engineer and surveyor.

SHREWSBURY.—May 11th.—For the erection of boundary walls and wrought-iron fences, for the corporation.—Mr. A. W. Ward, borough surveyor.

GUILDFORD.—May 11th.—For the erection of twenty cottages, for the corporation. Mr. C. G. Mason, borough engineer.

FARINGDON.—May 11th.—For works of water supply and sewerage, for the rural district council.—Mr. H. Glynn Warne, engineer, Faringdon, Berks.

ILKLEY.—May 11th.—For the erection of an electricity generating station, for the urban district council.—Mr. George Wilkinson, consulting engineer, Beech Mount, Harrogate.

MACCLESFIELD.—May 12th.—For the reconstruction of a bridge, for the corporation.—Borough Surveyor.

HANTS.—May 12th.—For the erection of a school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

BARNES.—May 12th.—For the erection of a mortuary, for the urban district council.—Mr. G. B. Tomes, surveyor, Council House, High-street, Mortlake.

WALLASEY.—May 13th.—For the erection of a central fire station, for the corporation.—Borough Engineer and Surveyor.

ABERDEEN.—May 13th.—For the construction of a reinforced concrete roof and contingent works at a reservoir, for the corporation.—Water Engineer, 41½ Union-street, Aberdeen.

ESSEX.—May 14th.—For additions to a school, for the Education Committee.—Mr. G. T. Forrest, architect, 73 Duke-street, Chelmsford.

LEEDS.—May 15th.—For the erection of a house and premises, for the Parks Committee.—Mr. G. F. Bowman, architect, 5 Greek-street, Leeds.

LEDBURY.—May 18th.—For the construction of a reinforced concrete open-air swimming bath, with dressing-boxes and corrugated iron fencing, for the urban district council.—Mr. R. G. Gurney, surveyor.

DURHAM.—May 19th.—For the erection of a school, for the county council.—Mr. A. J. Dawson, clerk to the Education Committee, Shire Hall, Durham.

OLDHAM.—May 20th.—For the supply and fixing of equipment for a public wash-house, for the corporation.—Borough Surveyor.

WEST RIDING.—May 22nd.—For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

DEVON.—May 25th.—For the erection of a police station, for the Standing Joint Committee.—Mr. E. H. Harbottle, County Chambers, Exeter.

BIRMINGHAM.—May 25th.—For constructional works at generating station, for the corporation.—Electric Supply Department, 14 Dale-end.

WEST HAM.—May 26th.—For painting, cleansing, and repairing public buildings in the borough, and certain other institutions, for the corporation.—Mr. J. G. Morley, borough engineer.

CLONMEL.—For the erection of a retort-house and store, for the Gas Committee.—Mr. H. O'Connor, engineer, 1 Drummond-place, Edinburch.

Iron and Steel.

ENFIELD.—May 6th.—For the supply of 350 lin. yds. (more or less) of wrought-iron unclimbable fencing, 5 ft. high, and one pair of gates, for the urban district council.—Mr. Richard Collins, surveyor.

MANCHESTER.—May 6th.—For the supply and fixing of wrought-iron balustrades to staircases, for the Education Committee, Education Offices, Deansgate.

MADRAS.—June 17th.—For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer, and Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

BRITON FERRY.—May 19th.—For the supply of 2,337 lin. yds. of cast-iron plates 7 in. in diameter, 1,317 lin. yds. 6 in. in diameter, and 15 lin. yds. 3 in. in diameter, for the urban district council.—Mr. Alex. Clarke, engineer and surveyor.

BRITON FERRY.—May 19th.—For laying, jointing and completing cast-iron pipes, for the urban district council.—Mr. H. Alex. Clarke, engineer and surveyor.

Roads.

LANCASTER.—May 2nd.—For highway improvement at Over Wyresdale, for the rural district council.—Mr. W. Dixon, surveyor.

ELY.—May 4th.—For the supply of broken Leicester granite, for the urban district council.—Mr. G. M. Hall, clerk.

WHITWORTH.—May 4th.—For paving sections of the main road, for the urban district council.—Mr. J. C. Owen, clerk, Council Offices, Facit, near Rochdale.

WIMBLEDON.—May 4th.—For work of surfacing with asphalt or other bituminous material, for the corporation.—Borough Surveyor.

MADRAS.—May 4th.—For the supply of 400 40-gallon casks of tar, for the corporation. A copy of specification and conditions may be obtained at the office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

CHINGFORD.—May 5th.—For making up certain portions of Hall-lane, for the urban district council.—The Surveyor.

LARNE.—May 5th.—For the construction of a new road and repairing bridges and fences, for the rural district council.—Mr. T. Nelson, clerk.

LONDON.—May 5th.—For repairs to carriageway in Blackwall and Rotherhithe tunnels, for the county council.—Mr. G. W. Humphreys, chief engineer, Spring-gardens, S.W.

BARNET.—May 5th.—For private street works in Byng-road and Wentworth-road, for the urban district council.—The Surveyor.

ALDERSHOT.—May 5th.—For the supply of 100 tons of 2½-in. basalt, 200 tons of slag tar-macadam, 130 tons of ¾-in. and 1½-in. limestone tar-paving, and 1,750 yds. of 2½-in. Hungry Hill flints, for the urban district council.—Mr. F. C. Uren, surveyor.

EALING.—May 5th.—For making up Curzon-road (portion), Hope-road, Gumbleigh-road, Ellis-road (portion), and Ealing Park-gardens (portion), for the corporation.—Mr. W. R. Hicks, borough engineer.

WREXHAM.—May 5th.—For making up certain streets, for the corporation.—Mr. J. England, borough engineer.

HOLYWELL.—May 6th.—For the supply of road materials, cartage, and tools, for the rural district council.—Mr. E. Foulkes, surveyor, Northop.

CLACTON.—May 6th.—For making up a road, for the urban district council.—Mr. D. J. Bowe, surveyor.

KINGSTON-UPON-THAMES.—May 6th.—For the supply of 2,000 tons of Guernsey, Quenast, or other granite, the whole to be broken so as to pass through rings having 1½ in. or 2 in. internal diameter, according to percentages specified, for the corporation.—Mr. R. Hampton Lucas, borough surveyor.

ENFIELD.—May 6th.—For the supply of 780 yds. of granite kerbing, 780 yds. of granite channelling, and 4,100 yds. of artificial stone paving, for the urban district council.—Mr. Richard Collins, surveyor.

HAMMERSMITH.—May 6th.—For paving the carriageways of portions of Latimer-road, Bridge-avenue, and North Pole-road with creosoted deal blocks, for the borough council.—Mr. H. Mair, borough surveyor.

ATCHAM.—May 7th.—For the purchase of a steam roller, sleeping-van, and accessories.—Mr. E. P. Everest, clerk.

BRECON.—May 7th.—For paving works in certain streets, for the corporation.—Borough Surveyor.

JARROW.—May 8th.—For cementing certain footpaths, for the corporation.—Mr. J. S. Weir, borough surveyor.

BENTHILL.—May 8th.—For the supply of best blue Leicester quartzite, Guernsey, Penlee, or other granite, and Sevenoaks macadam, for the corporation.—Borough Surveyor.

BRUMBY AND FRODINGHAM.—May 9th.—For the supply of 800 tons of whinstone, and 200 tons of tar-macadam for footpaths, for the urban district council.—Mr. Joe Green, surveyor, New Frodingham, Lines.

MILNROW.—May 9th.—For improvement works on the Rochdale and Shaw main road, for the urban district council.—Mr. Robert R. Jones, engineer and surveyor.

PENGE.—May 9th.—For laying creosoted deal wood blocks, for the urban district council.—Mr. H. W. Longdin, surveyor, Town Hall, Anerley, S.E.

STRETTFORD.—May 9th.—For making up certain streets, for the urban district council.—Mr. Ernest Worrall, surveyor.

SOUTHAMPTON.—May 11th.—For laying about 1,000 super. yds. of tar paving, for the corporation.—Borough Engineer.

HORNCASTLE.—May 11th.—For the supply of 340 tons of X granite, 220 tons of XX granite, 115 tons of X slag, and 50 tons of slag chips, for the urban district council.—Mr. P. Weeber, surveyor, Foundry-street, Horncastle.

MERFIELD.—May 11th.—For the supply and delivery of about 800 tons of 4-in. and 6-in. granite setts within the next four months, for the urban district council.—Mr. Edwin Gill, Council Offices.

HARPENDEN.—May 11th.—For making up part of Spencer-road, for the urban district council.—Mr. John H. Leverton, surveyor.

FAREHAM.—May 11th.—For the supply of granite, basalt, or other hard stone, for the rural district council.—Mr. J. P. Whitecar, surveyor, Southampton-road, Fareham, Hants.

COLCHESTER.—May 12th.—For the construction of tar-paved roads and surface-water drainage, and the supply of material for bottoming and surface metalting, for the Committee of Visitors of the Essex and Colchester Lunatic Asylum.—Mr. H. H. Gapp, clerk, 57 New-street, Chelmsford.

MOUNTAIN ASH.—May 12th.—For the execution of private street works, for the urban district council.—The Surveyor.

BRIGG.—May 12th.—For the supply of 400 tons of 2½-in. granite to be delivered during the year for the urban district council.—Mr. G. S. Sowter, clerk.

SOUTHALL-NORWOOD.—May 12th.—For works of road widening, for the urban district council.—Mr. R. Brown, engineer and surveyor.

COLCHESTER.—May 12th.—For making up tar-paved roads, paths, and surface-water drainage, for the Committee of Visitors of the Asylums.—Mr. H. H. Gepp, clerk, 57 New-street, Chelmsford.

ST. MELLONS.—May 12th.—For widening and improving part of Lighthouse-road, for the rural district council.—Mr. Gomer S. Morgan, engineer, Pontypridd.

WOOLWICH.—May 12th.—For resurfacing roads in Woolwich, Plumstead, and Eltham with asphalt, asphalt macadam, and wood and other material, for the borough council.—Mr. J. Rush Dixon, borough engineer.

LITTLEHAMPTON.—May 13th.—For scarifying and surfacing work, for the urban district council.—Mr. H. Howard, surveyor.

BARNET.—May 13th.—For the supply of any quantity up to 1,100 tons of 2½-in. broken granite of approved quality, for the urban district council.—The Surveyor, 49 High-street, Barnet.

HESTON AND ISLEWORTH.—May 14th.—For laying wood paving, for the urban district council.—Mr. J. G. Carey, engineer and surveyor.

REIGATE.—May 15th.—For the execution of private street works, for the rural district council.—Mr. Arthur J. Head, surveyor.

NORTH WALSHAM.—May 16th.—For the supply of granite, tar and road rolling, for the urban district council.—Mr. J. W. Stevens, surveyor.

BELCHAMP.—May 19th.—For the supply of broken slag, for the rural district council. Mr. S. Alpress, surveyor.

TANGIER.—June 8th.—For the construction of about 10 miles of road, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

Sanitary.

WESTPORT (co. Mayo). May 4th.—For the construction of an outfall sewer, for the urban district council.—Mr. P. H. McCarthy, 39 Westmorland-street, Dublin.

BISHOP AUCKLAND.—May 4th.—For the supply of disinfectants, for the rural district council.—Dr. Macdonald, medical officer of health.

GOOLE. May 4th.—For the construction of drainage works, for the Joint Hospital Board. Messrs. Chambers & Son, Belgravia, Goole.

STANLEY.—May 4th.—For scavenging work, for the urban district council.—Mr. J. Harris, sanitary inspector.

ALDERSHOT.—May 5th.—For laying a 9-in. stoneware sewer, with two manholes, for the urban district council.—Mr. Fred. C. Uren, surveyor.

SHREWSBURY.—May 5th.—For providing and laying 130 lin. yds. of 9-in. cast-iron pipes, with manholes, for the corporation.—Mr. A. W. Ward, borough surveyor.

ASPULL.—May 5th.—For the removal of nightsoil, for the urban district council.—Chairman of the Council, Whitehall, Aspall.

FEATHERSTONE.—May 5th.—For the construction of sewerage and other works.—Mr. S. Chesney, engineer.

HOOLE.—May 5th.—For the reconstruction of sewers, for the urban district council.—Mr. F. Davies, surveyor, 14 Newgate-street, Chester.

HOLMFIRTH.—May 6th.—For the construction of sewers and manholes, for the urban district council.—Messrs. J. Barrowclough & Son, engineers.

ROTHERHAM.—May 6th.—For the construction of circular outfall sewer, for the corporation. Borough Engineer.

SOUTHWELL.—May 7th.—For the construction of a sewer, septic tank, filter and fencing, for the rural district council.—Mr. G. Symon, sanitary surveyor.

SWANSEA.—May 7th.—For the construction of pipe sewer with junctions and manholes, for the corporation. Borough Engineer, Guildhall.

WEYMOUTH.—May 7th.—For drainage work, for the corporation.—Mr. K. I. S. Harris, borough surveyor.

CORK.—May 7th.—For the construction of sewer, for the rural district council. Mr. J. Cotter, clerk.

KENDAL.—May 8th.—For the supply of 100 ft. diameter sprinklers, floating arms, decanting and sludge valves, penstocks, sluices, cast-iron pipes, and specials, for the corporation.—Mr. F. W. Oxberry, borough surveyor.

CLEVEDON.—May 9th.—For the construction of a stoneware pipe sewer and manholes, for the urban district council.—Mr. G. W. Knowles, surveyor.

KIVETON PARK.—May 9th.—For laying stoneware pipe sewers, for the rural district council. Mr. F. Hewitt, engineer and surveyor.

WARMINGSTER.—May 11th.—For the construction of stoneware pipe sewers, for the urban district council.—The Surveyor.

WOOLWICH.—May 12th.—For the construction of main and subsidiary sewers, for the borough council.—Mr. J. Rush Dixon, borough engineer.

RICHMOND.—May 12th.—For the supply of Welsh steam coal, house coal, lime for precipitation, lime for sludge pressing, sulphate of ammonia, green copperas, and filter press cloth, for the Main Sewerage Board.—Mr. William Fairley, engineer, West Hall-road, Kew Gardens.

KINGSTON-UPON-THAMES.—May 13th.—For the supply of 300 tons of bauxite for the sewage works, for the corporation.—Mr. R. Hampton Clucas, borough surveyor.

RHYMNEY.—May 18th.—For the construction of outfall sewer, storage tank, discharge pipe, and storm overflow pipe, for the Sewerage Board.—Mr. J. S. Alford, 9 Victoria-street, Westminster, S.W.; Messrs. Wilcox & Raikes, 63 Temple-row, Birmingham; and Mr. T. J. Thomas, 36 High-street, Bargoed.

LEEK.—May 25th.—For laying and jointing about 2,840 yds. of 9-in. and 6-in. stoneware pipe sewers, and constructing manholes, flushing chambers, engine house, pump well, liquefying tanks, bacteria beds, sludge beds, approach road, and other works, for the rural district council.—Messrs. Wilcox & Raikes, 63 Temple-row, Birmingham.

WAKEFIELD.—May 25th.—For the construction of a main outfall sewer, comprising 4,000 yds., or thereabouts, of pipe sewers, pumping station, and subsidiary branch sewers, comprising 5,800 yds., or thereabouts, of pipe sewers, for the corporation.—Mr. A. C. Allibone, town clerk.

WARBLINGTON.—May 25th.—For laying laterals or branch drains from the public sewers, and the connection of existing drains, with all necessary inspection chambers and other works, for the urban district council.—Mr. Arthur J. Martin, engineer, 7 Victoria-street, Westminster, S.W.

CHEPPING WYCOMBE.—May 28th.—For the supply and erection of steam engines, air compressors, air lifts, ejectors, and all necessary appurtenances in the extension of the sewage outfall works at Wycombe Marsh, for the corporation.—Mr. T. J. Rushbrooke, borough engineer and surveyor.

DEWSBURY.—May 30th.—For the construction of sewage disposal works, for the corporation.—Mr. Henry Dearden, borough engineer.

Stores.

MID-LOTHIAN.—May 9th.—For the supply of tools, ironmongery, brushes, oils, paints, rubber goods, explosives, bricks, pipes, cement and fencing, for the county council.—Road Office, County Buildings, Edinburgh.

Miscellaneous.

EDMONTON.—May 4th.—For the supply and erection of 780-ft. run of best English oak fencing, for the urban district council.—Mr. Cuthbert Brown, engineer.

DUNDALK.—May 12th.—For the supply of electricity plant, for the urban district council.—Mr. P. A. Spalding, engineer and manager, Electricity Works.

MADRAS.—June 1st.—For the supply of two petrol-driven motor fire engines, for the corporation.—Mr. James R. Coak, engineer.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.

‡ Provisionally accepted.

DOVER. For work of making up, for the corporation. Mr. W. C. Hawke, borough engineer:—

G. Munro, Dover	£2,746
Ansten & Lewis, Dover	2,700
Morton Pickett, Guston, near Dover	2,668
Paramors, Limited, Margate	2,654
Road Maintenance and Stone Supply Company, Limited, Gravesend	2,479

DUBLIN. For the extension of the technical schools, for the Technical Education Committee. Mr. C. J. McCarthy, city architect:—

Farmer Brothers, Dublin	£6,172
A. Hull & Co., Dublin	5,895
J. Pemberton & Co., Dublin	5,869
A. Fraser & Co., Dublin †	5,794

GUILDFORD. The following tenders have been accepted by the town council:—

Guernsey Granite, Rowe & Mitchell, London.
Granite Chippings.—Mountsorrel Granite Company.
Granite Sets and Cubes.—A. & F. Manuelle, London.
Cast-iron Pipes.—Stanton Ironworks Company, Limited, Nottingham.
Flints, Gravel and Chippings.—Farham Flint, Gravel and Sand Company, Limited.
Horse Hire and Cartage.—B. Heath, Guildford.
Creosote and Pitch.—Grindley & Co., Limited, Poplar.
Dehydrated Tar.—Guildford Gas Company.
Tar.—Farmac, Limited, Wolverhampton.
Cement and Lime.—West Brothers, Battersea.
Brooms and Brushes.—Pryke & Palmer, London.
Galvanised Steam Tubes.—S. Pontifex & Co., London.
Disinfectants.—H. E. Hope & Co., and Adcocks, Limited.
Iron Castings.—Dickinson & Burne, Guildford.
Stoneware Pipes.—Hooper & Ashby, Limited.

HAM.—The following tenders have been accepted by the urban district council:—

Cartage and Labour.—West; horse and man, 7s. 10d. per day, and unloading, 1s. 8d. per yard.
 Steam Roller.—S. Kavanagh, £1 10s. per day.
 Fodder.—J. & T. Trower, Limited, £1 7s. 6d.
 Plints.—J. Horsford & Co., 5s. 3d. per cube yard.
 Disinfectant Powder.—Newton, Chambers & Co., £5 5s. per ton.
 Sundry Tools.—F. Bird & Co.

No tender was received for the supply of old granite, oil, or precipitate for sewage tank, and the council decided that the old granite should stand over, and that the surveyor (Mr. R. W. Hirdhaugh) be directed to obtain sulphate of alumina as before from the company.

HUNTS.—For the enlargement of a school, for the Education Committee.—Mr. Herbert Leete, county architect:—

Pamphilon & Sayer, Peterborough ..	£966
D. Gray & Sons, Peterborough ..	950
Allen & Sons, Brampton, Hunts * ..	895

NORTHANTS.—For building a public school, for the Education Committee.—Blackwell & Ridley, High-street, Kettering:—

Franklin, Limited, Deddington, Oxon	£1,020
O. P. Drever & Son, Limited, Kettering	888
T. Kench, Eydon, near Byfield ..	849
W. W. Webster, Guilsborough ..	820
Smith & Bunning, Kettering ..	808
Beardmore & West, Northampton	790
T. Hickman & Sons, Market Harborough	732
D. Ratledge, Bugbrooke, near Weedon	730
T. Adams & Son, Daventry ..	720
Holland & Marks, Daventry * ..	705

OUNDLLE.—For supplying and laying earthenware pipes and construction of manholes, for the rural district council.—Mr. S. Broadbolt, inspector, Oundle:—

F. Francis, Peterborough ..	£269
W. M. Freman, Oundle ..	179
O. P. Drever & Son, Limited, Kettering *	163

Surveyor's estimate, £151.

TIPPERARY.—For the erection of twenty-four two-story stone houses, for the urban district council. Mr. W. J. Heffernan, architect, Tipperary:—

W. Jennings, Kenmare	£4,971
Maher & Hayes, Cork ..	£4,920
J. Kenny & Sons, Limerick	4,470
J. Cavanagh, Tipperary	4,080
T. Divan, Templemore ..	4,056
M. Barry, Tipperary *	3,957

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MAY.

- 1.—Concrete Institute: Informal Meeting of Junior Members. 7 p.m.
- 1.—Junior Institution of Engineers: Mr. S. T. Robson on "The Control and Organisation of the Engineering Profession." 39 Victoria-street, S.W. 8 p.m.
- 9.—Institution of Municipal and County Engineers: Meeting at Dover.
- 11.—Institution of Municipal Engineers (with Society of Engineers): Mr. W. T. Taylor on "The Greater New York Water Supply Scheme." Institution of Electrical Engineers. 7.30 p.m.
- 11.—Institute of Sanitary Engineers: Mr. Guy B. Grave on "A London Builder's Experiences with Sanitary Officials in the Metropolis." 8 p.m.
- 13.—Royal Sanitary Institute: Annual Dinner, Langham Hotel.
- 14.—Concrete Institute: Mr. J. A. Devonport and Prof. S. W. Perrott on "Sand and Coarse Material, and Proportioning Concrete." 7.30 p.m.
- 20.—Institute of Sanitary Engineers: Visit to Metropolitan Water Board's Reservoirs at Chingford.
- 23.—Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham; Mr. A. S. Parson on "Bridge Construction."
- 24.—Institution of Civil Engineers (Students' Meeting): Mr. A. A. Hudson, k.c., on "Engineering Contracts." 8 p.m.
- 27.—Institute of Sanitary Engineers: Visit to Eton Rural District Council's sewage outfall works at Gerrard's Cross. Train from Marylebone, 2 p.m.
- 28.—Concrete Institute: Annual General Meeting, 4.30 p.m.; Annual Dinner, Connaught Rooms, 8 p.m.

JUNE.

- 5-6.—Institution of Municipal and County Engineers: Meeting in Dunfermline.
- 6.—Institution of Municipal and County Engineers: Meeting at Southend.
- 11-13.—Institution of Water Engineers: Summer Meeting at Stockport.
- 13.—Institution of Municipal Engineers: Western District Meeting at Tisbury. Mr. E. Plummer Davies on "Wiltshire Roads, Past and Present."
- 17.—Royal Institute of British Architects: Annual Dinner, Hotel Cecil.
- 24.—Institute of Sanitary Engineers: Visit to Luton sewage farm. Train from St. Pancras, 2.50 p.m.
- 24-27.—Institution of Municipal and County Engineers: Annual Meeting and Town Planning, Housing and Road Conference at Cheltenham.

JULY.

- 4-11.—Royal Sanitary Institute: Annual Congress and Exhibition at Blackpool.
- 6-10.—Institution of Mechanical Engineers: Summer Meeting in Paris.

APPOINTMENTS OPEN.

CITY OF LICHFIELD.

APPOINTMENT OF CITY SURVEYOR AND SANITARY ENGINEER.

The Corporation of Lichfield invite applications for the above offices. Salary £200 per annum, with use and occupation of the house and garden in the Corporation-yard, Stowe-street, rent free. The candidate to be appointed must be an active man, and be between 25 and 40 years of age, have had some years' experience of similar duties, and will be required not to undertake, or be directly or indirectly concerned in any other business than that of the Council, and he will be required to devote the whole of his time to the duties of the Offices.

Form of Application will be forwarded by the undersigned upon receipt of stamped addressed foolscap envelope, which must be filled up in the Candidate's own handwriting, and returned with not more than three recent testimonials not later than Monday, the 13th May, 1914, endorsed "City Surveyor."

Selected Candidates will have notice to attend on the day of election.

Canvassing in any form will be a disqualification.

HERBERT RUSSELL,

Town Clerk.

Lichfield.

April 28, 1914.

(1,565)

COUNTY BOROUGH OF BOLTON.

ARCHITECTURAL ASSISTANT.

The Corporation invite applications for the appointment of an Architectural Assistant in the Borough Engineer and Surveyor's Department.

Canvassing, directly or indirectly, will be deemed a disqualification.

Salary commencing at £120 per annum.

Application, in candidate's own writing, stating age, experience, qualification, and accompanied by copies of three recent testimonials, must be delivered at the Town Clerk's Office, Town Hall, Bolton, not later than 9 a.m. on the 13th May, 1914, addressed to "The Chairman of the Streets Committee," and endorsed, "Architectural Assistant."

SAMUEL PARKER,

Town Clerk.

April 24, 1914.

(1,554)

THE URBAN DISTRICT COUNCIL OF KINGSWOOD (Near Bristol).

APPOINTMENT OF SURVEYOR.

The above-named Council invites applications for the appointment of Surveyor.

Salary £150 per annum, with annual increments of £5 up to £180.

The person appointed will be required to carry out the duties attached to the office of Surveyor, including the preparation of Plans and Specifications, the keeping of all necessary Books and Accounts, the Supervision of the Sewerage Outfall Works, and to devote the whole of his time to the duties of the office, and provide security in the sum of £200.

Applications, endorsed "Surveyor," stating age, qualifications, and experience, with two recent testimonials, to be sent to me by the 18th May next. Canvassing, either directly or indirectly, will disqualify.

PERCY BALDWIN,

Clerk.

Council Offices,
Kingswood, Near Bristol.

April 25, 1914.

(1,555)

URBAN DISTRICT OF BILSTON.

SEWAGE WORKS MANAGER.

The Council invite applications for the appointment of Sewage Works Manager.

Wages £2 per week, rising by 2s. 6d. per week per annum, to a maximum of £2 5s., with house, rates, and water free.

Applicants must have held a similar appointment, and be capable of making the usual analyses.

Particulars of duties and conditions of appointment will be forwarded on application.

Applications, accompanied by copies of not more than three recent testimonials, should be delivered to the undersigned not later than the 13th May, 1914.

Canvassing, directly or indirectly, will be a disqualification.

JOSEPH L. ARLIDGE,

Clerk to the Council.

Town Hall, Bilston.

April 28, 1914.

(1,570)

THE BLACKWELL RURAL DISTRICT COUNCIL.**SURVEYOR'S GENERAL ASSISTANT.**

The undersigned is prepared to receive applications from persons who must have had previous experience in the routine duties pertaining to the office, be a neat Draughtsman, and have a knowledge of Surveying.

Candidates should not be less than 21 years of age, and must be prepared to reside in Mansfield.

Salary £75 per annum (payable fortnightly), rising by annual increments of £5, to £90.

Applications, on the Form to be supplied by me upon receipt of a stamped and addressed foolscap envelope, accompanied by three copies of recent and brief testimonials.

Canvassing in any form will be a disqualification.

H. SILCOCK,
Surveyor of the Council.

67 Westgate,
Mansfield, Notts.

April 27, 1914. (1,561)

WHITLEY AND MONKSEATON URBAN DISTRICT COUNCIL.

The Council invite applications for the appointment of General Assistant in the Surveyor's Office. Salary £101 per annum.

Candidates must be good Draughtsmen and experienced in the general work of a Municipal or District Council Surveyor's Office, including the Design of Sewers, Public and Private Street Improvement Works, &c.

Applications, endorsed "General Assistant," stating age, present appointment, qualifications, and experience, together with copies of two recent testimonials, to be sent to me on or before Monday, 18th day of May, 1914.

Canvassing members of the Council, directly or indirectly, will disqualify.

Dated this 27th day of April, 1914.

AUGUSTUS WHITEHORN,
Clerk to the Council.

60 Saville-street,
North Shields. (1,560)

RUGELEY URBAN DISTRICT COUNCIL.
APPOINTMENT OF INSPECTOR OF NUISANCES.

The above Council invite applications for the appointment of an Inspector of Nuisances, who will also act as Officer for the purposes of the Housing (Inspector of District) Regulations, 1910, and as Inspector for certain purposes under the Factory and Workshops Acts, at an inclusive salary of £90 per annum.

Candidates must possess the Certificate of Inspector of Nuisances of the Royal Sanitary Institute, or its equivalent.

Applications, stating age, experience and qualifications, and endorsed "Inspector of Nuisances," to be delivered to the undersigned, with copies of not more than three recent testimonials, not later than Monday, the 4th May, 1914.

Canvassing, directly or indirectly, will be deemed a disqualification.

(By order)

W. L. ORGILL,
Clerk to the Council.

Rugeley.
April 22, 1914. (1,546)

MONMOUTHSHIRE COUNTY COUNCIL.**APPOINTMENT OF A SURVEYOR FOR ONE OF FOUR DISTRICTS OF MAIN ROADS.**

The Main Roads and Bridges Committee are prepared to receive Applications for the Appointment of a District Surveyor of the County, to act under the direction of the County Surveyor. The Salary to be £190, with an annual increase of £10, to a maximum of £230, to include all expenses except stationery and postages.

He will be required to devote the whole of his time to the duties, must ride a bicycle, and provide and keep a machine at his own expense.

Canvassing, either directly or indirectly, will disqualify.

Candidates must be between the ages of 26 and 40, and are to send not more than three testimonials to the undersigned on or before Tuesday, May 12, 1914.

Information as to duties and terms of appointment may be obtained from the County Surveyor, at the offices of the Council.

H. STAFFORD GUSTARD,
Clerk to the Council.

Newport, Mon.
April 21, 1914.

(1,559)

TENDERS WANTED.**FAREHAM RURAL DISTRICT COUNCIL.**
TENDERS FOR MACADAM.

Tenders are invited by the above Council for the Supply of Granite, Basalt, or other Hard Stone, required for the year ending March 31st, 1915.

Form of Tender may be obtained on application from the undersigned.

Tenders, sealed and endorsed "Tenders for Macadam," together with Samples of Stone, to be delivered to me on or before 11th May, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

J. F. WHITEAR,
Surveyor.

Southampton-road,
Fareham, Hants. (1,567)

BARNET URBAN DISTRICT COUNCIL.
GRANITE, GRAVEL, &c.

Tenders are invited for the supply of any quantity up to 1,100 tons of 2½-in. Broken Granite of approved quality, delivered in trucks, carriage paid, at High Barnet Station, G.N.R., at the rate of about 150 tons per week.

Also for any quantity up to 150 tons of 2½-in. Gravel, and 150 tons of Hoggin, in trucks, carriage paid, at High Barnet Station, G.N.R., as may be ordered.

Official Tender Forms and further particulars can be obtained at the office of the Surveyor to the Council, 40 High-street, Barnet.

Tenders, duly sealed and endorsed "Granite," &c., are to be addressed to me, and delivered at the Council's Offices, No. 40 High-street, Barnet, on or before Wednesday, the 13th day of May, 1914, and must be accompanied by an average sample of the material.

The Council do not bind themselves to accept the lowest or any Tender.

H. W. POOLE,
Clerk of the Council.

Barnet.
April, 1914. (1,574)

BARNET URBAN DISTRICT COUNCIL.**TO CONTRACTORS.****PRIVATE STREET WORKS ACT, 1892.**

The Council invite Tenders for the Making up, under the above Act, of the Private Streets within their District known as Byng-road and Wentworth-road.

Plans and Specification can be seen, and all information, with Form of Tender, obtained, on application to the Surveyor to the Council, at his office, No. 40 High-street, Barnet, on any day during office hours.

Tenders, on official forms only, sealed and endorsed "Tender for Roads," must be addressed to me, and delivered at the Council Offices, No. 40 High-street, Barnet, not later than noon on Tuesday, May 5, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

H. W. POOLE,
Clerk of the Council.

April 14, 1914. (1,573)

BRIGG URBAN DISTRICT COUNCIL.
TENDERS FOR GRANITE.

The Brigg Urban District Council invite Tenders for the supply of 400 tons of 2½-in. Broken Granite, to be delivered during the year.

All Tenders (which must be on the official form) and samples must reach my office before 12 noon on May 12th.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

G. S. SOWTER,
Clerk to the Council.

1 Bigby-street, Brigg.
April 27, 1914. (1,575)

LEEK RURAL DISTRICT COUNCIL.

ENDON SEWERAGE.

CONTRACT No. 1.

The Leek Rural District Council invite Tenders for the Provision, Laying, and Jointing of about 5,740 yds. of 9-in. and 6-in. Stoneware Pipe Sewers; also the Construction of Manholes and Flushing Chambers, Engine House and Pump Well, Liquefying Tanks, Bacteria Beds, Sludge Beds, Approach Road, and other incidental Works in accordance with the Drawings and Specification prepared by the Engineers.

Drawings and Specification may be seen, and Bills of Quantities and Form of Tender obtained, at the Offices of the Engineers, Messrs. Willcox & Raikes, 63 Temple-row, Birmingham, on or after the 6th day of May, 1914, on payment of a deposit of Three Guineas, which will be refunded on receipt of a *bona-fide* Tender and the return of all documents to the Engineers.

Sealed Tenders, in envelope supplied, endorsed "Endon Sewerage and Sewage Disposal Works—Contract No. 1," to be delivered at my Office not later than 12 noon on the 25th day of May, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

(By order)

J. MORRISSHAW,

Clerk to the Leek Rural District Council.

Leek.

April 28, 1914.

(1,568)

B RITON FERRY URBAN DISTRICT COUNCIL.

WATER SUPPLY.

CONTRACT No. 1.

The above Council are prepared to receive Tenders for the Laying, Jointing, and Completing of about 2,337 yds. of 7-in. Cast-iron Pipes, 1,317 yds. of 6-in. 15 yds. of 3-in., and the Fixing of Valves, &c.

Drawings may be seen, and Specifications, Bills of Quantities, and Form of Tender obtained, from the undersigned on and after the 5th day of May, 1914, upon payment of the sum of One Guinea, which will be returned upon receipt of a *bona-fide* Tender on the Form provided for the purpose.

I shall be prepared to go over the ground with the intended Contractors if they will meet at my Office on the 11th day of May, 1914, at 11 a.m.

Sealed Tenders, endorsed "Tender for Pipe Laying," to be addressed to James Revell, Esq., Solicitor and Clerk to the Briton Ferry Urban District Council, and delivered at the Council Office, Briton Ferry, Glamorganshire, on or before the 19th day of May, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

H. ALEX. CLARKE,

Engineer and Surveyor.

Council Offices,

Briton Ferry.

April 28, 1914.

(1,571)

B RITON FERRY URBAN DISTRICT COUNCIL.

WATER SUPPLY.

CONTRACT No. 2.

The above Council are prepared to receive Tenders for the Supply of 2,337 lin. yds. of Cast-iron Pipes, 7 in. in diameter, 1,317 lin. yds., 6 in. in diameter, 15 lin. yds., 3 in. in diameter.

Specification, Bills of Quantities, and Form of Tender can be obtained from the undersigned on and after the 5th day of May, 1914.

Sealed Tenders, endorsed "Tender for Pipes," to be addressed to James Revell, Esq., Solicitor and Clerk to the Briton Ferry Urban District Council, and delivered at the Council Office, Briton Ferry, Glamorganshire, on or before the 19th day of May, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

H. ALEX. CLARKE,

Engineer and Surveyor.

Council Offices,

Briton Ferry.

April 28, 1914.

(1,572)

BOROUGH OF EALING.

PRIVATE STREET IMPROVEMENTS.

The Town Council of this Borough hereby invites Tenders for the Making Up of the following:—

- Curzon-road (portion),
- Hope-road,
- Gumleigh-road,
- Elers-road (portion),
- Ealing Park-gardens (portion).

The Drawings and Specifications may be seen, and Forms of Tender, together with Schedule of Quantities and other particulars, obtained from Mr. W. R. Hicks, Assoc. M.INST.C.E., Borough Engineer, Town Hall, Ealing, W., any day during office hours, upon payment of a deposit of 10s. 6d. for each road, which will be returned upon receipt of a *bona-fide* Tender.

Sealed Tenders, in the envelopes provided, endorsed "Tender for Making Up," must be delivered at my office not later than 9.30 a.m. on Tuesday, the 5th day of May, 1914.

The Council does not bind itself to accept the lowest or any Tender.

The Tenderer whose offer is accepted shall be held to have bound himself to an agreement, and may be compelled to carry out the obligation arising from his Tender even though he may not have signed a formal contract.

Dated this 20th day of April, 1914.

(By order of the Council)

GEO. E. BRYDGES,

Town Clerk.

Town Clerk's Office,

Town Hall, Ealing, W.

(1,536)

MIRFIELD URBAN DISTRICT COUNCIL.

Tenders are invited for the Supply and Delivery at Mirfield Station of about 800 tons of 4 in. by 6 in. Granite Setts within the next four months.

Sample setts and prices should be forwarded to the undersigned not later than May 11, 1914.

EDWIN GILL.

Council Offices,

Mirfield.

(1,563)

NOTICE.

CORPORATION OF MADRAS, WORKS DEPARTMENT.

MOTOR FIRE ENGINE.

The President, Corporation of Madras, will receive Tenders for the Supply and Delivery of Two Petrol-driven Motor Fire Engines. Specification containing further particulars can be obtained from the Editor of this Journal. Tenders shall be enclosed in sealed covers, superscribed "Tenders for Motor Fire Engines," and shall be addressed to "The President, Corporation of Madras, Ripon Buildings, Madras."

Each Tender shall be accompanied by a draft on a Madras Bank for £20.

Tenders will be opened by the President at 12 noon on Monday, 1st June, 1914, in the presence of such Tenderers as may attend. No Tender received after 12 noon on Monday, 1st June, 1914, will be considered.

JAMES R. COATS, B.S.C., ASSOC. M.INST.C.E.,

Engineer.

Corporation of Madras,

Madras.

April 9, 1914.

(1,550)

BRUMBY AND FRODINGHAM URBAN DISTRICT COUNCIL.

The above Council invite Tenders for Supplying about 800 tons of Whinstone, also about 200 tons of Tar-macadam for Footpaths, more or less, up to March 31st, 1915, to be supplied at such times and in such quantities as ordered by the Surveyor, and delivered at Frodingham and Guinness Stations (G.C.R.).

The Council do not bind themselves to take the above quantity, but more or less as required.

The lowest or any Tender not necessarily accepted.

Specifications and Form of Tender may be had from the undersigned, to whom Tenders, sealed and endorsed "Tender for Whinstone," must be sent not later than Saturday, the 9th day of May, 1914.

JOE GREEN,

Surveyor.

Council Offices,

New Frodingham,

Lincolnshire.

April 28, 1914.

(1,560)

CITY OF WAKEFIELD.

TO PUBLIC WORKS CONTRACTORS.

MAIN AND SUBSIDIARY DRAINAGE WORKS.

Contractors desirous of tendering for the works comprised in:—

CONTRACT No. 1.—The construction of a Main Out-fall Sewer in the Pugneys Valley from Portobello Mills to Newmillerdam, comprising 4,000 yds. or thereabouts of pipe sewers varying in diameter from 24 in. to 12 in., and the necessary pumping station, and/or for

CONTRACT No. 2.—The construction of subsidiary branch sewers in the Western area of Sandal, comprising 5,800 yds. or thereabouts of pipe sewers varying in diameter from 21 in. to 6 in.,

are requested to send their names to the undersigned not later than Friday, the 8th May, after which date the Bills of Quantities and Forms of Tender will be forwarded to them. Applications must be accompanied by a £5 Bank of England Note for each Contract, which will be refunded upon receipt of a *bonâ-fide* Tender or Tenders and the return of the documents supplied. Applicants must state their experience in carrying out work of a similar nature.

Tenders, sealed and endorsed, "Tender for Main Drainage, Contract No. 1 or No. 2," must be delivered

to me not later than 12 o'clock noon on Monday, the 25th May, 1914.

A. C. ALLIBONE,

Town Clerk.

Town Hall, Wakefield.

April 24, 1914.

(1,552)

COUNTY BOROUGH OF SOUTHAMPTON.
TO CONTRACTORS AND OTHERS.

The Corporation invite Tenders for Laying about 4,000 super. yards of Tar-paving.

Plan may be seen, and Specification and Form of Tender obtained, at the Borough Engineer's Office upon production of the Borough Treasurer's receipt for a deposit of £1 1s.

Deposits will be returned, after the Council have dealt with the Tenders, to Contractors who have submitted *bonâ-fide* Tenders.

Sealed Tenders, endorsed "Tender for Tar-paving," must be delivered at the Town Clerk's Office on or before the 11th proximo.

No pledge is given to accept the lowest or any Tender.

R. R. LINTHORNE,

Town Clerk.

Town Clerk's Office,

Municipal Offices, Southampton.

April 17, 1914.

(1,551)

SIMPLEX STEEL SHEET PILING

In two weights—i.e.,
22 & 27 lbs. per super.
foot when interlocked.

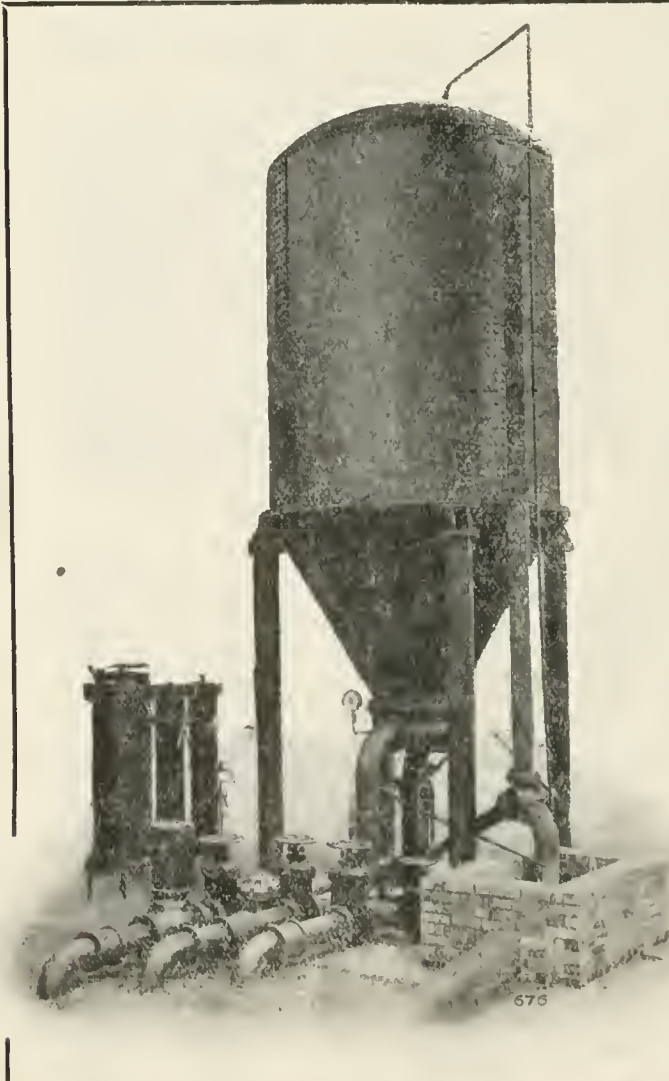
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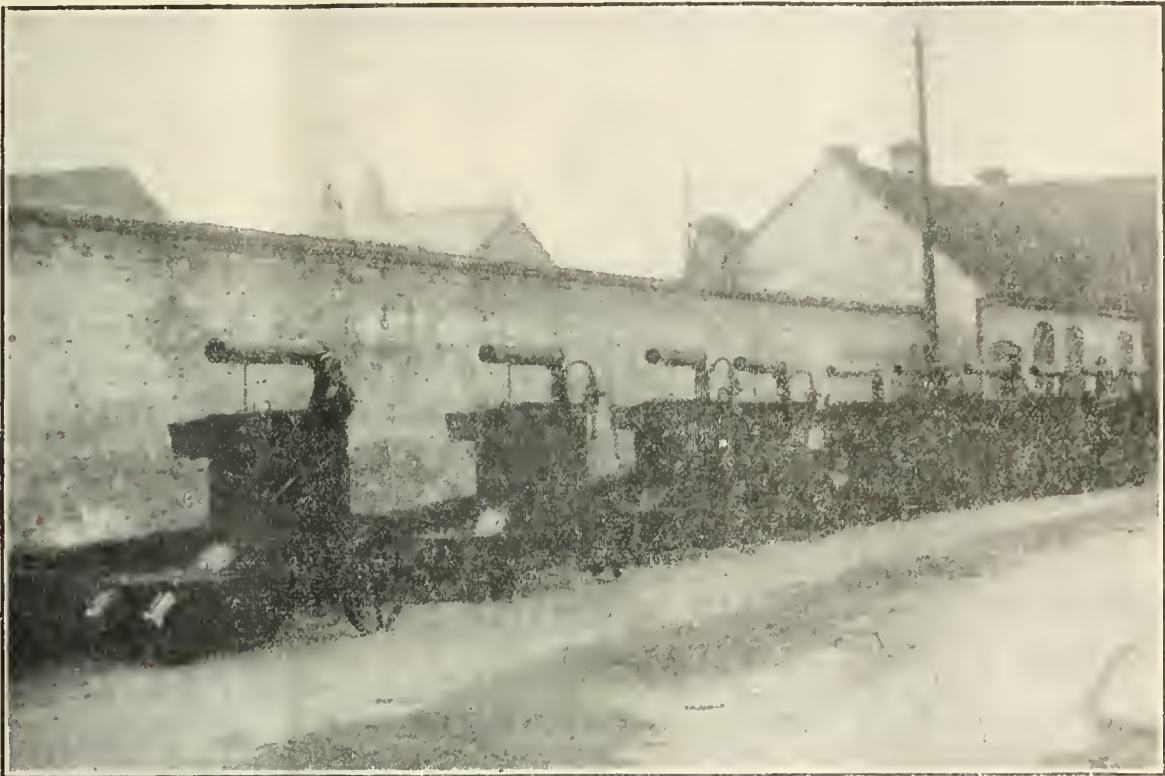
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Tar Boilers, Single & Double Furnace. Waithman Apparatus. Smart's Patching Boiler.



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"CLARMAC" FOR ROADS.

Made of well-matured, hard, Cold Blast Furnace Slag.

No. I.—Tarred strictly to Road Board Specification.

No. II.—Coated with Asphaltic Mixture of special strength.

Claridge's Patent Asphalte Co., Ltd.,

21 Surrey Street, Victoria Embankment, W.C.

Established 1838.

**COUNTY BOROUGH OF WEST HAM.
TO PAINTING AND BUILDING
CONTRACTORS.**

The Council hereby invite Tenders for Painting, Cleansing, Repairs, &c., of Public Buildings within the Borough; also at Goodmayes Asylum, Dagenham Hospital, and the Convalescent Home, Harold Wood.

Specification, Form of Tender, and further particulars may be obtained at the Office of Mr. John G. Morley, Borough Engineer, Town Hall, West Ham, E., upon payment of One Pound, which will be returned upon receipt of a *bona-fide* Tender.

NOTE.—No Tender will be considered unless the same is delivered at the Office of the Town Clerk, Town Hall, West Ham, E., in the envelopes supplied, by registered post, not later than 1 o'clock p.m., on Tuesday, 26th May, 1914.

The Council do not bind themselves to accept the lowest or any Tender. The Contractor will be required to enter into a bond, with one surety, for the due

performance of the Contract, and no work will be ordered under the Contract until such bond has been duly executed.

The Contractor whose Tender is accepted, and with whom a Contract is entered into, will be required to pay the whole of his workmen such rate of wages, and observe such hours of labour, as are recognised by the Workmen's Trade Unions, and shall not assign, nor under-let, or make a sub-contract with any person or persons for the execution of any part of such work. In the event of any breach of such agreement the Council will enforce the penalty clause in its entirety.

(By order of the Council)

H. W. GREAVES,
Town Clerk.

Town Hall,
West Ham, E.
May 1, 1914.

(1,566)

NOTICE TO SURVEYORS

THE EAGLE ENGINEERING CO., Ltd.

of the **EAGLE WORKS, WARWICK,**

are the Proprietors and the **SOLE MAKERS** of the

"WARWICK" PATENT SPRINKLER

**WITH PATENT GRIT CHAMBER,
AS MADE SINCE 1907,**

and all "Warwick" Patent Sprinklers made since that date have been made under these patents.

BEWARE OF IMITATIONS,

which are becoming numerous, but cannot be compared with the original for efficiency.

We are also the **SOLE MAKERS** of

CAINK'S PATENT DISTRIBUTORS,

Invented by **THOMAS CAINK, Esq.,** City Engineer, Worcester.

PHONE:— 13 THORNBURY

TYTHERINGTON

For other materials and address,
see page vii.

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ANY SIZE ANY COLOUR

STONE

ANY DESCRIPTION

WIRES:— ROCK TYTHERINGTON

A road-bed laid with 6-in. of concrete and reinforced with B.R.C. Mesh is stronger than a 12-in. road-bed without reinforcement.

B.R.C. Road-bed Reinforcement consists of a high-grade steel wire mesh, the transverse wires of which are securely welded to the horizontal wires by a patent electrical process.

The material is made in rolls 6 ft. wide and to any length required. It is easy to unroll or otherwise handle, and requires no expert labour to instal. The effect of B.R.C. Reinforcement in a Road-bed is to spread loads over a wide area thus relieving and reducing the strain immediately below the point of impact.

A road reinforced with B.R.C. Mesh lasts longer, costs less to maintain, takes less time to construct, and needs much less supervision during construction.

Full particulars from—

THE BRITISH REINFORCED CONCRETE ENGINEERING CO., Ltd.
82 Victoria Street, Westminster, London, S.W.
C.W.H.

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

MAY 8, 1914.

No. 1,164.

Minutes of Proceedings.

River Pollution by Trade Effluents.

The decision of the King's Bench Division in the case of *West Riding Rivers Board v. Linthwaite Urban District Council* (noted at page 686 *ante*) is one of considerable importance to local authorities. Briefly, it amounts to this, that proceedings under sec. 4 of the Rivers Pollution Prevention Act, 1876, for the pollution of a river by trade effluents can only be taken against the manufacturer producing the effluents, and not against the local authority through whose sewers they are discharged. So far as sewage pollution is concerned, it was decided in 1882 that proceedings under sec. 3 of the Act could not be taken against a local authority merely because a sewer vested in them polluted a stream, they themselves not having constructed or interfered with the sewer. (*Attorney-General v. Guardians of Dorking Union*, 20 Ch.D., 595.) But in this respect the law was altered by the passing of the Rivers Pollution Prevention Act, 1893. Sec. 1 of that Act, it will be remembered, expressly provides that where sewage flows into a stream, after passing through a channel vested in a sanitary authority, the latter shall, for the purposes of sec. 3 of the Act of 1876 be deemed knowingly to permit the sewage so to flow. But trade effluents are not within sec. 3, being dealt with by sec. 4. Clearly, therefore, the latter Act (the effect of which is restricted to sec. 3) has no application to trade effluents. This restriction, of course, does not conclusively negative the liability of the authority for trade effluents, because it leaves open the question whether such liability exists under the earlier Act. The contention of the Rivers Board in this case was that, upon the true interpretation of sec. 4, the council were liable for the trade effluents passing through their sewers. In support of this view it was argued that the opening clauses of the two sections 3 and 4 are almost identical, sec. 3 dealing with "every person who causes to fall or flow or knowingly permits to fall or flow, or to be carried into any stream any solid or liquid sewage matter," while sec. 4 is concerned with "every person who causes to fall or flow or knowingly permits to fall or flow or to be carried into any stream any poisonous, noxious or polluting liquid proceeding from any factory or manufacturing process." "Person," by sec. 20, it is to be noted, includes any body of persons, whether corporate or unincorporate—thence local authorities are, no doubt, within the scope of both sections, provided, of course, that they are guilty of the prohibited offence. Nor is there anything more in the language of sec. 4 to limit the class of "persons" against whom proceedings may be taken than there is in the language of sec. 3.

But this does not dispose of the question. The Act is divided into several "Parts." Part II. comprises the "Law as to Sewage Pollutions," and consists solely of sec. 3. Part III. consists

of secs. 4, 5 and 6, and comprises the "Law as to Manufacturing and Mining Pollutions." Now although sec. 4 taken alone corresponds so closely with sec. 3, when we look at sec. 6 we find it there enacted that "proceedings shall not be taken against any person under this part of this Act, save by a sanitary authority." Is it a legitimate inference that such proceedings cannot be taken against a sanitary authority? It is not an inevitable inference, because one sanitary authority might be permitting manufacturing pollution to flow into a stream in another district. But looking further into the section we find: (1) that no proceedings are to be taken without the consent of the Local Government Board; (2) that the board are not to give their consent in a district which is the seat of a manufacturing industry unless satisfied that means for rendering the effluents harmless are practicable and that no injury will be inflicted on the industry; and (3) that any person against whom proceedings are proposed to be taken is to have an opportunity of being heard before the sanitary authority against such proceedings being taken. Having regard to these provisions, the Court came to the conclusion that sec. 4 is aimed at the manufacturer producing the polluting liquid, and not at the sanitary authority through whose sewers it passes. This conclusion seems to us not only to be amply warranted by the language of sec. 6, but to be wholly in accordance with the equity of the matter, especially bearing in mind that under sec. 7 the sanitary authority is bound (subject to certain qualifications) to give facilities for enabling manufacturers to carry the liquids proceeding from their factories or manufacturing processes into the sewers.

* * *

Motor Omnibuses on Country Roads.

At a meeting of the Dorking Rural District Council a short time ago there was some discussion of the position with respect to the service of motor omnibuses now running between Guildford and Leatherhead by way of Shalford, Gomshall, and Dorking. The route, although it lies within the valleys of the Tillingbourne, the Pip Brook, and the River Mole, and includes some miles which are nearly level, has fairly steep ascents, and one very stiff one. The Shalford-Dorking road is, of course, a part of the Shalford-Reigate road, the widening of which is at present under consideration, although, it may be remarked in passing, a new road on the other side of the valley would probably be a cheaper and more useful work. At present there are two motor omnibuses services a day, each way, between Guildford and Leatherhead, and two more between Shalford Green and Guildford—a ten minutes' run. For the whole distance of some 18 miles the time allowed is from about one hour thirty minutes to one hour forty minutes, permitting of average speeds of 12 miles

an hour and a little less, and, in view of the nature of some of the hills, speeds of considerably over 12 miles an hour over the easier portions of the route. This motor service is of much interest to road surveyors, since it differs in character from services such as those to Whyteleafe, in the Caterham valley, and Kingswood, by Walton Heath, and those to Reigate and Godstone, these being Sunday extensions of London services or run in connection with the radiating services of Greater London. The Leatherhead-Guildford service will, no doubt, be linked up with London, or overlapped by the proposed service to Dorking, through Epsom, but from its cross-country character and the nature of the roads traversed it may be regarded as essentially a country coaching service, like that from Reigate to Dorking.

At the meeting referred to above there seemed to be a general opinion that such services should be under some effective control; but it must not be supposed that a local veto on the use of the roads would be tolerated by the public, and it may be pointed out that there is suitable machinery for dealing with the case of any road which is really unsuited to any particular form of motor traffic. One member of the council, a clergyman, said that it was not right that people should be brought down in crowds on Sundays "to fill our villages," but surveyors must not count upon any check being imposed to traffic developments on such grounds as these. Looking at the subject as a whole, it must be contended that there are sufficient indications that there will be no insuperable difficulty in dealing with traffic developments. In this connection, and as bearing upon the invasion of country roads by motor omnibuses and motor coaches, attention may be directed to the main points of an article by "A Civil Engineer," which appeared in the issue of the *Dorking Advertiser* containing the report of the meeting to which reference is made above. The writer advocates, from the administrative point of view, common action on the part of local authorities, who should, he contends, ask the Road Board to give special consideration to roads over which motor omnibuses are soon to run, and to give priority, in point of time, to the making of these grants, and similarly should pass resolutions, in identical terms, asking that the Road Board may be empowered to make grants in aid of the maintenance of roads. In the meantime, this writer suggests, works of reconstruction and of general improvement should precede, by a considerable period, the provision of new and costly forms of road crust; partly for engineering reasons and partly because the local authority would then be able to apply to the Road Board for successive grants, each coming under the head of "improvement." This policy may be recommended to the attention of rural authorities generally, the more so that in some cases the applications for the later grants of a series would be backed by traffic statistics showing increases in the numbers of heavy motor vehicles using the road.

Institution of Municipal and County Engineers.

At the last meeting of the council of the Institution of Municipal and County Engineers, some extracts from the official report of which are given on another page of this issue, many important matters arose for consideration. Our younger readers should take careful note of the fact that alterations to the examination syllabus have been proposed, and that the final recommendations of the board of examiners will be made to the council at their next meeting. Moreover, consideration is being given to a suggestion for the establishment of a preliminary examination for junior candidates,

which would be an entirely new departure. The Roads Committee reported that they had received from Mr. E. J. Lovegrove certain representations from a meeting of the engineers to the North Metropolitan local authorities in regard to arterial roads in Greater London. This question is one upon which the municipal and county engineers of the Greater London area are entitled to express an opinion, and we observe with satisfaction that the council of the institution have agreed to convene sectional conferences to consider the proposals of the Local Government Board and the Board of Trade, such sectional conferences to report to a central committee. We entirely agree that this subject is eminently one in the discussion of which the institution should take an active and important part. One other matter which was before the council is worthy of remark. We refer to the resolution which was unanimously passed expressing the view that it is not in the best interests of the institution to follow the practice of nominating the president or vice-presidents according to seniority. The system hitherto adopted has worked well, and the institution has always been fortunate in those who have consented to preside over its destinies. Nevertheless we agree that the principle of fitness, rather than seniority—although naturally both qualifications usually exist in the same person—is the one which should be placed first in filling any post of importance.

The Sheffield Meeting.

The North-Eastern District meeting of the Institution of Municipal and County Engineers held at Sheffield on Saturday last must be accounted a complete success. Honoured by civic hospitality, and having the opportunity of examining some most interesting town-planning designs, and of hearing papers from Mr. Wike, descriptive of the sewage disposal works, and dealing with housing in the city, those present at the meeting were fully catered for. In the discussion which followed the visit to the disposal works Mr. Steele voiced the general opinion of the members when he said that he was impressed alike with the boldness of the conception of the scheme and the efficiency and the wonderful economy with which it had been carried out. During the afternoon a visit was paid to the High Wincobank Corporation model dwellings. This must have reminded many of those present of the paper dealing generally with town planning and housing in Sheffield which Mr. Wike read at Great Yarmouth last July. In that paper it was pointed out that the purchase of the High Wincobank estate in the year 1900 was one of the first steps which the corporation took towards town planning. Situated in a good position, both as regards elevation and convenience of access, the difficulties in developing this estate have not been so great as is often the case. The site has been laid out with full regard to the future development of the surrounding estates and district. Before erecting any houses it was agreed that every house should have an area of at least 200 yds. of land exclusively appropriated to it. Competitive plans were advertised for, and fifty-three cottages were erected in the form of a quadrangle, in the centre of which is a green, instead of a separate garden being appropriated to each house. Additional houses have been erected on the estate on several subsequent occasions, and, as inspected by the members last Saturday, the development and design met with general approval.

During the course of the district meeting the question was raised as to whether such meetings should be considered to be private, and, after a general discussion, it was resolved to ask the executive to take this matter into consideration.

The point made by Mr. Fowlds, who introduced the matter, was that if the district meetings were private members could express themselves more freely and informally. The matter is, of course, purely a domestic one, but it occurs to us that at these district meetings papers are often read and discussions take place which are certainly of very much more than local interest. Surely the case might be met by resolving the meetings into private conferences on those occasions when, by reason of the particular subject under discussion, it is thought desirable to do so.

* * *

The Cheltenham Meeting. We print on another page of this issue the final programme of the annual general meeting and housing and town planning and roads conferences to be held next month at Cheltenham. From this it will be seen that the number of papers to be submitted for discussion during the several days over which the proceedings will extend has now grown to the somewhat formidable figure of twenty-two, no fewer than ten referring to town planning and housing and seven to questions connected with roads, the remaining five dealing with such varied subjects as office organisation, sewage disposal, bridge construction, and geology. If there is anything in the arrangements for which there may be reason for regret, it is that the amount of business to be transacted is so great that it is necessary, as at Yarmouth last year, for the two conferences to be held simultaneously. The question of housing is now receiving from numerous municipal engineers an amount of attention little short of that bestowed on the problems connected with road construction, and the choice of sections may therefore present some difficulty to not a few members. The remedy seems to be to make the housing conference a gathering quite unconnected with the annual meeting.

* * *

An Islington Repaving Inquiry. The general question of the cost of repaving London streets came incidentally under review at an inquiry held recently into an appeal by the Islington Borough Council against the decision of the London County Council, who refused to grant a loan of £5,744 for the repaving of certain roads in the borough. These roads were in 1894 changed from macadam to paved roads, at a cost of nearly £10,000, and the borough council had asked for sanction to a loan to meet a repaving scheme. The refusal of the county council to grant a loan is based upon what may be in theory a very laudable conception of their duty to the ratepayers, though it is easy to see that it may entail in certain cases a good deal of inconvenience and a certain amount of injustice. Both the inconvenience and the injustice were pressed upon Mr. H. S. Bidwell, the Local Government Board inspector, on behalf of the borough council, and in his evidence Mr. J. Patten Barber, borough engineer of Islington, made the forcible point that, owing to the motor bus and heavy traffic of a similar type, roads subjected to this traffic had to be pulled up four or five years before they would be worn out by horse traffic. This alone would seem to us to supply an example of the "exceptional circumstances" under which the London County Council occasionally feel justified in relaxing the stringency of their practice with respect to the granting of loans. It is admitted that in the matter of road upkeep the metropolitan boroughs have been very severely handicapped for some years past, and with rates on an ascending scale a strong inducement is held out to borough councils to reduce the expenditure upon the roads to an insufficient limit. This deplorable contingency must be avoided at all

costs, and one way out of the difficulty, until, say, the basis of metropolitan rating is re-adjusted, or the principle of adequate Government grants is conceded, would be for the London County Council to sanction loans for such repaving works as were the subject of the official inquiry alluded to. Whether these ends will be attained by the Budget introduced this week is yet to be seen.

* * *

Evasion of By-laws.

The ingenuity which is expended by builders in this country in the evasion of by-laws is sufficiently remarkable at times, but judging from the last annual report of Mr. Charles H. Godfrey, the engineer and surveyor to the Municipal Council of Shanghai, the Chinese architect and builder must be considered as the supreme exponents of this practice. The main fault of the system adopted appears to be that the responsibility of the architect ends with the preparation of plans and the securing from the municipality of a permit to build, the result being that he has nothing to do with supervising the actual work of construction. The plans as submitted and upon which the permit to build is granted, may comply with every by-law, but as soon as building operations are started the single aim of the contractor and owner is to scamp the work, and particularly to rush through any alterations of the original design which are contrary to the by-laws. For example, in the report referred to, Mr. Godfrey quotes a case in which the partitions between the rooms of a large hotel were shown on the plans to be constructed of brickwork. These partitions were all hurriedly erected within the space of a few days, but were constructed of hollow lath and plaster—a method which was not only in direct contravention of the plan and by-laws, but which seriously increased the danger from fire and afforded a convenient harbour for rats and vermin. The result of these evasions has been that additional building inspectors have had to be appointed, thus throwing upon the rates the cost of supervision which ought in fairness to be borne by the building owner. Mr. Godfrey suggests the compulsory registration of architects—and presumably the compulsory extension of their responsibility to supervision—as a remedy. An alternative method of dealing with the situation would be to make the building owners pay the building inspectors by fees, in a way similar to that which obtains under the London Building Acts.

* * *

Is the Tramway Doomed?

As will be seen from our report of the sitting of the Select Committee of the House of Commons who have under consideration the western approach road scheme of the Middlesex County Council, the chief engineer to the latter body, Mr. H. T. Wakelam, is not yet convinced that the days of the tramway are over. Like the motor buses, the tramways, he points out, are doing a great service, but, unlike the former, they have to pay for the maintenance of the roads, and his view appears to be that the new vehicles should not be allowed to escape a similar contribution. A recent article in the *Auto-Motor Journal* suggests that there is growing up among road engineers a strong feeling that the tramway will eventually give way to the "more modern and flexible methods of traction," but even admitting that this is the case, the statements of Mr. Wakelam before the Select Committee tend to show that the officials referred to are likely to insist that the free use of the public highways by motor buses should be conditional upon the companies bearing a proportion of the additional cost of maintenance.

Institution of Municipal and County Engineers.

NORTH-EASTERN DISTRICT MEETING AT SHEFFIELD.

Sheffield was the scene of a meeting of the North-Eastern District of the Institution of Municipal and County Engineers on Saturday last. There was a large attendance of members belonging to the district, and an attractive programme kept the meeting going until a late hour in the evening.

Mr. Frank Massie (Wakefield), district chairman, presided, and there were present Messrs. J. H. P.



MR. CHARLES F. WIKE, M. INST. C. E.,
City Engineer and Surveyor of Sheffield.

Mr. Wike was appointed city engineer and surveyor of Sheffield in 1888, and prior to this was deputy borough surveyor of Leicester. He is a member of the Institution of Civil Engineers, and a member of council of the Institution of Municipal Engineers, and was for several years vice-president of the latter body. Among the principal works carried out by Mr. Wike since his appointment in Sheffield may be mentioned the construction of the majority of the permanent way of the tramways on the overhead electric system at an approximate cost of £500,000, together with the erection of two car sheds. Within the past fifteen years various local Acts of Parliament and Provisional Orders have been obtained for improvements in Sheffield, involving an expenditure of about £1,000,000. One of the principal thoroughfares of the city—High-street—has been widened under his supervision at a cost of £260,000. In addition to these, other street improvements of a more or less important character have been executed, bringing the total cost of improvement schemes to a sum of about £2,000,000. Mr. Wike has designed and carried out the installation of a new sewage disposal works on the bacteriological process, which is capable of dealing with a maximum rate of flow of 64,500,000 gallons per twenty-four hours, at an estimated cost, exclusive of land and second-contact beds, of £270,000, including the construction of an additional 6 ft. 6 in. by 7 ft. outfall sewer nearly 1 mile in length. Various bridges, both steel girder and stone in construction, have been built across the canal and River Don, at a cost of nearly £50,000. Two large boundary extension schemes have been carried out under his direction, resulting in the addition of 4,688 acres to the area of the city. The scheme for the clearance of the Crofts insanitary area was undertaken by Mr. Wike at a cost of about £100,000, and in 1900 60 acres of land at High Winebank were purchased for the erection of artisan dwellings, Mr. Wike being responsible for the lay-out of the estate and the erection of the majority of the 175 houses now built there. Prior to the appointment of a city architect in 1909, Mr. Wike had control of the whole of the architectural work carried out by the corporation, including the erection of baths, libraries, police stations, and two refuse destructors. The lay-out and maintenance of parks, recreation grounds, and allotment gardens come within his jurisdiction, together with the planning of new cemeteries. Since the adoption by the corporation of the Town Planning Act in 1910, Mr. Wike has prepared schemes involving an area of over 4,250 acres. The areas, which in some cases are of a very hilly nature, include over 15 miles of new main roads varying in width from 55 ft. to 100 ft. The area of the city is 24,347 acres, and about 11 miles between the eastern and western boundaries, and 6 miles from north to south. The population is 459,923, having increased from 312,795 since Mr. Wike's appointment at Sheffield.]

Andrews (Dewsbury), A. Beaumont (Yorks, E.R.), W. E. T. Burton (Wakefield), H. A. Butterfield (Batley), F. M. Copley (Wath-on-Dearne), H. Dearden (Dewsbury), F. J. Dixon (Ashton-under-Lyne), W. Dixon (Leeds), J. H. Drewe (Wath-on-Dearne), H. M. Driver (Tadcaster), W. Fowlds (Keighley), G. Gledhill (Baby-

with-Hexthorpe), W. M. Green (Castleton), W. J. Hadfield (Sheffield), T. H. Hailstone (Birstall), H. L. Hall (Batley), F. Hewitt (Kiveton Park), A. C. Hodge (Sheffield), F. C. Jenkinson (Rotherham Rural), F. Oscar Kirby (Doncaster), W. T. Lancashire (Leeds), H. Leadbeater (Rotherham), A. E. Loach (Wakefield), J. A. Lough (Parkgate), C. Lund (Cleckheaton), S. H. Newsome (Sheffield), W. H. Price (Leeds), A. Rothera (Liversedge), J. Rowbottom (Ashton-under-Lyne), T. Salvin (Rotherham), J. Saville (Heckmondwike), F. Simms (Sheffield), J. Southwart (Rothwell), F. W. Spurr (York), W. J. Steele (Newcastle-on-Tyne), F. Thackray (Heyburn), J. P. Wakeford (Wakefield), E. H. Whiteford (Derwent), H. Gilbert Whyatt (Grimby), F. Wilkinson (Prestatyn), C. F. Wike (Sheffield) and J. Wrest (Dewsbury), members; F. D. Tunnicliffe (Dewsbury), J. P. Tutin (Sheffield) and H. Walker (Sheffield), visitors.

The members assembled at the town hall, where they were received and welcomed by the Lord Mayor (Colonel G. E. Branson, J.P.).

The members having examined the plans of the town planning scheme, which were on exhibition in the council chamber, then proceeded in brakes to Winebank to inspect the sewage disposal works.

A paper by Mr. C. F. Wike, the city engineer, descriptive of the sewage works, was distributed to the members, and greatly facilitated the work of inspection.

SHEFFIELD SEWAGE DISPOSAL WORKS.

Mr. Wike stated that, on his advice, after full consideration of the results of careful investigations, the difficulties with the State, the trade wastes peculiar to the city, and other local circumstances, it was decided by the corporation, in 1905, to adopt a scheme for the purification of the Sheffield sewage by the bacteriological process, consisting, in its main principles, of continuous-flow settling tanks and contact beds.

The scheme, which is now partly completed, is so designed that a single contact may be given to the effluent from the tanks, which it is hoped may prove to be adequate treatment; but second contact beds can be added if required by the Local Government Board or the river authorities. It was only after a long series of experiments, carried out with every care, and on strictly scientific lines, that sufficient experience was obtained to warrant the confident recommendation of the present scheme to the city council. This met with the sanction of the Local Government Board and the approval of the West Riding Rivers Board. The Local Government Board held an exhaustive inquiry, lasting two days, in December, 1905, and finally approved of the proposed scheme, at an estimated cost of £270,369, exclusive of land and second contact beds, and sanctioned the borrowing of this sum. Steps were taken for the acquisition of land, and in the Session of 1900 Parliamentary powers were obtained for the acquisition of 99½ acres. It was, however, then felt that this area was not sufficient for the extensions, which would be necessary to meet requirements due to increase of population, and for the treatment of sewage from the outside districts which drained naturally into its system. Therefore, an application was made to the board for sanction to the purchase of a further 81½ acres. The gross area of the land, including the site of the existing works, which will ultimately be available is 204 acres. The total cost is, approximately, £84,000. If second contact beds should be insisted upon, these will be placed on the 81½ acres referred to.

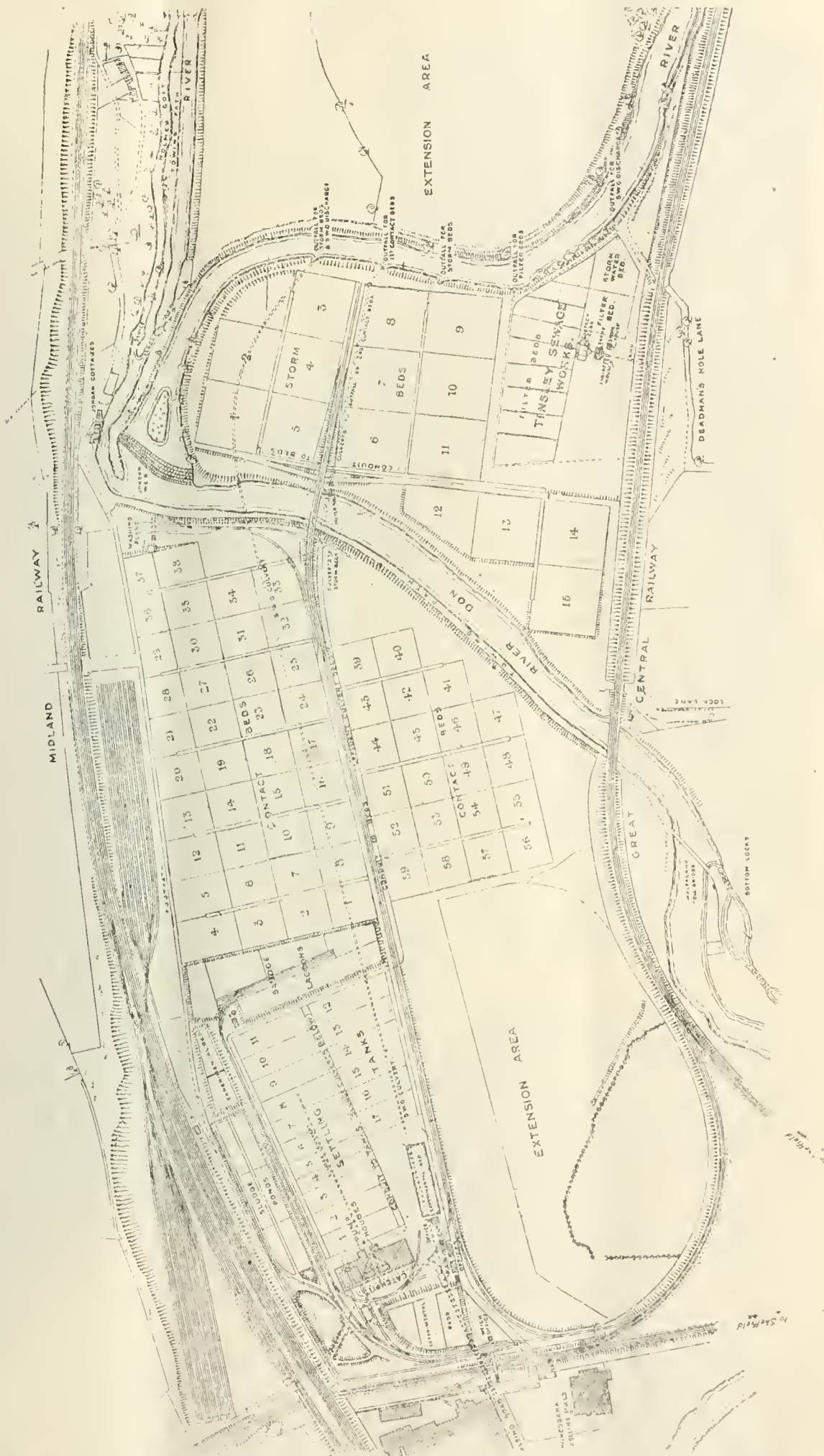
The original estimate for the work in progress was £270,000, but later experience and economies in carrying out the work indicated that probably £250,373 would be sufficient to cover the cost. This sum may eventually be slightly exceeded, but the works will undoubtedly be completed for less than the original estimated cost.

The scheme comprises the construction of (1) new main valve chamber to receive the original 5-ft. and the new 7-ft. barrel sewers, fitted with a new storm-water overflow; (2) two new catchpits and the re-modelling of the existing catchpits; (3) nine new

settling tanks, and the conversion of the present tank area into eight additional tanks, having a total capa-

(5) sixty contact beds, each 1/2 acre in area; (6) sixteen storm beds, each, approximately, 1 acre in extent;

SCALE
Feet 0 100 200 300 400 500 600 700 800 900 1000



SILEFIELD SEWAGE DISPOSAL WORKS: GENERAL PLAN.

city of 15,000,000 gallons; (4) deepening the existing sludge wells, and remodelling the pumping plant;

(7) bridge and four syphon tubes across river Don; (8) roads and railways, including diversion of a public

footpath which divided the site, and a footbridge over the Great Central Railway.

CONTRACT WORK.

Messrs. Logan & Hemingway, of Nottingham, have completed contracts for the following works: (1) The removal of 220,000 cub. yds. of excavation; (2) the construction of six settling tanks and twenty-four contact beds; (3) the construction of three further settling tanks and thirty-five contact beds; (4) the building of a bridge over the river Don to give access to the storm-bed area; (5) the laying of four inverted syphon tubes, each 4 ft. in diameter, beneath the river, to convey the first contact-bed effluents and storm water across the river; (6) the construction of 16 acres of storm beds; (7) the laying of four 48-in. Venturi tubes and building of a meter-house, to be fitted with Venturi recorders, for the accurate measurement of the flow of sewage, supplied by Messrs. Kent & Co., of Luton and London.

ADMINISTRATION WORK.

The following works have been executed by men directly employed by the corporation: The new main valve and storm-water overflow chamber. The old catchpits have been remodelled, and new feed and effluent conduits constructed. The sludge wells have been deepened and remodelled, and fitted with new pumps. The public footpath across the site of the works has been diverted and fenced. The laboratory has been enlarged and equipped for the special work required. The lime precipitation tanks have been converted into eight settling tanks, and the necessary sludge culverts, valves, and conduits have been added. The concrete floors to the contact and storm beds have been laid, and the necessary underdrainage provided. Fifty-nine contact beds have been provided with clinker; 227,000 tons of clinker have been placed in position in the beds. The total quantity needed is about 230,000 tons.

This has been obtained from the Lumley-street destructor and private firms, and about 80,000 tons by aerial ropeway from Messrs. Steel, Peach & Tozer's tip. The construction of two new catchpits of modern design, fitted with electrically driven dredging apparatus and mechanical screens, have been completed, and the works have been lighted by electricity, including generating plant and new boilers. The additional work remaining to be done is chiefly the construction of permanent roads and railways, and the completion of the clinker filling to the storm beds. At the present time there are in operation 17 settling tanks, 59 contact beds, and 11 storm beds.

The following is a summary of the total expenditure on the sewage works extension scheme since the works were commenced:—

Works executed by contract	... ..	£142,494
Works executed by administration	... ..	105,051
Total	... ..	£247,545

CAPACITY OF NEW WORKS.

The works will be capable of dealing with a maximum flow of 64,500,000 gallons per twenty-four hours. The whole of the sewage will pass through the catchpits and settling tanks, and a flow up to 34,250,000 gallons will be treated on the contact beds. The subsequent 32,250,000 gallons will be treated on the storm beds. The scheme is based on a dry-weather flow, including trade wastes, of 12,000,000 gallons per day; the dry-weather flow at the time the scheme was designed was 15,000,000 gallons, but this included 3,000,000 gallons of dilution with clear water from works and other sources.

A volume of sewage averaging 19,205,000 gallons per day has been treated on the contact beds for the year ending March 25, 1913, and, in addition, storm water has received tank treatment. The average flow of sewage treated has been 21,505,000 gallons per day. The contact beds have been put into operation as completed, and some are necessarily not yet in a mature condition. In consequence of this, the average analytical results will still improve. The total volume of sewage treated during the year ending March 25, 1913, is 7,849,190,000 gallons. The effect upon the river has already become apparent, and the West Riding Rivers Board have reported on the improved condition of the stream; 59,346 tons of sludge have been conveyed to Kilnhurst to be tipped, and 325 tons have been sent to farmers. The follow-

ing table shows the quantity of sludge produced per 1,000,000 gallons of sewage during several years:—

Year ending	Volume of	Tons per
March 25th.	sewage treated.	1,000,000 galls
1906-7	5,836,250,000	8.80
1907-8	6,362,520,000	8.11
1908-9	5,693,430,000	11.34
1909-10	6,999,100,000	8.44
1910-11	6,701,403,000	8.97
1911-12	7,726,567,000	6.99
1912-13	7,849,190,000	7.60

The strength of the sewage delivered at the works shows indications of increasing strength by reason of the addition of water-closets and increase in trade wastes.

The cost of the sewage disposal of the city may be briefly summarised as follows:—

Original cost of lime precipitation works	£33,028
Cost of lands for scheme	84,127
Estimated cost of construction of present extension scheme	270,000

Total cost of scheme (including land and old works) £37,155

N.B.—To this total it will be necessary to add the cost of second contact beds should these be required eventually.

Although this sum is a large one, and has been incurred only after very mature consideration, exhaustive experiments and inquiries, and under extreme pressure by the Local Government Board and West Riding Rivers Board, it is fully anticipated that the city will be provided with an efficient sewage disposal works sufficient to meet all requirements for many years to come.

DUPLICATE OUTFALL SEWER.

A main outfall sewer, 5 ft. diameter, was laid twenty-eight years ago, but owing to the rapid growth of the city it was found absolutely necessary to construct a new and additional brick barrel sewer 6 ft. 6 in. diameter, increasing to 7 ft. diameter, for about three-quarters of a mile, laid alongside the old main outfall sewer in Meadow Hall-road and Alsing-road, terminating in the main valve chamber at the sewage works. This sewer has a fall of 1 in 1,894.

When crossing beneath the Barnsley branch of the Great Central Railway, near the sewage works, it has been necessary to raise the level of the railway and to modify the section of the sewer, giving a flat top formed in girder and concrete work. At the Blackburn Brook in Alsing-road the sewer has been carried over the brook in a steel tube 7 ft. diameter, lined with brick, and here the storm-water overflow chamber has been entirely remodelled and improved, so as to serve both the old and new sewers. The junction chamber in Meadow Hall-road, at which difficulty has frequently arisen owing to the deposit of silt, has been removed, and a new chamber built on improved lines.

Just above this point the 5-ft. sewer draining the Carbrook and southern portion of the city crosses the river in the form of two inverted syphon pipes, each 3 ft. 3 in. diameter, a third syphon pipe 4 ft. diameter has been laid beneath the river, and the chambers on each side of the river have been remodelled and extended. Owing to the flow of sewage having to be maintained, this work has been of a tedious and difficult character. The inverted syphon carrying the main sewer from Brightside district under the Bagley Brook has been removed, and the brook syphoned under the sewer. A direct and uninterrupted passage of the sewer is now obtained at this point. The work was complicated by the presence of numerous culverts, water, gas, and other pipes. The storm-water overflow near the river crossing in Meadow Hall-road, and those at Weedon-street Bridge, Weir Head, and Sanderson's Weir, have been constructed; the overflow culvert to the last named being carried under the Midland Railway in tunnel work.

The combined capacity of the old and new sewers is equal to 96,000,000 gallons per day, which is well above the present requirements.

A loan of £20,127 was sanctioned for the work by the Local Government Board, and the work has been executed well within the estimate.

The works have been designed by the author and his staff, and carried out partly by contract and partly by administration under his supervision.

[For further details and photographic views of the

undertaking described by Mr. Wike readers may be referred to the supplement which accompanied our issue of November 5, 1909.]

At the conclusion of the inspection, and before leaving the works,

Mr. FRANK MASSIE, chairman of the district, proposed a vote of thanks to the Lord Mayor (Colonel G. E. Branson) for his kindness in granting the use of the town hall for the meeting, and for his hospitality to the members of the institution. He said they greatly appreciated the kindness of the Lord Mayor in granting them facilities for the holding of their meeting, and for the generous hospitality which he had shown in inviting them to tea on their return to the town hall.

Mr. W. T. Lancashire (Leeds), who seconded, also spoke of their indebtedness to the Lord Mayor for the kindly manner in which he had received the institution.

The vote of thanks was heartily accorded.

Mr. J. P. WAKEFORD (Wakefield), hon. district chairman, then proposed a vote of thanks to Mr. Councillor Osborne, chairman, and the members of the Sewage Committee for their kindness in allowing the members to visit the sewage disposal works, and for the hospitality extended to the members at the works. He spoke of the great advantage it was to the members and to the authorities which they represented to be able to visit works of the character of Sheffield, and thus see what was being done by other municipalities.

Mr. H. DEARDEN (Dewsbury) seconded the vote of thanks, which was accorded by acclamation.

Mr. W. J. STEELE (Newcastle-on-Tyne) moved a vote of thanks to Mr. Wike for his paper descriptive of the sewage disposal works. The members of the institution, he said, were greatly indebted to Mr. Wike for the opportunity of inspecting the carrying out of what was a great problem. Personally, he was impressed not only with the boldness of the conception of the scheme, but with the very efficient manner in which it had been completed. The remarkable feature of the scheme was the wonderful economy with which it had been carried out. That works of such magnitude had been executed for an outlay of £300,000 was highly creditable to Mr. Wike. He was impressed with the Sheffield works as one of the most economical schemes on a big scale which had ever been undertaken.

Mr. F. W. SPURR (York) seconded the vote of thanks, which was unanimously approved.

Mr. WIKE, in acknowledgment, thanked Mr. Steele and the members for the appreciation expressed of the sewage works, and his pleasure at seeing so many members of the institution in Sheffield. It had been a great pleasure to him to prepare the paper, and to arrange for the meeting.

The members then proceeded to visit the High Wincobank Corporation model dwellings. The visits proved so full of interest that it was after 6 o'clock in the evening before the members arrived at the town hall for tea and the transaction of district business.

BUSINESS MEETING.

The district meeting was held after tea in the council chamber, Mr. Frank Massie presiding.

The district secretary read the minutes of the district meeting at Wakefield, which were confirmed.

THE NEW DISTRICT CHAIRMAN.

Mr. WIKE said he wished to make a personal explanation with regard to the appointment of chairman of the North-Eastern District. He supported the nomination of Mr. W. J. Steele, of Newcastle, as chairman of the district. He found that some person, without his knowledge, had been good enough to nominate him for the chairmanship, and put him in rivalry with Mr. Steele. He thought it right to make that explanation.

The CHAIRMAN remarked that if any member wished to make a nomination for any office they should first communicate with the member and get his consent before putting his name forward.

INSTITUTION MEETING AT SCARBOROUGH.

Mr. J. P. WAKEFORD announced that the borough engineer of Scarborough had offered them an institution meeting at Scarborough on the last Saturday in September (the 26th). They had communicated that to the council, who had approved the date. Mr. Smith was going to some trouble with the meeting, and they ought to have a good attendance.

Mr. WAKEFORD then announced the receipt of a telegram from Mr. L. Roseveare, of South Shields, expressing his regret at not being able to be present.

SHOULD DISTRICT MEETINGS BE PRIVATE?

Mr. W. FOWLDS (Keighley) then raised a question as to whether the district meetings of the institution should be private. He thought it would be much better if the district meetings were private. Members could then express themselves more freely and informally than if their speeches were reported in the "Journal" and the technical press. He did not say that a short summary of the meeting should not be sent to the "Journal" and the technical press by the secretary, but not reports of the speeches.

Mr. C. LUND (Cleckheaton) asked if it was usual to have reporters present at district meetings? Was it an order of the council?

Mr. J. P. WAKEFORD, district secretary, said they received a circular from one of the districts which stated "Visitors are not admitted to this meeting." He immediately wrote to Mr. Cole and asked him where this came from, and if it was a fact that visitors were not to be admitted, and whether there was any order of the council to that effect. Mr. Cole replied that so far as he knew there was no order by the council, and he saw no reason why visitors should not be admitted. Later there came a circular asking the district secretary to send reports of the meetings.

The CHAIRMAN remarked that it was inadvisable to make up their minds hurriedly as to the best course to be taken. It was rather aggravating to Mr. Fowlds, after he had generally let himself go at the Wakefield meeting, to find that he was reported. They ought to think it over before the next meeting, and find out from other districts as to whether these district meetings should not be considered conversational among themselves. The original idea of these meetings was that they would bring the members more closely together, and he thought that object would be better served if the meetings were not reported.

Mr. W. FOWLDS (Keighley) then proposed that the executive take into consideration the question of district meetings being private.

This was seconded and carried unanimously.

TOWN PLANNING IN SHEFFIELD.

By CHARLES F. WIKE, M.INST.C.E.,
City Engineer and Surveyor.

The total area of town planning schemes at present in hand in Sheffield is about 6,000 acres, out of a total area of about 12,000 acres of land available for development and inclusion in town planning schemes.

The number of schemes in hand at the present time is seven, and sanction has been received from the Local Government Board to prepare schemes in respect of four of these. The board will shortly be approached for authority to prepare the further schemes.

One of the most important features of these town planning schemes is the earmarking of certain areas as open spaces, and advantage has been taken to secure lands possessing natural woodland scenery, in order that they may be preserved as open spaces for ever.

The town planning of a city with contours like Sheffield is a very different matter to that of some cities and towns in England, which are practically flat, and the hilly nature of the sites and the great difference in level makes the planning of roads a difficult one.

Prior to the passing of the Housing and Town Planning Act there was nothing to prevent an owner laying out his estate irrespective of any other owner, at any rate so far as Sheffield was concerned. This resulted in many cases in the formation of numerous cul-de-sacs, which by a little rearrangement on a give-and-take principle might have become good through roads. In some instances, especially in the case of large landowners, the estates have been laid out on very satisfactory lines.

The service of the various notices and preparation of the plans and estimates to comply with the regulations of the Local Government Board, the prolonged negotiations with landowners respecting the laying out of the different estates, and other work, occupy a great amount of time and a large staff. Five assistants are employed solely on town planning work, with additional assistance when required.

The following are the particulars with regard to the various schemes in hand:—

AREA 1.—GREYSTONES AND BANNERDALE.

Area	188½ acres.
Approximate length of new roads	6 miles.
No. of houses to the acre	12
Approximate area of open spaces	85 acres.

Principal Road Widening:—

	Present width (approx.) Feet.	Proposed width. Feet.
Eccleshall-road (from Banner Cross to Eccleshall Church	50	80
Carterknowle-road (for a length of 700 yards)	25 & 40	50

One of the principal new roads in this scheme is Bannerdale Valley-road. This road will be 1,300 yds. long, and have a width of 55 ft., and it is intended to have a macadam roadway with asphalt footpaths and grass margins on either side. Among other new roads is one suggested from Porter Bridge, skirting Whiteley Woods, to Stainlon-road, which will be 1,300 yds. in length, and have a width of 40 ft. In addition to Whiteley Woods, the High Storrs estate of the corporation is included in this area.

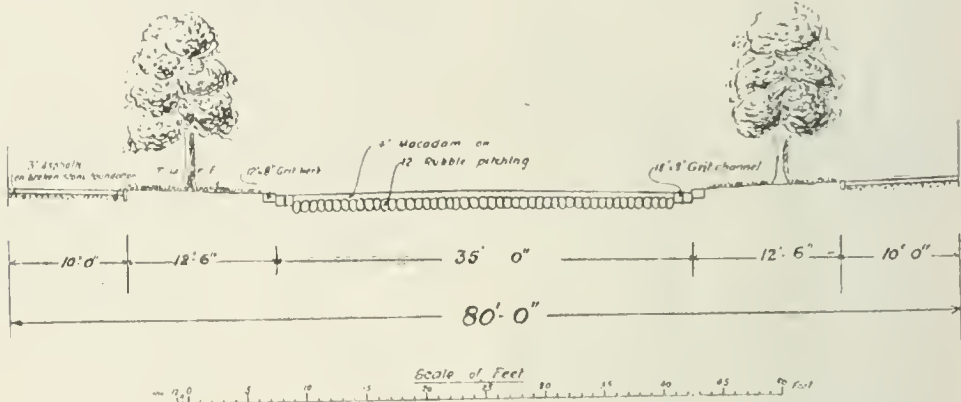
This area, for which sanction to town plan has been obtained, contains land near some of the large works, which is in immediate demand for workmen's dwellings, and is a most important area from a town planning aspect, as it adjoins a densely populated neighbourhood. It has been decided to vary the requirements as to the number of houses to be erected to the acre, to suit the varying circumstances.

This area is a good illustration of the difficulty in fixing a limit for the whole of one scheme.

The houses or cottages already built immediately abutting upon a portion of the area average as many as thirty-five (gross) to the acre, and it would be scarcely reasonable or desirable to fix a limit of twelve to the acre (as in some of the schemes) for the area immediately adjoining. The committee therefore decided upon a limit of twenty-four to the acre for this portion, reducing the number to twenty-two and twenty as the area recedes from the overcrowded district.

HIGH WINCOBANK ESTATE.

This area also includes the High WincoBank estate of the corporation. This estate was purchased in



SECTION OF PROPOSED 80-FT. ROADS.

On Area 1 it is suggested to set apart as open spaces the plantation adjoining Brincliffe Edge-road, the land adjoining Bingham Park and Whiteley Woods, and the plantation on the central portion of the High Storrs estate.

This is one of the areas for which the Local Government Board gave authority for a town planning scheme to be prepared, and the preparation of the scheme and plans for submission to the board is in hand.

AREA 2.—SANDYGATE.

Area	97 acres.
Approximate length of new roads	2 miles.
No. of houses to the acre: 20 on the North side, tapering to 12 on the South	
Approximate area of open spaces	Nil.

	Present width (approx.) Feet.	Proposed width. Feet.
Manchester-road (portion of)	36	80
Sandygate-road	50	80
Watt-lane	30	80

This scheme is comparatively small, and was taken in hand on account of impending building operations which threatened an undesirable development. The principal new main road here is one 80 ft. wide, from east to west of the area. This new road was not originally part of the scheme, as it was then intended to widen Sandygate-road (an existing road about 35 ft. wide), but the alteration has been made to meet the wishes and suggestions of the landowners, and also on account of the much better gradient.

Sanction has also been received from the Local Government Board to prepare a scheme for this area.

AREA 3.—BRIGHTSIDE, FIRTH PARK, AND SHIREGREEN.

Area	62½ acres
Approximate length of new roads	6 miles.
No. of houses to the acre	20, 22 and 24
Approximate area of open spaces	90 acres

Principal Road Widening:—

	Present width approx. Feet.	Proposed width. Feet.
Barnsley-road (for a length of nearly a mile)	45	80
Hadfield House-lane	37	60
Shiregreen-lane	38	60
Stubbin-lane	25	55

the year 1900, and contains about 60 acres of land. The estate is in a good position on account of its elevation, and is very convenient for housing purposes. It is nearly 400 ft. above sea level, with an easy reach of some of the large engineering works, and is a few minutes' walk from the tram terminus. Altogether, 228 dwellings (including flats) and two shops have been erected, the rents being 4s. and 4s. 3d. per week for flats, and varying from 5s. to 10s. per week for dwellings, the majority of which are provided with baths. Forty-four of the dwellings were erected in connection with a model cottage exhibition, and afterwards purchased by the corporation, one of the conditions of the competition being that the competitors should sell at the price stated for the particular class of cottage. A further fifty-nine dwellings, all provided with baths, to let at from 5s. 8d. to 7s. 6d. per week, are shortly to be erected.

AREA 4.—FULWOOD AND STUMPERLOW.

Area 1,530 acres.

This is a further area, abutting on areas 1 and 6, which the committee have decided to town plan. The contouring of the maps and the surveying and levelling for road widenings and suggested new roads are being proceeded with, and when this work is completed a draft scheme will be prepared.

AREA 5.—KENWOOD PARK ESTATE.

Area, 140 acres.

This is another small area to be dealt with as a town planning scheme with a view to limiting the number of houses to be erected to the acre, and to preserve the amenities of the district.

The necessary maps for submission to the Local Government Board are in course of preparation.

AREA 6.—ECCLESALL, ABBEYDALE, AND WOODSEATS.

Area	1,618 acres
Approximate length of new roads	8 miles
No. of houses to the acre	8 Abbeydale, 20 Woodseats, and 12 Ecclesall and Millhouses
Approximate area of open spaces	121½ acres

Principal Road Widening:—

	Present width (approx.). Feet.	Proposed width. Feet.
Ecclesall-road (from Church to City boundary)	37	80
Abbey-lane (part of)— Abbeydale-road to Woodseats	35	100
Do. do. Abbeydale-road to Wood Lodge	40	80
Abbeydale-road	37	80
Chesterfield-road	40	80

This area adjoins Area 1, and is situate in the South-Western portion of the city. The Ecclesall part of the scheme contains Ecclesall Wood (area, 372 acres, approximate), and it is proposed to set about 75 acres of this aside as an open space to prevent it being absorbed for building purposes, and also Hutcliffe Wood, abutting on the Midland Railway.

The principal new roads are, one from Millhouses to Whirlow Bridge, and a branch road from this to Abbeydale; one from Silver Hill to Limb Bridge, and a branch road to Dore, all of which it is proposed to make 80 ft. wide. Other new roads are shown to be 60 ft. and 50 ft. wide.

One of the most important road widenings is Ecclesall-road, from the church to the city boundary, a length of about 1½ miles, which is in continuation of the widening of the short length mentioned in Area 1.

There is considerable motor and other traffic on this road, and the committee decided to include the widening in the town planning scheme, the improvement to be carried out as opportunity arises. The existing width of the road is about 37 ft., and it is proposed to widen it to 80 ft.

Another very important road widening is Abbey-lane, from Abbeydale-road to Woodseats, which is to be widened to 100 ft., and along which it is proposed to run a double line of tramways or trackless trams. The roadway will be constructed of tar-macadam carriageway, grass margins and trees, and pathways.

The statutory meeting was held on February 10th last, and the Local Government inquiry into the application of the corporation for authority to prepare a scheme for this area on July 15, 1913.

At this inquiry there was opposition to the inclusion of certain portions of the area in the scheme, and also to the scheme itself. The Local Government Board inspector explained that the inquiry was only for the purpose of ascertaining if the area was suitable for town planning, and that he could not go into details at this stage.

Authority to prepare a scheme has now been received from the board, and its preparation is well advanced.

AREA 10.—HILLSBOROUGH, MALIN BRIDGE, STANNINGTON AND CROOKES.

Area, 1,400 acres.

The boundary of this area is rather irregular, as the line has been arranged to follow closely built-up portions of districts adjoining. Portions of the Loxley and Rivelin Valleys run through this area, which adjoins and contains some of the most beautiful and attractive parts of Sheffield; portions of Hillsborough, Walkley and Crookes are included, and as these are districts which will probably be inhabited by a working-class population, it is of the greatest importance that they should be included in a town planning scheme before they are built up on lines which in the past have done so much injury to the city.

The posting up and contouring of the maps, the surveying and levelling for road widenings and suggested new roads is being proceeded with, and a draft scheme is in course of preparation for submission to the committee.

Set-backs.—With respect to set-backs, the following have been arranged for the different areas:

Existing and new main roads	25 and 15 feet
Secondary main roads	15 feet
Subsidiary streets	10 feet

Estimates.—The estimates already prepared have been based upon the assumption that the owners would give up, without charge, the necessary land for widening the roads, the corporation paying for the street works over the width required by the by-laws *i.e.*, 40 ft. as has already been arranged in several cases.

STATISTICS AS TO TOWN PLANNING.

Total area of the city	Acres.	24,347
Population of the city, 471,662		
Area densely population	Acres.	5,000
Area sparsely built upon		2,500
Area which cannot be dealt with under the Town Planning Act		7,500
Area not available for building purposes, such as moorland, reservoirs, parks, recreation grounds, precipitous ground, &c.		5,000
		12,500
		11,847
Approximate area of land available for further development and inclusion in town planning schemes		12,000
Areas for which sanction has been received from Local Government Board to prepare schemes:—		
Area 1	Acres.	488½
„ 2		97
„ 3		624½
„ 6		1,618
		2,828
The total approximate area proposed to be reserved as open spaces in connection with these four schemes is 296½ acres.		
Areas for which sanction will be asked to prepare schemes:—		
Area 4		1,530
„ 5		142
„ 10		1,400
		3,072
Total area of schemes receiving attention at various stages		5,900

DISCUSSION OF MR. WIKE'S PAPER.

Mr. F. J. THACKRAY (Hoyland Nether) said there was one question he wished to ask with regard to the housing problem. It was a question which he had to face and answer himself, and probably it was a question which Mr. Wike had had to face himself. The question was this: The council purchased some land for the purpose of street improvement, and having carried out that improvement had a surplus area of land available. Two-thirds of that area was resold at a price almost equal to the original purchase price, leaving a small area of land practically free of cost. The council had decided to erect houses on that site, but the type of house they decided to erect upon it was not such as would be erected for the poor or dispossessed slum dwellers. The question came in arriving at the rent what value should be taken for the land. Should the land be taken as of no value, the council having recovered the purchase price, or most of it, or should it be taken at the ordinary price as building land, the rents based upon that price, and the profits derived go to the ratepayers generally instead of to the tenants of the houses. If they took the land as of no value, then the persons who were privileged to inhabit the houses would derive the benefit instead of the whole of the ratepayers. In his opinion, if application were made to the Local Government Board they would object to the proposed arrangement. If the land was utilised for housing slum dwellers at cheap rents, it would be different, but he wished to know whether they must not take into consideration the value of the land, having regard to the class of housing which the corporation were putting up.

Mr. Wike said he thought it quite optional on the part of the local authority to fix what value they liked on the land. The London County Council, in the making of improvements, put a good deal of the cost down to the improvement. That had been done in Shetfield, when they cleared a slum area, and the value of the land was fixed at a good deal less than they gave for it.

Mr. W. T. LANCASHIRE (Leeds) mentioned that with some of the slum areas they had cleared in Leeds the value of the land was probably 30s. or 40s. per yard, but to have some housing done plans were prepared, and the land was sold to builders at 12s. 6d. per yard on the understanding that they would build to those plans. He thought it was a matter for the

council to decide as to the value to be fixed on the land.

Mr. W. J. STEELE (Newcastle-on-Tyne) remarked that it was a matter of expediency. Financially it was extremely unsound.

Mr. WIKE said they had to clear an area on which were public-houses and works, and then they had to put flats on the land, and they had to fix a price for the land. They could not fix the price at what it had cost.

The CHAIRMAN agreed with what Mr. Steele had said that financially it was unsound, and they ought not to do anything of the sort. The private speculator did not get his land given to him at less than the market price.

Mr. C. LUND (Cleckheaton) said he thought they should take the value of other land in the vicinity and base it on that.

The CHAIRMAN said he agreed that that was the proper way to do it—to take not the price paid for the land, but what it would sell for if put on the market.

Mr. WIKE: If it was sold for works it might fetch a good deal more than land sold for private dwellings.

Mr. THACKRAY said he held that he must take the market price as building land, taking as the basis the value of adjoining land. He based the scheme on that, but it had been altered, and would go in the altered form to the Local Government Board. He had asked the question really to see what chance the amended scheme would have. It was very hard to make out a good case for an inspector under the circumstances. If they had turned poor people out of their houses it would be different; but they were housing people who could afford to pay a decent rent, and they had no right to house them at the expense of the general body of ratepayers.

Mr. LUND asked whether Mr. Wike had any case where, in carrying a scheme through undeveloped land, he had obtained anything under the betterment clauses for opening up the land for building.

Mr. WIKE: We have not got as far as that. We have got plenty of threats for compensation.

Mr. LUND: Oh, compensation! Nothing the other way.

THE HON. DISTRICT CHAIRMAN.

The CHAIRMAN said he was very pleased they had had a good meeting in Sheffield. He hoped they would support Mr. Steele as they had supported him (Mr. Massie) during the two years he had held the position of chairman of the district.

COUNCIL MEETING.

At a council meeting of the institution of Municipal and County Engineers held on the 25th ult. the following applications were approved for election to membership:—

Members: Messrs. J. D. Hurst, surveyor to the Wardle Urban District Council; D. Megaw, assistant county surveyor, Antrim; F. H. French, borough surveyor, Harwich; W. W. Shennan, engineer and surveyor to the Wirral Rural District Council; P. Darroch, surveyor to the Newport, Salop, Urban District Council; J. E. Swindlehurst, city engineer and surveyor, Coventry; T. A. M. Brownlie, municipal engineer, Amritsar; C. A. Mackenzie, burgh surveyor and engineer, Monifieth; C. W. Hall, engineer and surveyor to the Felling Urban District Council; and D. C. Fidler, engineer and surveyor to the Hayes Urban District Council.

Associate-members: Messrs. A. P. Howell, engineering assistant to city engineer, Birmingham; J. W. Turner, engineering assistant to borough engineer, Southend; P. F. Spiller, chief assistant surveyor, Devon County; E. B. Wray, chief assistant surveyor to the Paignton Urban District Council; J. A. Burnett, resident engineer, Arley sewerage scheme; F. Stewart, assistant burgh engineer Paisley; and R. V. Toms, assistant water engineer, Town Hall, Torquay.

Students: Messrs. G. R. B. Mazengarb, surveyor's office, Town Hall, Anerley; A. H. Edymann, surveyor's office, Brentford Urban District Council; E. B. Cook, surveyor's office, Tilbury Urban District Council; J. C. Fairfax, surveyor's office, Town Hall, Southall; J. W. Williamson, surveyor's office, Town Hall, Southall; and K. G. Foster, Assistant surveyor to the Buckfastleigh Urban District Council.

Transfer from Associate-member to Member: Messrs. K. C. Bannerjee, assistant engineer to the Calcutta Improvement Trust, and R. Blakeway-

Phillips, surveyor to the Wellington Rural District Council.

The council received with regret the notification of the deaths of Mr. J. P. Wilkinson and Mr. R. S. Anderson.

APRIL, 1914, EXAMINATIONS.

Upon the report of the acting examiners for the examinations recently held at London, the following candidates, having satisfied the examiners, were granted the testimony of the institution. Messrs. C. H. Bradbury, B. V. Bradforth, A. E. Cockerton, A. S. Culham, H. S. Ganderton, T. S. Griffin, W. A. Hill, O. Hilton, R. Humphreys, J. K. Hunter, W. H. Jarvis, W. H. Lewis, H. E. Lunn, F. N. McRae, G. E. H. Ross, H. R. Sayer, H. Taylor, B. D. Tracy, G. A. Waite and R. K. Wortley.

DISTRICT ELECTIONS.

Upon the report of the scrutineers as to the scrutiny of the district ballot lists, the following were found to be elected as district officers for the year 1914-1915:

METROPOLITAN DISTRICT.—Chairman, J. Patten Barber; representatives, N. Scorgie and O. E. Winter; secretary, N. Scorgie.

NORTH WALES DISTRICT.—Chairman, J. P. Evans; representative, W. Jones; secretary, J. England.

WEST MIDLAND DISTRICT.—Chairman, H. E. Stidgoe; representative, F. C. Cook; secretary, F. C. Cook.

SOUTHERN DISTRICT.—Chairman, R. Read; representative, L. S. McKenzie; secretary, F. R. Phipps.

IRISH DISTRICT. Vice-president, W. E. L. Duffin; chairman, J. F. Delany; representative, R. H. Dorman; secretary, M. Sellars.

EAST MIDLAND DISTRICT.—Chairman, E. G. Mawbey; representative, E. P. Hooley; secretary, E. H. Crump.

SOUTH-WESTERN DISTRICT. Chairman, J. Paton; representative, T. Moulding; secretary, D. Edwards.

SOUTH WALES DISTRICT.—Chairman, W. Harpur; representative, G. A. Phillips; secretary, H. Alex. Clarke.

NORTH-EASTERN DISTRICT. Chairman, W. J. Steele; representatives, E. B. Martin and F. Massie; secretary, J. P. Wakelord.

SCOTTISH DISTRICT.—Vice-president, A. Stevenson; chairman, J. Young; representative, T. Nisbet; secretary, D. A. Donald.

SOUTH-EASTERN DISTRICT. Chairman, A. Dryland; representative, F. Harris; secretary, H. W. Bowen.

EASTERN DISTRICT. Chairman, H. T. Wakelam; representatives, E. J. Ellord and W. H. Prescott; secretary, J. A. Webb.

NORTH-WESTERN DISTRICT.—Chairman, J. S. Brodie; representatives, C. Brownridge and W. Stubbs; secretary, A. W. Bradley.

The report was received and adopted.

BOARD OF EXAMINERS.

The Board of Examiners reported consideration of the alterations proposed to the syllabus, which had been referred to a sub-committee for further report. The final recommendations of the board will be made to the council at their next meeting.

The board do not see their way to recommend the council to add a subject, "Gas Engineering," to the examination syllabus.

The board are unable to recommend the council to hold an examination at Cairo.

The board are considering the geographical division of India for examination purposes, and will report later.

The board are considering a suggestion as to a preliminary examination for juniors, and will report later.

The report was adopted.

ARTERIAL ROADS IN GREATER LONDON.

The Roads Committee reported that they had received from Mr. E. J. Lovegrove representations sent up from a meeting of the engineers to local authorities in the northern section of London. The representations set forth that the meeting was unanimously of opinion that the subject of arterial roads in Greater London should be considered as a whole by the engineers to the local authorities within the area claimed as Greater London, and that to this end conferences should be held by each section, and a central committee formed to receive the report of the sectional conferences with a view to preparing a comprehensive statement upon the proposals of the Local Govern-

ment Board and the Board of Trade, and the question generally. The committee recommended that the council should agree to the institution undertaking the direction of the matter of convening the proposed conferences. They feel that, unless the question is considered in this way, the views of the municipal and county engineers of Greater London cannot be satisfactorily expressed, and that the subject is eminently one in which the institution should take an active and important position. The committee recommended that the report of the central committee should, in due course, be forwarded to the Local Government Board, the Board of Trade, and the Road Board, in addition to it being placed at the service of the county and local authorities concerned through their respective engineers. The committee also recommended that the engineers to the several counties of which the area planned forms part, the engineers to the London County Council and the City Corporations should be asked to be members of the conference.

SPECIAL EXAMINATIONS.

The committee recommended that the Road Board be informed that the institution have arranged to hold special examinations in connection with the construction and upkeep of highways and highway engineering generally.

The report was adopted.

TOWN PLANNING CONFERENCE.

The Town Planning Committee reported that Mr. Thomas Adams has consented to open the forthcoming Town Planning Conference at Cheltenham, and to give an address.

ALTERATIONS TO ARTICLES AND BY-LAWS.

The Constitution Committee reported that they had given careful consideration to the suggested class of associates, and did not see their way to recommend the council to take steps for the formation of this class at present.

NOMINATION OF PRESIDENTS AND VICE-PRESIDENTS.

On the motion of Mr. W. H. Prescott, seconded by Mr. P. H. Palmer, it was unanimously resolved:—

"That this council is of opinion it is not in the best interests of the institution to follow the practice of nominating the president or vice-presidents according to seniority of service, and it is hereby agreed that the practice be not observed in all future elections."

London County Hall.—At Tuesday's meeting of the London County Council on a vote of £460,000 on capital account for the new county hall, Mr. J. D. Gilbert moved a nominal reduction of £1 in order to give the chairman of the Establishment Committee an opportunity of offering an explanation of the slow progress which had been made with the building. Up to the end of last December the council had, he said, passed votes amounting to £806,725, and of this only £375,000 had been spent. The hall was to be open in 1917, but he believed that it would be five years later than that before it was finished. The chairman of the Establishment Committee said there was every desire to press on with the work, and he hoped the hall would be ready in 1917. The trouble in the building trade had, however, delayed the work. The amendment was withdrawn.

Street Repairs in London.—Mr. R. A. Norton, 15 Queen's-terrace, Jesmond, Newcastle-on-Tyne, writes: "I read with much interest the article in your last issue with reference to the breaking up of streets for repairs to gas, water mains, &c. I would wish to point out that, as far as manholes, gullies, hydrants, gas and water covers are concerned, my patent surface boxes will minimise the difficulties stated by your correspondent. The special advantages are that broken, smooth, or dangerous covers can be removed and new ones refixed in a few minutes without disturbing the roadway, &c., thus preventing their disfigurement and inconvenience to traffic. These cases have been universally adopted by public bodies in the North of England. I note your correspondent emphasises the expedient methods of work carried out in the provinces. It was owing to the repeated complaints from engineers and surveyors of local authorities of interference with their roads and inconvenience to traffic that I went thoroughly into the pros and cons of this matter, the result being I devised a surface box that will entirely overcome many of the objections raised by your correspondent."

IS THE STREET TRAMWAY DOOMED?

(From the *Auto-Motor Journal*.)

From correspondence which is appearing in *THE SURVEYOR* it would seem that there is growing up a strong current of feeling among road engineers that the day of the tramway is fast passing away. As a matter of fact, there does not, among the correspondents of that journal, appear to be one who has the courage to say that the tramway will eventually hold its own with the more modern and flexible methods of traction by motor vehicle. The most pronounced of the anti-motor writers—though "anti-motor" hardly expresses the matter, since none actively disapprove of the motor 'bus—predicate that the time is arriving when motor traction must be more heavily taxed for the upkeep of the roads. That is a matter of argument which does not, however, affect the main proposition of motor traction v. tramways, which is really all that matters as a main issue. In the issue of *THE SURVEYOR* of the 17th ult. there is an interesting letter on this subject from the pen of Mr. Reginald Ryves, whom the older members of the *Auto* may remember as a contributor to its pages some years ago. After justifying the opinions he expressed before a meeting of the Institution of Civil Engineers, to the effect that the tramways are doomed, Mr. Ryves proceeds to say that:—

"A belief that the tramway is doomed involves no adverse criticism of the work of tramway engineers. The tramway system is a fine example of engineering skill; the trouble is that it is in the wrong place on public roads and streets, and prevents the application of methods of construction and maintenance proper to such highways. The authorisation of trailers on certain lines only hastens the end, being at once a challenge and an admission that the tramway is a railway. While they have been occupying the public roads, the natural sphere of the tramways has been to some extent filled by branches and loops of steam railways intended for local traffic, and possibly less suitable for that traffic than would have been tramways of the ordinary type occupying roads of their own. The railways strangled the first-born of the motor-vehicle family, and put a changeling in its cradle, and the proper place of that changeling is now occupied by the legitimate offspring of the railways, while the younger and more vigorous children of the motor-vehicle family are struggling for their birthright."

That has been our attitude from the time when first we began to realise that the development of above-ground traction meant a fight to the death between motors and tramways. There is no quarrel with the tramway engineer, who has done his work admirably well, but there most decidedly is one with bodies like the London County Council, who have rushed into a suicidal tramway policy, spending the money of the ratepayers like water in an endeavour to balance two wrongs into a right. It is not as though these bodies had not had ample warning of what was likely to happen. Not only did those warnings come from those interested in the development of motor traction, whose views, it is true, might have been somewhat tinged by enthusiasm for the new locomotion, but road surveyors as long ago as 1905 warned them of what would ultimately happen. Therefore, if they find themselves committed to huge, money-wasting enterprises which they are unable to justify, they have only themselves to blame. The pity is that it is not their own money with which they are playing. We venture to think that if it had been, there would not have been so much of it sunk in an obviously hopeless attempt to make ends meet.

Sewage Disposal in Linlithgowshire.—The new sewage disposal works for the district of Broxbourn, Linlithgowshire, were recently formally inaugurated. The works were designed and carried out under the supervision of Messrs. Hunter, Duff & Middleton, Edinburgh, Mr. David Gibson, Glasgow, being the contractor. The works deal with the sewage from the drainage districts of Broxbourn, Broxbourn West End, Uphall and Dechmont, besides that from Bangour Asylum, the total population being about £12,500. The cost of the purification scheme, including nearly ½ mile of an extension of the main sewer, will be somewhat over £9,000. The revolving distributors were supplied by the firm of Adams-Hydraulics, Limited, York.

Skidding Vehicles and Street Pavements.

CAMBER: WHEEL DIAMETER: DRIVING.

The friendly discussion on the subject of the skidding of vehicles, which has been a feature of some of the recent issues of the *Commercial Motor* and *THE SURVEYOR*, has reached a point at which it is convenient, and may be profitable, to summarise briefly the most important of the considerations brought forward. Attention may be directed to an article in the *Commercial Motor* of April 23rd, and to one in the *Motor* of April 21st, the latter being a somewhat unexpected contribution to the discussion in the form of an acceptance of certain conditions conducing to skidding as being inevitable, an expression of agreement with *THE SURVEYOR* and the *Commercial Motor* up to a certain point, and the conclusion that the most important means of preventing skidding is careful driving. "Skidding," we read, "is, and will be, an ever-present difficulty under certain weather conditions; it will always necessitate careful driving in order to limit the accidents that are likely to occur." The same idea is repeated in the closing words of the article: "Having regard to all the factors, it would seem that it is careful and experienced driving that will enable the car to escape from skidding difficulties with success."

CAMBER.

The view that camber is a very important element is supported, in the *Commercial Motor*, by certain data relating to the coefficient of friction between rubber tyres and asphalt surfaces; in different conditions of those surfaces. The resolved part of the weight of a vehicle parallel to the slope on which it is travelling is taken into consideration; and it is assumed that the portion of the coefficient of friction used in driving, a fore and aft resistance, is not available as a coefficient of sideways friction, preventing side-slip. An important omission, or what would be an omission if it had been attempted to show the relative importance of camber, may be noticed. No calculation is made of the amount of deviation from a straight path which, at a given speed, corresponds to a given amount of crossfall, or corresponding to the skidding point with the given coefficient of friction. A very moderate amount of deviation from a straight path introduces a force demanding an appreciable coefficient of friction parallel to the axle of the wheels. On a perfectly flat surface this factor would set a limit to the efficiency of a pavement with a given coefficient of friction between its surface and the tyres of the wheels; and it is evident that the combined effect of speed and deviation is very important indeed. This is a subject to which we shall recur at an early opportunity. It seems to be the view of the *Commercial Motor* that the alteration of the cambers of a considerable mileage of streets should at once be carried out. Against this idea *THE SURVEYOR* has brought forward two considerations. First, that in the places where camber is steeper than it ought to be there are usually a number of difficulties in the way of altering that camber; and some of these are connected with matters not controlled by the road authority, and not such as are decided on the advice of the highway engineer. Secondly, it has been pointed out, the proper camber for a street surface cannot be decided without reference to considerations other than the tendency of certain classes of vehicles to skid; while, in any case, the coefficient of friction which can be counted upon in the near future has not yet been determined even within fairly wide limits. Developments in vehicle design proceed apace, and it cannot be said that the solid rubber tyre, in its present form, is certain to be the heavy motor vehicle tyre of the near future. Considerable and costly alterations to street pavements and their foundations ought not to be made until this subject has been further considered. *THE SURVEYOR* also points out that the diameter of wheels has a considerable influence upon the tendency of vehicles to skid, and supports this view by considerations based on natural laws, though, having regard to the applications made and the manner in which they are made, the *Commercial Motor* considers that the main arguments are dependent on assumptions "in so far as they can be applied to any differences due to variations of wheel diameters on public service

vehicles." The *Commercial Motor* concludes its article with the following paragraph: "We will concede that the points, each admirably and simply put forward, are not to be disregarded, but we cannot believe that the editor of *THE SURVEYOR* himself believes or imagines that they approach in importance, severally or jointly, in these days of increasing rubber-tyred motor traffic, the resultant of more appropriate cleansing of surfaces and reduction of camber."

The fairest way to answer this is to say that if we are to consider all the adaptations of camber to traffic that should ultimately be made by the time that stable traffic conditions are established, as well as all the improvements in cleansing that can ultimately be called for, within the limits of an economic but liberal expenditure, then wheel diameter, though still important, would not be sufficiently so to "approach in importance" these two elements taken together. To-day, however, the financial conditions, and the uncertainty of developments in surfaces and tyres, are such that, for the time being, wheel diameter, as a matter that could and should receive immediate attention, has an immediate importance certainly approaching the combined importance of the other two elements. The essential difference between the position as regards wheel diameters and that as regards camber and cleansing is that the influence of diameter is one which it will be felt under any conditions, while the actual amount of camber or of cleansing which may be desirable will depend upon the coefficients of friction between the particular kinds of tyres chiefly in use, upon the particular kinds of street surface on which the hold of the wheels is least effective, and upon other factors. It is contended that we should do first what will anyhow be right, and in the meantime seek the best solution as regards matters which cannot be decided except after further study and trial. Such changes of camber as are obviously desirable should be made as circumstances permit, and the best practice in street cleansing should be steadily extended, and any further improvements that are desirable should be adopted.

It may be remarked that, having regard to the importance of the coefficient of friction as a factor affecting the allowable deviations occurring when a vehicle is steered along a busy street, there are many cases in which wheel diameter is a more important factor than camber, within the limits of the worst camber that would be tolerated and the least that would be practically convenient. Some of the steepest cambers should be altered as soon as is convenient, and there are many places which should be marked down for attention as soon as some definite conclusions can be arrived at with respect to the worst coefficients of friction that can be tolerated, whether the fault lies with the pavement or with the tyres. That is to say, we must first decide what coefficient should be demanded as the result, if necessary, of improvements in the street surface or in the tyres, or both, and then, not before, decide what are the steepest crossfalls that may be allowed with different classes of pavings. As regards the cleansing of street surfaces, it is difficult to assign a definite meaning to the word "improvement" in the paragraph quoted above. Assuming that the conditions are those where cleansing is most efficiently carried out, wheel diameter is more important than any further measures that can be thought of, under the head of cleansing. Under conditions which are those of the streets in which watering, sweeping, and sanding are least efficiently carried out, the improvements that can be effected under this head are probably greater than those which would result from increases in the diameters of wheels. Between these two classes of cases there is a large number in which considerable improvement could be effected by further expenditure in cleansing, and especially in watering and sweeping combined, in drizzling weather. As regards these cases we may look for a steady development of a sound policy, not due to outside pressure, but the result of friendly competition between municipal engineers in producing sufficiently good results with a reasonable expenditure. This seems to be the view expressed in the *Motor*.

The writer of the article in that journal evidently realises, perhaps instinctively rather than as a matter of reasoning, that even on a perfectly flat road surface the deviations necessary in steering, and the effects of braking, produce skidding; and he perceives therefore that camber is not so important a factor as it is considered to be by the *Commercial Motor*. "Road Engineer" also regards the perfecting of street surfaces as an impossibility; and he therefore considers careful driving to be the most important factor. This interesting article is reproduced below, and a few remarks are necessary with reference to the third paragraph. It cannot, of course, be admitted that we "scoffed," however "amiably," at the suggestion that camber is a factor in skidding; and we did, in fact, agree that the figures put forward in the *Commercial Motor* were significant, though not conclusive. We did not advocate the use of broader tyres as a means of reducing side-slip, chiefly because they would, on the whole, increase side-slip. Nor did we state that "larger diameter wheels were the solution." To recognise an important factor is not the same thing as finding a solution. Nor was our advocacy of larger diameters based in the least on the assumption that the larger the area in contact with the road surface the greater is the resistance. What we did say was that one of the *least important* of the advantages of large wheels is that they give a *longer* contact with the road. We gave other and more important reasons, based on a study of the elastic strains on wheels.

In stating that he is inclined to think that "all of the writers have missed the real causes of skidding, and how difficult it is to deal with them," "Road Engineer" is, in effect, strongly supporting municipal engineers against those whose comments on skidding are so made as to give the impression that the municipal engineer is chiefly responsible, and for this reason we forgive him for his misreading of our own arguments.

The most valuable contribution that could now be made to the discussion would be the presentation of further data similar to those put forward in the *Commercial Motor*, and relating to the actual coefficients of friction between tyres and pavements. The importance of most other factors can be indicated partly by calculation or by considerations based on the laws of dynamics; but the coefficients of friction provide the prime data. The only substitute for directly observed coefficients of friction is the estimation of these coefficients from the behaviour of vehicles travelling at known speeds and skidding at measurable deviations from a straight path under recorded conditions of the street surfaces. It would, of course, be possible to come to certain conclusions as the result of observations made without measurements, but it seems a pity to rely only on these. Lastly, it may be pointed out that the humble receptacle for banana skins, other fruit refuse, and loose papers is by no means an unimportant factor in the prevention of skidding.

THE ARTICLE BY "ROAD ENGINEER" IN THE "MOTOR."

To all intents and purposes we are at the beginning of the season when the most careful driver feels that he is free from the unnerving "skid" which renders him helpless, and causes dismay to all who happen to be in the immediate vicinity.

In the early part of the year, a writer in the daily Press was so evidently annoyed—probably from a painful personal experience—that he quite calmly suggested that a time limit should be given to horsed traffic, because he was obsessed with the idea that the horse manure was the cause of the trouble.

Then the editor of the *Commercial Motor* and the editor of *THE SURVEYOR* endeavoured to deal with the problem of skidding; one suggested that the contour of the road is a factor and gave interesting figures, the other amiably scoffed at the suggestion, and brought to bear an exposition that broader tyres and larger-diameter wheels were the solution—on the assumption that the larger area in contact with the road surface the greater the resistance.

The writer is in agreement with both of these solutions up to a certain point, but he is inclined to think that all of the writers have missed the real causes of skidding, and how difficult it is to deal with them.

Skidding is, and will be, an ever-present difficulty under certain weather conditions; it will always necessitate careful driving in order to limit the accidents that are likely to occur.

Generally speaking, the road is in its most dan-

gerous state, in this respect, when a gentle, drizzling rain falls; this rain acts as a washer to the atmosphere, and brings down a large quantity of carbonaceous matter—soot—which acts as a lubricating agent to the surface of the smooth-faced roads. A heavy rain also brings down the soot, but it is washed away into the channels, so that in such circumstances skidding is not so prevalent. Then there is another cause: When motors or other vehicles constantly and continuously use a road, a certain amount of very finely divided material is abraded from the surface of the road material. In dry weather this material is in the atmosphere, and if the dust that is blown on to pavements, shops, houses, &c., is microscopically examined, it will be found that it is composed mainly of wood fibre from the wood pavements, and very little material that can be said to be horse manure. In the case when the gentle rain occurs, this finely divided material is retained on the road surface, and, not being a part of the pavement, it is in a sense loose, and, like all very finely divided material, acts just as a lubricant will act, and also, unless there is sufficient weight on the tyre to cut through it to the actual road surface, the wheels will fail to grip the road, and, consequently, will skid.

The suggestion that larger and broader wheels should be used is a very proper one, and will apply in certain circumstances; such a policy appeals to the road engineer because it reduces the wear of the structure, and it would be equally satisfactory to the vehicle owner; but it is doubtful whether it would prevent skidding, although it may minimise it.

The broad and long-bladed ski distributes the weight of the sportsman who slides over the surface of the snow. The same person, however, uses a thin and short skate if he does not wish to slide over ice.

For the same reason non-skid tyres are steel-studded; these studs reduce the area in contact with the road, and thus the greater weight than is the case with the plain rubber tyre enables it to cut through the slimy material between the wheel and the actual road surface more effectively. Parsons chains perform the same function as do the steel studs placed in horses' shoes, and the wheels of tractors in winter weather.

The writer was travelling on a tar-painted road, the surface of which was like glass, because at the time a heavy rain had chilled the surface and had hardened it, and at the same time had washed it free from any extraneous material. The surface was level, and the car was travelling in the centre of the road. Having suddenly to slow down, the brake was applied, and, before it was realised, the car had turned completely round in its own length and faced the opposite direction. One wheel was fitted with a steel-studded tyre and the other with rubber. It was a case in which the rubber tyre had gripped the road, and the steel-studded tyre had glided over the surface. The front wheels, being lightly loaded, were willing to do anything, and, consequently, the wheel that gripped was the pivot or centre, while the other wheels made the half circle.

In another case, where the two rear wheels were fitted with non-skids (steel-studded), and travelling on a perfectly dry wood pavement, the car, in turning a corner, skidded half round; here the wheels should have been fitted one with a non-skid and the other with plain rubber, because the steel studs could not cut into the pavement, and the broader tyre would have given the resistance which the studs failed to do.

On macadam roads so much fine material is abraded in the interior of the structure that in wet weather it is forced upwards, and it is this muddy mass, in a pasty condition, which has to be cut through by sheer weight in order to prevent a skid.

It will have been observed when a very powerful engine in a car is exerting full power, and the driver is careless enough to allow this power to be suddenly transferred to the driving wheels when the car is at rest, that the wheels suddenly revolve without the car moving. The power is probably sufficient to enable the car, under other circumstances, to travel 30 miles per hour. Suppose that the car is actually travelling 30 miles per hour, and the brakes are suddenly applied, then the vehicle is bound to skid, because the wheel surface in contact is not sufficiently broad to take up the resistance that the road offers. The same argument applies if the vehicle is travelling at 10 or 15 miles per hour if the road surface has, by any contingency, had its coefficient of friction reduced by hardening, as in the case of the tarred surface above described—in such circumstances the suggestion of the broader wheel and larger diameter is

applicable—but when it is a film of lubrication that lies on the surface, then the tyre which gives the greatest weight on the unit of area in contact with the road will give the most satisfactory results.

During the dry summer weather there is no necessity to use steel-studded tyres; they should be used as a "spare" wheel for wet weather only, and otherwise for winter use.

Having regard to all the factors, it would seem that it is careful and experienced driving that will enable the car to escape from skidding difficulties with success.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2

ROAD TERMINOLOGY.

To the Editor of THE SURVEYOR.

SIR,—May I trespass on your courtesy to make a few brief remarks on "Engineer's" letter, which appears in the current issue of your journal?

The letter from me (THE SURVEYOR of April 17th), which is referred to by "Engineer," was addressed to laymen. It was, in fact, a few suggestions from a layman to laymen with a view to our adopting greater uniformity in the application of road terms.

I am disappointed that an engineer should have used the publication of my letter as an opportunity to attack the Standardisation Committee. Surely the chairman of the committee is entitled to confer with the American engineers—I would respectfully suggest it is his duty to do so—and thus bring British road terminology into line, as closely as possible, with that which is now under review in the States. Surely, if the result of the co-operation is to be, as "Engineer" surmises, to classify petroleum pitch as "bitumen," no harm will have been done to either science, usage or commerce. Bitumen is a generic term which can be correctly applied to a number of substances which have physical properties.

When one comes to consider what material may be defined as "natural asphalt bitumen" and "asphalt bitumen," differences may—I do not say they will arise; but that would be dangerous ground for a layman to tread upon. Yours, &c.,

JOHN HUTCHINSON.

11 Tothill-street,
Westminster.

May 3, 1914.

THE DOVER MEETING: RAILWAY FACILITIES.

To the Editor of THE SURVEYOR.

SIR,—I am endeavouring to obtain reduced fares for a party travelling to the above meeting from Charing Cross (South-Eastern and Chatham Railway).

Provided that a sufficient number of members assemble at the third-class main line booking office, Charing Cross (South-Eastern and Chatham Railway), not later than 8.40 a.m., I hope to get tickets issued at the reduced fare of 8s. 9d., third-class return, available by the 9.7 a.m. from Charing Cross, reaching Dover at 11.28 a.m.—Yours, &c.,

J. W. DUDLEY ROBINSON
Secretary.

Institution of Municipal and County
Engineers.

92 Victoria-street, S.W.
May 6, 1914.

Bristol Tramways. Bristol Corporation—one of the very few municipalities not owning a tramway system—on Monday succeeded in getting passed by a House of Lords Committee a Bill empowering them to work tramways. The committee insisted on the insertion of a clause providing for the purchase by the corporation of the undertaking of the Bristol Tramway Company within six months after May 1, 1915.

Chadwick Public Lectures.—At the Royal Sanitary Institute, on Thursday of last week, Mr. E. P. Hill, M.INST.C.E., member of the firm of G. H. Hill & Co., Manchester and Westminster, delivered the first of the present year's series of Chadwick Public Lectures, taking "Water Supply" for his subject. The lecture was an epitome of the course of Chadwick lectures delivered at the Birmingham University a year ago, and was repeated with the special object of showing a London audience the very fine series of illustrations which have been collected by Mr. Hill.

ROYAL SANITARY INSTITUTE.

A YEAR'S WORK.

One of the most interesting features in the work of the Royal Sanitary Institute during the past year is the progress made in its development in other Dominions of the Empire. An additional branch of the institute has been formed in British Columbia, and meetings for discussion have already been held. New examination centres have been established in Rangoon in conjunction with the Government of Burma, in the provinces of Quebec and Manitoba in Canada, and in British Guiana. Branches and examination centres are now established in every Continent of the world, and in every Dominion of the Empire, and in nearly all cases courses of training for sanitary officers have been arranged by the authorities concurrently with the establishment of the examinations.

A number of new exhibits has been added to the museum during the year, and the exhibits in the water supply section have been connected up with the water main so that they may be shown in working order. Alterations were made to the roof of the museum with the object of securing more light in the building, glass being substituted in place of the louvres at one end of the roof.

The statement of accounts shows a steady improvement in the general finances of the institute. The establishment charges have naturally increased with the growth of the institute, and the additional branches of the institute have involved further expenditure, and rather more expenditure than usual has been incurred in general repairs and office furniture; this cost has, however, been more than met by an increase in the receipts, especially those from membership subscriptions and examination fees, which are considerably higher than last year. The accumulated fund has been increased by the balance on the year's working. The total balance of the assets over liabilities, £17,555, is greater than last year by an amount of £300.

The total membership of the institute is now 4,434. The total of the elections to membership during last year is the highest reached in any one year, and the nett addition to the membership roll is larger than that for many years.

BUILDINGS AND STREETS CONSTRUCTION BY-LAWS.

APPOINTMENT OF A DEPARTMENTAL COMMITTEE.

The President of the Local Government Board has appointed a Departmental Committee to consider the control exercised in England and Wales over the erection of buildings and the construction of streets by means of by-laws and local regulations and their effect upon building and development, and to make recommendations.

The committee will consist of Mr. J. Herbert Lewis, M.P. (chairman), Sir Randolph L. Baker, Bart., M.P., Mr. A. E. Collins, M.INST.C.E., Mr. Eustace Piennes, M.P., Mr. E. J. Gowen, Mr. E. V. Hiley, Mr. W. T. Jerred, C.B., Mr. F. R. Harding Newman, Mr. J. Pointer, M.P., Mr. W. T. Postlethwaite, Mr. Raymond Unwin, and Mr. Henry Vivian, with Mr. A. N. C. Shelley, of the Local Government Board, as secretary.

Mr. A. E. Collins, who is the city engineer of Norwich, and engineer to the River Yare Commissioners, was in his early years engaged in railway construction in connection with Messrs. Tanzy Brothers, Birmingham. Afterwards he became chief engineering assistant to the borough engineer of Salford, and was subsequently appointed town engineer and water engineer at Weston-super-Mare, becoming three years later borough engineer of Reading. He was appointed city engineer of Norwich in 1894, and in 1905 he was elected president of the Institution of Municipal and County Engineers. Many of the municipal works of Norwich have been entirely revolutionised during his tenure of office there. Mr. Collins has had a wide experience as an expert witness on municipal and cognate works.

Mr. Gowen is clerk to the Croydon Rural District Council, Mr. Hiley town clerk of Birmingham, Mr. Jerred an assistant secretary of the Local Government Board, Mr. Harding Newman a land agent, Mr. Postlethwaite clerk to the Swinton and Pendlebury Urban District Council, Mr. Raymond Unwin an architect, and Mr. Henry Vivian chairman of Co-Partnership Tenants, Limited.

Exchequer Grants in Aid of Roads.

MEMORANDUM BY SIR GEORGE GIBB, CHAIRMAN OF THE ROAD BOARD.

Being Appendix XVI. of the Final Report of the Departmental Committee on Local Taxation.

(Concluded from last week.)

There can be no doubt that the growth of motor traffic does entitle highway authorities maintaining roads used by that traffic to claim special contributions from Imperial sources of revenue. It is generally through traffic in relation to most of the districts, and in many districts it forms a very large percentage of the total traffic. The Road Board have received seven-day returns of traffic on certain roads in several counties on the form which is appended hereto (Document No. 6 in Appendix), and, although the number of these is not yet sufficient for any general conclusions, the following instances may be given from returns received from the county of East Sussex, from which the most complete set of returns has been obtained.

It will be seen from the above figures that the percentage of motor traffic on some roads is very high, and the bulk of it is undoubtedly through traffic.

Moreover, the damage done by motor traffic (especially motor omnibuses, traction engines, heavy

wards which Exchequer contributions amounting to 50 per cent of the cost of maintenance should be given.

(2) Subsidised county roads, comprising roads towards which Exchequer contributions amounting to 30 per cent of the cost of maintenance should be given.

(3) County local roads, comprising roads maintained by or at the cost of county councils out of county rates.

(4) District roads, comprising all other public roads.

It is also suggested that, in addition to the regular grants suggested above, a general annual grant should be given to be administered by a central authority to enable special grants to be given in those special cases which would not be equitably met by the percentage grants.

No estimate can at present be made as to the amount of money involved in these proposals, because

EAST SUSSEX.

Instances from Statistics of Traffic compiled for the Road Board.

Road and point.	Date.	Average weight per day. Tons.	No. of motor cars, including motor cycles, per day.	No. of heavy motor vehicles and trailers per day.	No. of heavy horse-drawn vehicles per day.	Grand total <i>all</i> vehicles, excluding ordinary cycles and trancars per day.	Percentage of motor vehicles (including trailers) to total of <i>all</i> vehicles, excluding ordinary cycles and trancars.
Heathfield—Battle (Main Road), south of Main Road junction at the "Crown Inn," Heathfield	Aug. 28 to Sept. 3, 1911	461	29	1	66	210	12
London—Crawley Down. Turners Hill—Cophorne, south of County Boundary at Cophorne	Aug. 28 to Sept. 3, 1911	218	17	3	38	150	33
Flinwell—Hurst Green, south of Cross Roads at Flinwell	Aug. 28 to Sept. 3, 1911	178	65	8	2	91	81
London—Brighton (Main Road), north of Patcham	Aug. 28 to Sept. 3, 1911	1,204	131	35	91	662	70

motors and trailers) in the case of roads which have not been constructed of adequate strength and suitable materials for bearing such traffic is out of all proportion to the number of vehicles. The problem which has to be faced by highway authorities solely because of motor traffic, and mainly because of the heavy commercial motors, is a most serious problem, and a very large expenditure must yet be incurred in almost all counties (except in those counties, of which there are a few, which have already greatly strengthened and improved their roads) in strengthening the road crusts and substituting bituminous-bound methods of construction for the water-bound method.

Having regard, therefore, to the increase which has already taken place in maintenance cost, and to that which is certain to occur in the future, it is evident not only that the amounts and apportionment of the existing Exchequer grants should be revised, but also that the system should be altered as recommended above, so that the grants may represent a definite proportion of the expenditure on the roads to be classed as main roads, and thus increase with the increase of expenditure.

PROPOSED CLASSIFICATION.

As regards the reclassification of roads and the grant of proportions of actual expenditure, it is suggested that all roads should be classified into (1) urban roads, (2) rural roads, and that each of these groups should contain four classes, of which two classes should receive percentage grants as follows:—

(1) Subsidised main roads, comprising roads to-

this would depend on the result of the classification; but it is suggested that either a money limit should be fixed for the first year's grant, or that a mileage limit should be fixed for the mileage of roads to be included in the classes of subsidised main roads and subsidised county roads.

It is doubtful whether even maintenance grants on the scale suggested will sufficiently meet the case. There are many miles of road in nearly every county which were excellent roads before motor traffic commenced, and which could have been maintained as good roads on the water-bound system even under a large increase in ordinary horse-drawn traffic. But these roads have not sufficient strength to bear traction engines and heavy commercial motors or motor omnibuses, and the use of the roads by even a small number of these vehicles causes great damage, involving heavy cost of repair. The fast and light motor traffic also damages such roads and materially shortens the life of the surface coatings, thus causing heavy increases in expenditure, due to the necessity for more frequent renewal of the surface coatings. An increase in ordinary maintenance expenditure by frequent renewals of surface coatings in water-bound material is a most extravagant and wasteful way of meeting the difficulty. What is required is an alteration in method and materials, and the adoption of bituminous binding. Improvements of this character would check the waste and the increase in maintenance expenditure which is now going on, and would undoubtedly repay the highway authorities for the extra initial cost by reducing the future cost of re-

newals. In the case of a road having an average width of 18 ft. and carrying a volume of traffic which involves re-coating the surface in water-bound material once in four years on the average at an assumed cost of 18d. per super. yard, which on the basis of the assumed width is equal to £792 per mile, the adoption of tar-macadam at an assumed extra cost of £528 per mile would, if the extra cost were spread over eight years, probably save the highway authority as much as 10 per cent on the average annual cost for repairs and renewals. But the provision of the money for the extra cost is the difficulty. It is quite impracticable for highway authorities generally to pay for this extra cost out of the rates, and no system of grants towards maintenance expenditure will enable them to do so.

It is so important, however, that the crusts of main roads should be strengthened and improved in order to enable them to bear the motor traffic, which is certain to increase, that in any revision of the system of grants to road expenditure, an endeavour should be made to provide means whereby highway authorities might be enabled to protect themselves against the further increases of expenditure which are certain to occur unless many miles of road crusts are strengthened and improved.

It is suggested, therefore, that a loan fund should be created to be administered by a central authority from which highway authorities might borrow, without interest, for the purpose of enabling them to strengthen and improve road crusts. A fund of £5,000,000 would enable loans to be made for periods varying, say, from three to ten years, which would at an average extra cost of £500 per mile enable about 10,000 miles of road to be improved in the manner indicated. This would be the most useful form in which assistance could be given to road authorities. It would also be an economical form for the State, as the cost would merely be the loss of interest on outstanding loans.

The Road Board have power under the development and Road Improvement Funds Act, 1909, to make grants and loans to highway authorities out of the Road Improvement Fund, the income of which is now estimated at about £1,250,000 per annum.

The board have no power to make grants "for ordinary repairs essential for placing a road in a proper state of repair," and it is undesirable that any part of the Road Improvement Fund should be diverted to such purposes. Grants and loans are being made for the purpose of strengthening and improving road crusts, but these diminish the amount which would otherwise be available for improvements in the widths, alignment, and gradients of roads and for the construction of new roads, and the total amount which can be granted or advanced by way of loan for road crust improvement is not sufficient to meet the urgent need to strengthen roads to enable them to carry motor traffic without undue increase in the expenditure on repairs and renewals. If this increase is to be checked it can only be done by carrying out the work of strengthening and improving the road crusts on an extensive scale, promptly, and inasmuch as the expenditure required is of the nature of capital expenditure, and would result in savings on maintenance account, the best way of dealing with the situation would appear to be the creation of a substantial loan fund in the manner suggested.

The case of London and county boroughs needs separate consideration. There are no main roads in the technical sense of the term in these areas, but county boroughs in the year 1909 shared to the amount of £290,947 in the proceeds of the assigned revenues. Probably some part of this amount represented an equivalent for abolished earmarked grants which were paid in respect of roads formerly county main roads and now included within county borough areas.

TRAFFIC RELATIONS BETWEEN COUNTIES AND COUNTY BOROUGHS.

It is difficult to justify any claim for State assistance to the maintenance of roads within county boroughs by the same arguments as are used to justify grants to roads in rural or small urban areas. If the object in view is merely, on general grounds, to make payments from national sources of revenue for the relief of local ratepayers, it may be convenient to contribute part of the total relief to the item of road maintenance, but none of the factors on which reliance is placed in order to establish that road maintenance is a national service are present in the case of county borough roads. The traffic using

these roads is preponderantly local or regional, and the standard of maintenance required is not raised or materially affected by the small percentage of through traffic which may use some of the roads. The total burden of maintenance cost in the year 1909 amounted in county boroughs to 5.5d. per £ of assessable value, and 27.3d. per head of population, the corresponding figures for metropolitan boroughs being 4.22d. and 36.7d. These figures contrast with an expenditure in the administrative counties of 14.2d. and 72.4d. respectively, or, after deduction of the Exchequer contributions to main roads, 11.2d. and 57d. Measuring the burden, therefore, by its ratio to assessable value, it is much less in county and metropolitan boroughs than in the administrative counties, and it cannot be said in the former case, as it can in respect of some roads in the latter case, that the burden is materially affected by through traffic.

It must also be remembered that county boroughs enjoy an advantage in not contributing like urban authorities in administrative counties to the maintenance of county main roads. There is no doubt an exchange user of the roads inside and outside of county borough areas, but there can be no question that the burden thrown upon adjoining outside roads by county borough traffic greatly exceeds the burden thrown upon inside roads by county traffic. Each year this excess of burden thrown upon the outside roads becomes greater as motor traffic increases, and especially the practice of delivering goods over wide areas by means of motor vans and heavy commercial vehicles. The account may be fairly adjusted by the additional rateable value of premises in the proximity of the outer boundary of county boroughs, but the point certainly requires consideration in connection with any claim on the part of county boroughs to share in funds drawn from national taxation for assisting road maintenance.

It may be useful to illustrate this point by a concrete example:—

Coventry and Birmingham are on the main London-Holyhead road. They are situated 17 miles apart, and the intervening road is a main road maintained by the Warwickshire County Council. It is probable that on the Warwickshire section 90 per cent of the traffic originates either in the county boroughs of Coventry and Birmingham, or from outside the county of Warwickshire. If Warwickshire maintained this road for the 10 per cent of local traffic originating in its own county, its expenditure would be very small compared with the expenditure that it has to incur to maintain the road in a strong enough condition to carry the through traffic on the Holyhead road, and the commercial and pleasure traffic originating in Coventry and Birmingham.

Neither Coventry nor Birmingham contribute to the Warwickshire roads, and the case of Warwickshire for some assistance in respect of this section of road is, therefore, on these grounds a strong one.

Consider now the position as regards that section of the Holyhead road which is situated within the county borough of Birmingham. In the central parts of the city the proportions of local and through traffic are reversed, and it may be assumed that at least 90 per cent of the traffic on that road originates or terminates in the city of Birmingham, and only 10 per cent or less is through traffic. Birmingham must, therefore, make and maintain a good and strong road in order to carry its 90 per cent of local traffic, and to satisfy the demands of its own ratepayers, and once a strong road has been laid down the 10 per cent of additional traffic from the outside imposes practically no additional burden upon the city.

On the outskirts of the city the proportions will vary and approximate more to those prevailing in the county, but, generally speaking, it is impossible to say that in the case of large county boroughs like Birmingham, Leeds, Liverpool, Manchester, as well as in the administrative county of London, the through traffic doubles or quadruples the cost of maintaining the roads, as it does, in fact, on many a county main road connecting two important county boroughs.

It would be very difficult to select particular roads within county borough areas for the purpose of classifying these as subsidised main roads in the manner suggested for county areas. Perhaps, on the whole the best conclusion on this matter would be that county boroughs should be left to bear the comparatively slight burden which the maintenance of roads throws upon them, and that any relief to their local taxation should be given under other heads of expenditure; but if it is thought desirable in principle that

TABLE VI.

FORM No. 12.

Reference No. _____

County _____

THE ROAD BOARD—SUMMARY OF STATISTICS OF TRAFFIC.

Where taken _____

(The exact spot must be indicated on a small sketch plan on back of Summary Sheet. The plan should show the widths of (a) the metalled carriageway, (b) the footpaths, (c) the roadside margins.)

Days on which Census was taken _____

Time: Each day from _____ m. to _____ m. Width of Carriageway in feet _____

Classification of vehicles.	Assumed average weight.	Number each day of					Total in seven days.		Average number.		Total weight in tons per yard width of carriageway.	
		hours.					Number	Weight in tons.	Per day.	Per hour.	Per day.	Per hour.
Ordinary cycles	Tons. 0.09											
Motor cycles	0.13											
Motor cars (including motor cabs and any other motor vehicles not specified)	1.6											
Motor vans (covered)	2.5											
Motor omnibuses	6.0											
Motor lorries (rubber tyres) ...	6.0											
Trailers to rubber-tyred lorries	5.0											
Motor lorries (steel tyres) ..	10.0											
Trailers to steel-tyred lorries	5.0											
Light tractors	5.0											
Trailers to light tractors ...	5.0											
Traction engines	12.0											
Trailers to traction engines ...	8.0											
Total motor vehicles and trailers												
Light vehicles (one horse) ...	0.4											
Light vehicles (two or more horses)	0.6											
Heavy vehicles (one horse) ...	1.25											
Heavy vehicles (two or more horses)	2.5											
Omnibuses (two or more horses)	3.0											
Total horse-drawn vehicles												
Tramcars ()*	—											
Horses (led or ridden)	0.5											
Cattle	0.3											
Sheep and pigs	0.1											
Hand carts and barrows ...	—											
Horses drawing vehicles (to be calculated from number of vehicles)	0.5											
Grand total												

NOTE.—Steam rollers not recorded.

* Insert "Electric," "Steam," or "Horse," as the case may be.

county boroughs should share in road maintenance grants, then the share should be fixed by one or other of the following methods:—

(1) Roads to be selected and classified by central authority as subsidised main roads in county borough areas, and to receive subsidies calculated as near as practicable at the same rate per square yard on the selected roads as the average grant to subsidised main roads in the adjoining county or counties.

(2) Grant a small annual percentage, say 5 to 10 per cent of the total cost of maintaining all roads in county boroughs.

(3) In lieu of grants to maintenance, grant a fixed annual sum based on population to each county borough, to be spent either on the widening of roads or the construction of new roads to relieve traffic congestion.

It would probably be right to treat London in the same way as county boroughs.

SURVEYORS' QUALIFICATIONS AND SALARIES: PROPOSED STATE CONTROL AND CONTRIBUTIONS.

Questions in regard to the improvement in the condition of roads and savings in expenditure which might be effected by extending the practice of direct maintenance of main roads by county authorities are probably beyond the scope of the inquiry by the Departmental Committee, but there is one point of considerable importance which may be mentioned. The work of road maintenance under modern conditions requires a high standard of engineering skill and knowledge, and the organisation of a county surveyor's establishment cannot be carried out on a proper footing without an adequate and efficient staff. There is great risk of waste in any attempt to reduce the salaries and numbers of staff, or travelling expenses in the county surveyor's department below what is necessary to secure a good organisation and thoroughly efficient administration and supervision of the road work. It is desirable, therefore, to attract to the position of county surveyor men of good education and technical knowledge.

It would assist in gaining this result if one-half of the fixed salaries of county surveyors and, say, one-fourth of the salaries of staff, limited to a fixed sum per 100 miles of road under direct maintenance, were paid by the State, subject to a central authority being satisfied as to the qualifications, duties, and tenure of office of the county surveyor.

There are precedents for this course. One-half of the salaries of chief constables, medical officers of health, and sanitary inspectors are paid by the State, subject to their qualifications being approved by a central department. Any arguments that might apply for a State grant towards the salaries of these officers would apply in even a stronger measure to that of county surveyors.

SUMMARY OF PROPOSALS.

The following is a summary of the suggestions indicated in this memorandum, and of the procedure suggested for giving effect to them:—

(1) All public roads to be classified into the following groups:—

Urban roads—

- (1) Subsidised main roads.
- (2) Subsidised county roads.
- (3) County local roads.
- (4) District roads.

Rural roads—

- (1) Subsidised main roads.
- (2) Subsidised county roads.
- (3) County local roads.
- (4) District roads.

All bridges repairable by county councils on subsidised main roads or subsidised county roads to be deemed to be included in the expression main road or county road respectively.

(2) The classification to be made by some central authority after conference with highway authorities, and with power on its own initiative or on the application of a highway authority to determine the classification of each and every part of any road, and to alter the classification from time to time. Provided that the mileage to be included in the classes of subsidised main roads and subsidised county roads shall not exceed a prescribed limit.

No objection to sections of a continuous length of road being in different classes.

(3) All provisions contained in any existing Act of Parliament relating to main roads to remain applicable to roads classed as main subsidised roads, county sub-

sidised roads, and county local roads, except that secs. 15 and 16 of the Highways and Locomotives (Amendment) Act, 1878, shall cease to apply to main subsidised roads.

This would involve county councils taking over any district roads which may be classified as main roads in their existing condition. (See sec. 11 (7) of the Local Government Act, 1888.)

(4) The central authority to be empowered to determine whether any expenditure proposed or incurred in connection with any subsidised main road or subsidised county road, or district assisted road may be charged to—

- (1) Maintenance, or
- (2) Improvement.

Provided that all expenditure on works of drainage, widening of metalled carriageway or footpaths without purchase of additional land bottoming, strengthening or improving the road crust or footpath construction, plant and machinery required for the purposes of maintenance, and in addition thereto all works of improvement the aggregate cost of which does not exceed in any one year 10 per cent on the aggregate cost (including establishment charges) of maintaining all the subsidised main roads and subsidised county roads in the area of such highway authority shall be deemed to be properly chargeable to maintenance.

(5) Annual estimates of the cost of (1) maintaining, and (2) widening or improving all subsidised main roads and subsidised county roads to be prepared by the highway authorities liable to maintain such roads, and submitted on or before November 30th in each year to the central authority, who should prepare therefrom and submit to the Treasury a statement showing the total estimated cost of maintaining subsidised main roads and subsidised county roads in the following financial year, and should, subject to Treasury sanction, certify the amount payable by the Exchequer to the credit of the road maintenance fund in respect thereof.

(6) The amount so certified by the central authority, after approval by the Treasury, to be paid by the Exchequer to the credit of the road maintenance fund.

(7) The central authority to be empowered to authorise contributions by county councils (in addition to any contributions which county councils may make under existing statutory powers) to the cost of maintaining any district roads, which contributions are referred to in these recommendations by the expression "authorised contributions," and the roads in respect of which such authorised contributions are made are referred to by the expression "district assisted roads."

(8) The central authority to pay out of the road maintenance fund to each county council, non-county borough council, and urban district council in respect of roads maintainable by them:—

- (1) Fifty per cent of the certified estimated cost of maintaining subsidised main roads.
- (2) Thirty per cent of the certified estimated cost of maintaining subsidised county roads.
- (3) Special grants towards the maintenance of any main roads, and such percentage as the central authority may determine, not exceeding 25 per cent of authorised contributions by county councils to the cost of maintaining district assisted roads, but the total amount to be allowed under this head not to exceed a prescribed sum in any one year.

(9) Within two months after the close of each financial year highway authorities to submit to the central authority in prescribed form statements of the cost incurred in the maintenance and improvement of subsidised main roads and subsidised county roads, and differences between the estimated and actual cost of maintenance may be taken into account by the central authority in distributing the grants in aid of maintenance from the road maintenance fund in the succeeding financial year.

(10) The central authority to be empowered to cause inspections to be made of the work of maintenance on all subsidised main roads, subsidised county roads, and district assisted roads, and to withhold or reduce any grants in aid of the cost of maintenance of any road or roads if they consider that such road or roads have not been properly and adequately maintained.

(11) In addition to the above grants an annual grant to be made to cover one-half of the cost of the salaries of county surveyors, and one-fourth of the

cost of the staff employed in the county surveyor's department, limited to a prescribed amount per 100 miles of road directly maintained by county councils.

(12) Roads in county boroughs to be dealt with in one or other of the three following alternatives:—

- (1) Roads to be selected and classified by a central authority as subsidised main roads in county borough areas, and to receive subsidies calculated as nearly as possible at the same rate per square yard on the selected roads as the average grant to subsidised main roads in the adjoining county or counties.
- (2) Grant a small annual percentage, say 5 to 10 per cent of the total cost of maintaining all roads in county boroughs.
- (3) In lieu of grants to maintenance grant a fixed annual sum, based on population to each county borough, to be spent either on the widening of roads or the construction of new roads to relieve traffic congestion.

(13) Roads in London to be dealt with in the same way as in county boroughs.

ENGINEERING JOTTINGS.

3.—SUBSOIL WATER.

By HERBERT G. COALES, ASSOC.M.INST.C.E., F.S.I.

Water is a very excellent commodity in its right place. But it has a way, sometimes, of hiding itself in positions where it is distinctly detrimental to the interests of man, particularly in the neighbourhood of towns. Natural and artificial channels for conveying away surface water are common—in fact, no town could comfortably exist without them. A point for consideration is: Should the subsoil water be similarly dealt with?

(1) *What is Subsoil Water?*—By subsoil water we mean the water that lies under the top soil of the earth. It may be only a few feet from the surface, or a considerable distance; it may saturate a foot or two of earth or a great many. Usually the subsoil water is held in its position by basins or pockets of impermeable strata. Probably most town engineers know, more or less, where to find the water, for only too often, to their annoyance, it makes its appearance in sewer trenches or foundations. With the additional aid of boreholes, judiciously put down, the basin or basins holding the subsoil water may be mapped out with a fair degree of accuracy. To what end? To let the water off to the sea as fast as possible; for, broadly speaking, it does no good bottled up under a town, but a great deal of harm.

(2) *Of What Good is Subsoil Water?*—Except so far as it may be, in some localities, passing on water to feed deeper water-bearing strata, or giving drink to certain classes of vegetation, we know of no benefit. It may be said that it is the source of supply to shallow wells, and the indispensable friend to the dwellers in country villages. In the abstract—on paper—it may be so, but not in reality. Everybody knows that subsoil water is dangerous for dietetic purposes. Not only is surface impurity taken down into the supply, but the drainage from churchyards, farmyards, manure heaps and defective sewers is duly assimilated too. It is, in fact, in too many cases, both soil-polluted and drain-polluted. An analysis of well water that would condemn it as a town supply is euphemistically styled "good" in a village, because it compares so favourably with another that is little better than sewage!

(3) *What Harm can be Attributed to Subsoil Water?*—The earth must be allowed to breathe, for, like man, she insists upon taking air into her lungs, and it is essential to our health that we who live upon her surface should only breathe, as far as possible, a dry air, and not one surcharged with moisture from a wet subsoil. A too often damp atmosphere is our national heritage, and any means we may take to make it more salubrious is in the line of common sense and good hygiene. A damp town is an unpopular and a shunned resort for men, whatever it may be for guats and frogs. Even inanimate objects, like bricks or timber, are prejudicially affected by damp, and as they are universally employed in the building of our homes, we as individuals suffer through them in pocket and general vitality. Consumption, so we are told, is only to be stamped out by a proper regulation of the conditions under which we breathe the air. Open-air sanatoria are not placed in damp places, but in dry ones.

Sanitarians have, for several decades, recognised

the unwisdom of neglecting the evils of dampness under dwelling houses. Hence the by-laws calling for dampcourses and for beds of concrete under floors. No doubt it is true these essentials to a dry house will always be necessary, even where there is no subsoil water beneath; but how much more so where there is!

Perhaps equally with the point of view of damage to health comes the economic one—the utter waste caused by subsoil water during the construction of public and private work, and the loss in the subsequent working or use. Dare one calculate the amount of subsoil water which finds its way into the public sewers, and, having to be raised by pumping, ultimately augments the necessary area of the precipitation tanks and the bacteria beds? This subsoil water, which ought to have been drained away into the nearest stream running seawards, has added to the initial cost of the sewers, the pumping arrangements, and the sewage disposal works. Water is the great bugbear of the sewerage contractor. How much has many a tender been increased by the fear of subsoil water? The engineer, too, has been obliged to specify a more expensively constructed sewer or culvert because of his dread of subsoil water.

The permanent lowering of the saturation level of the subsoil water in a town would cheapen the cost of all underground works of construction. One calls to mind the increased cost of the reinforced-concrete and asphalt floors and walls of basements, subways, tanks, and so forth, which the appearance of subsoil water in the excavations has necessitated.

In some of the older towns it is not an uncommon thing for basement floors in certain districts to be covered periodically with several inches of subsoil water. When, at last, a builder is called in, he probably prescribes "connecting with the sewer," which frequently means that the last state of that basement (say during a thunderstorm) is worse than the first.

There may be difficulties in locating or tracing the extent of the subsoil water, and of finding suitable outfalls for the discharging drains, for the underground strata is not like a sponge that one can seize and squeeze out. It is the province of the engineer, however, to realise and overcome such difficulties. The cutting through the lip of a clay basin might be sufficient to allow the imprisoned subsoil water to escape from beneath a favourably situated town, while in another it might be necessary to lay a system of underdrainage, either separately or during the construction of main sewerage.

It has been noticed in sewerage a village for the first time, the complaint is often raised that the water in the wells has been lowered, plainly showing that the subsoil water has been given a new diversion or outlet somewhere. On a bigger scale in cities and towns the level of the subsoil water might at least be lowered, to the raising of the standard of health, and of the pecuniary interests of the community.

Abertillery Water Scheme.—The Abertillery and District Water Board Bill, to enable the board to make an additional reservoir to be used as a compensation reservoir, has passed the Committee of the House of Commons, and sent for third reading to the House.

Wakefield Improvement Scheme.—On Wednesday Mr. W. H. Collins, an inspector of the Local Government Board, held an inquiry respecting the application of the Wakefield Corporation for an Order to confirm an improvement scheme under the Housing of the Working Classes Acts. The property involved is at the bottom of Westgate, on the northern side. It is proposed to demolish houses which at the present time accommodate sixty-eight persons, who will, it was mentioned, be offered new council houses which the corporation propose to build at Alverthorpe.

Cumberland Roads and Bridges.—At Wednesday's meeting of the Cumberland County Council, Mr. W. Dixon, in moving the minutes of the Highways Committee, said they were bringing all the roads into thoroughly good order, and during last year they received from the Road Board £9,355. The bridges were also being attended to, and that morning the committee had made their final selection of the tender for the new bridge at Floriston to substitute the old "Metal Bridge." The tender was that of Henry Holloway, Brothers (Limited), of Westminster, for £17,285 14s. 6d., being £15,829 14s. 9d. for new ferro-concrete bridge, and £1,456 19s. 9d. for road works and approaches.

Road Maintenance—Past and Present.*

By A. McARTHUR, Highways Surveyor to the Cuckfield Rural District Council.

It is with some diffidence that I venture to deal with this all-important subject, having no illusions as to my unworthiness in this respect; even so I will endeavour to present briefly the main everyday issues as they appear to me.

During the past decade, and especially during more recent years, the profession has been rich in theory as well as in practice. Much also has been done by commercial enterprise and speculation; inventive genius has been much in evidence, and brain and fortune have been freely requisitioned and expended in the praiseworthy efforts made to secure some more permanent means to combat the ill-effects of the revolutionised traffic, in the upkeep and maintenance of highways.

Of late years we have lived in a changed and quickened atmosphere. An Imperial Road Board and numerous associations have been formed, and International Road Conferences have been held. A prudent yet critical Press has followed each movement, reproduced each venture, and marked each stage in this history-making epoch.

In pre-motor days . . . we had apparently reached our goal or limit and become apathetic and inactive, so far as advancement was concerned, to an almost culpable degree. True, the nature and amount of traffic did not demand any great upheaval, and little serious effort was therefore made to think out the niceties now practised; the traffic conditions then were of the jog-trot order, but the fast running, mechanically propelled products of to-day have, as it were, thrown out a challenge to which no self-respecting road engineer could remain passive; hence the experimental and general activity now present with us. . . .

THE ENGINEER AND SURVEYOR.

Times are changed for the surveyor; his life is now one of ceaseless activity, onerous duties and heavy responsibility; old forms of maintenance are rapidly becoming inapplicable and lapsing into disuse, and many old ideas and traditions are exploded. The expert surveyor of to-day must think more and must combine a first-rate education with a thorough professional training. A rigorous schooling in fact is also an essential; as he necessarily comes into contact with all shades and classes, he must be well versed in the psychology of human nature.

ROADMEN.

Many people have the impression that any old man can be a roadman. This is a delusion. Too much care cannot be exercised in the choice of suitable workmen, for the well-instructed and skilled, able-bodied roadman is a valuable asset to his employers, and, incidentally, I might say, makes the office of the surveyor a lighter and pleasanter one.

The full-fledged surfaceman in this district has charge of $\frac{3}{4}$ mile section of road, and occasionally assists in other parts of the district. He is provided with a complete set of tools, a book of rules and instructions, also note books and stationery; nothing is left to chance, so that there can be no bar, real or pretended, to the proper execution and discharge of his duties.

In this connection I understand that an interesting, novel and practical method is in vogue on the Continent. Each responsible roadman carries with him a staff with a pointed end, about 5 ft. long, upon the top of which is attached a weatherproof box. It is the roadman's duty before commencing work to place this staff upright on the grass margin or other suitable place where it is in a prominent position. This is an indication to the surveyor or other supervisor that he is actually at work on that length. In this box is kept the roadman's note-book. The surveyor or supervisor is thus enabled to find out exactly where the roadman is at work and the nature of the work he is doing, and any incident that has happened worth noting.

The surveyor can also by this means inscribe in the note-book any instructions he may wish to convey, feeling sure that this is a reliable method of conveying the desired instruction or information.

Much depends on the character and the intelligence of the workman employed. The raw recruit has a great deal to unlearn as well as to learn. One frequently meets with the indifferent type, clumsy, and with little natural aptitude—the man who cannot see many inches beyond his own proboscis. Occasionally one discovers the born roadman, as in other spheres, the man with the innate faculty of doing the right thing in and at the right time. The former, however, if he is to be of any real service, must be placed in the hands of an expert and trustworthy lengthsmen until he is drilled into shape and acquires the necessary skill to be placed in charge of a section of his own.

ROADSTONE.

In my late district in Mid-Perthshire, Scotland, we unearthed and provided our own stone; a variety of excellent stone abounded in the district, and several good quarries were worked. Steam power was used in the rock drilling and breaking and grading of the quarried material, and a 3-mile aerial ropeway—at that time, I believe, the second longest in the world—was used to convey the broken stone from the main quarry to the nearest local railway station, whence it was distributed over the district.

Here, in the South of England, we have things made comparatively easy for us in this respect; imported broken material is almost exclusively used, there being only some pit-stone and flints available locally, both of which are, however, now practically "taboo" for surface maintenance. A fine range of granite is, however, placed on the market, but no little discrimination is required in regard to its selection.

The only sure test of roadstone is, of course, its actual wearing capacity on the road. Price, while it must have considerable influence on the question, should not be the only ruling factor; attrition and crushing tests serve as a valuable first guide, but such questions as impermeability to moisture, sub-soil, drainage, class of traffic, and other conditions should be well and carefully considered, and the material selected, compatible with a reasonable price, the best adapted for the general conditions prevailing. Other factors not the least important are the size, shape, and uniformity of gauge as well as delivery and specific gravity as applied in its relation to the covering capacity of the material. Perhaps these two latter points are sometimes overlooked, but they are things that matter; the best of organised systems may be seriously dislocated by belated deliveries, and result in considerable expense and inconvenience to the authority, and as regards the covering capacity of the stone, though the increased cover per ton gained may be slight, it counts for a very great deal where it is necessary to use many thousands of tons.

The following is a brief description of the special granites used in this district—viz.:

Quenast Granite.—Quenast is certainly one of the best granites used in this country for road-making purposes. It was introduced into England over thirty years ago, and we find it now used very extensively in all the counties in the South and East parts of England. It is a "porphyry" of exceptional hardness and toughness, and breaking, as it does, with a very rough fracture, there is a great advantage in using this material on roads where tar or other bituminous substances are to be applied. It comes from a town in Belgium which gives it its name, and the quarry itself is the largest in the world. It consists of one huge working, the dimensions of which are 1 mile long, $\frac{1}{2}$ mile broad, and over 300 ft. deep. The method of transporting the granite from the depths of the quarry and distributing it to the breakers and other parts is very interesting. This is done by means of an endless chain working throughout the quarry. The length of this chain is over 10 miles. This quarry supplied over 1,000,000 tons a year, the output going to such countries, besides England, as France, Germany, Belgium; in fact, it is sought after all over the Continent. It has the advantage of a very low specific gravity, and consequently a high covering capacity. Roads made with this granite have excellent wearing results, and at the same time maintain a smooth running surface until the material is entirely worn out.

Penmaenmawr.—Penmaenmawr granite is quarried

* From a paper read at a meeting of the Public Health and Local Government Officers' Association for Sussex on Saturday last at Haywards Heath.

The Surveyor

And Municipal and County Engineer.

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at Penmaenmawr, North Wales. These quarries are without doubt the largest and the most up-to-date in equipment in these islands. This granite is an "Estate diorite," and is probably used by a larger number of county councils and other public authorities than any other granite. It has the combined advantages of hardness, toughness, and consequent general durability, and, being of low specific gravity, its covering capacity is large.

Alderney Granite.—The Alderney granite is a diorite, which, as macadam, breaks very cubically, and without flaky pieces. Owing, however, to its peculiar "toughness," it is found quite impossible to cut or cleave it so as to make kerb, setts or cubes; but this quality, of course, gives it a special value as a macadam. It is largely selected on account of the high tarring value of the rock, for use in the new asphalt-macadam roads.

ROLLING.

Prior to the advent of the steam roller the stone applied on the roads usually received a heavy coating of earthy binding material, and was then left to be worked in by the traffic; occasionally a horse roller was used, but this was of little practical use either. The roads were therefore in a rough macadam condition for months together. Now the steam roller and the scarifier have become indispensable to the road maker, and a return to the old conditions would seem inconceivable to all of us; in spite of this fact, however, I was astounded when told recently that there are still some parts of England where the steam roller is not in use. It is into such areas I should like to consign the unlovely road-hog.

I am afraid that in the consolidation of metal sheer weight has too often been taken as the main factor. This, however, is a costly mistake, wasteful in material, and wholly unsatisfactory in results. The great aim in rolling should be to get as nearly as possible the perfectly formed crust, well keyed to the original surface, and the whole rendered compact with the body of the metal preserved intact or with a minimum of wastage. In my opinion, a 10-ton roller is quite heavy enough for use in the formation of the water-bound crust, and a still lighter engine is advisable for tar-macadam or other mobile material.

On weak, narrow roads the large roller is fatal, the tendency being to flatten the cross-section, and the carefully moulded camber so necessary to the construction of a well-made road is never secured.

This is especially conspicuous when the abutment of the road is weakened by open ditches close to the

hardway, and where this combines with the piecrust and clayey subsoil the road takes a concave instead of convex surface, becomes wavy in contour, and banks out until the ditches become choked. With the lighter and more narrowly built engine the camber is gradually worked up from the sides to the centre of the road, thus forming a well-shaped and properly keyed crown.

A minimum of water and foreign binder should be used in the manufacture of the new crust. Personally, I use a quantity of Mendip screenings and flint gravel as a supplementary binder. This, I find, facilitates the rolling process, and results in a well-knit mosaic finish containing a minimum of damaged aggregate.

I think I may also claim for this a better surface for tar-dressing, and in the case of flint gravel, which I use mainly for the steeper gradients, the horse traffic finds a more suitable surface, a better bite than could be obtained by the use of granite only.

A good deal of interest has recently been evinced in the question of the transverse corrugations that appear in the road crust. This is undoubtedly an important question, and I agree with many others that these waves first take their formation in the process of rolling. Whether a three-wheeled roller is to eliminate this waving tendency I very much doubt. Personally, I consider that an increased diameter of the front rollers would at least minimise the effect now produced. As it is, the weight, width and intense curvature of the smaller wheels must, especially with a mobile class of material, provoke this billowing tendency, and I cannot help thinking that the flatter segment obtained in the larger wheel would give a more even surface. This, I have no doubt, the mechanical engineer has under consideration, and will ere long, we hope, introduce some effectual adjustment.

Let me add, however, that there are contributory agents. Much of this corrugation is the result of excessive fatigue, unstable foundation, and is often aggravated by injudicious scarifying, careless application of the stone, and, in the case of the water-bound roads, the misuse of water and binding material. Excellent results can be obtained with the steam roller now in use if the materials used are suitable and the work judiciously carried out. I have myself seen newly rolled roads left in a deplorable condition, covered with slurry and full of water—a quaking and quivering mass when the traffic passed over it. The ultimate effect of such work is obvious, and cannot be expected to do justice to any type of roller.

ROAD CRUSTS.

I do not wish to further enlarge on the activity displayed in the endeavour to secure the ideal conditions, and I do not here propose to make any attempt to enumerate or describe the many types of road crust now practised.

Through the public-spirited kindness of my council I have been able, to some extent, to keep in touch with the progressive movement, and, so far as I can see, taking the subject in a general way, tarred slag macadam still holds its own. In this connection I may say that only quite recently I carefully examined the trial lengths at Sidcup, and, in my opinion, although the work was generally of a very high standard, the superiority of the tarred slag lengths laid by Messrs. Constable, Hart & Co., was indubitable, yet this form of crust has been in use for many years, though, no doubt, much improved of recent years.

Personally, I laid several lengths of tarred slag, supplied by Messrs. Smart & Son, in Balcombe Village about six and a-half years ago, and except where disturbed by sewerage operations the road is in an almost perfect condition at the present moment. The length not disturbed carries all the traffic to and from the railway station and goods yard, as well as general traffic, which is tolerably heavy, but not a penny has been spent in the way of repairs or dressing since the macadam was first laid in September, 1907. The cost per yard was 2s. 3-57d.

I might also say that nearly eight years ago I put down several experimental lengths of tar and pitch-grouted macadam (tarred macadam in situ); the aggregate was quenast and quartzite. The voids in the coarser aggregate were filled in with graded material and finished with a coating of fine screenings.

For the purpose of comparison I may mention that one of the experimental sections had three years previously been well coated with water-bound granite, which, however, by the end of that time was completely worn out.

The cost of the experimental work was under 2s.

per super. yard, which, with a dressing of tar every two years, may be put down at 2s. 6d. against 1s. 9d. for ordinary macadam. Practically no mending was necessary till the end of last year, so that having regard to the life of the respective crusts, the tarr-grouting system has everything in its favour.

SURFACE DRESSING.

The efficient surface dressing of a modern road is undoubtedly one of the most important items in the duties of an up-to-date surveyor. Although the process of construction may have been perfect to a point, a slight mistake in the surface treatment may go far to undo the good that is done. Weather conditions certainly, in my view, have such bearing upon the success or failure of surface painting that it is essential to have ample plant at hand so that at short notice full strength may be put on to take the first advantage of warm, fine days, which in this country are unfortunately too few.

The tarring of a surface which contains even the least moisture is, I believe, doomed to failure, or at least the risks are so great that waste of money in the form of materials and labour are more than likely.

Choice of materials is also of great importance, and I have found excellent results to be obtained by the use of carefully distilled tar or proprietary compounds, such as Tarvia. It is clear to me that there are two most important factors to be reckoned with, and more especially in surface dressing a macadam road which has not been previously treated, first to obtain the maximum of percolation, and second, to obtain a skin of the compound being used to resist the wear. This can be accomplished, I believe, by giving two coats, the first and ample one of light grade tar, allowing ample time for percolation before spreading the grit or chippings, and following in due course with a second coat of more thoroughly distilled tar or compound, and upon this a good coating of coarse grit or chippings.

The expense of twice treating is one of considerable importance, and in many instances no doubt would be found prohibitive; but the outlay will be well justified when the efficiency of the work and the durability of the road are taken into account.

With regard to blinding material, personally, I almost invariably have used a good local pit sand, and with this combination a good wearing pad has been obtained at a minimum of cost. I consider, however, that the best results will follow on the use of compo sand—a mixture of pea beach and sea sand. This gives a wonderfully effective and lasting armouring.

I do not favour an all-round use of coarse granite chippings or gravel. Such dressing may have a carpeting effect, and may answer fairly well on roads with light carriage traffic, but where heavy traffic conditions obtain I contend that their use is unwise. The chips are usually charged with moisture, and unless keyed in with the main road crust they are in a short time crushed by the traffic, leaving a pitted and damaged surface, a prey to adverse weather conditions.

Having reference to the methods of application, the relative merits of machine and hand dressing, I personally hold the view that the improved modern machine, on a properly prepared surface, gives equal, if not better, results, the work besides being carried out more expeditiously, which is a thing that matters much in tarring. I grant, of course, that there may be exceptional circumstances where the hand work is warranted. . . .

DRAINAGE.

It would be idle for me to lay any special emphasis on the importance of securing a proper and complete system of drainage, knowing as I do that this is a fundamental principle which is fully recognised by the road engineer.

Surface and underground drainage are the first essentials in good road making, although from experience it is obvious that this must have been sadly neglected in the past. Ditches, outlets, and underground carriers of surface water should be made adequate and equal in capacity to the maximum demand, and it should be the roadman's first care to make himself conversant with all his drains and maintain these in a proper state of efficiency, reporting at once to the surveyor any faults found. Underground conditions should be carefully diagnosed, springs should be tapped, and other sources should be intercepted and drained off to a natural or other drain where no harm can accrue.

I have personally known places that have received

large quantities of material, which, however, were practically swallowed up by the wet, clayey subsoil and the road was soon again in the incipient stages of deformation. These places frequently are found where the roads are in cutting, and where the roadway becomes literally a channel for the discharge of the soakage from the surrounding land.

Intermittent springs also frequently appear, so that the roads become really dangerous to the traffic. My method of dealing with this is the cutting of a deep trench at the sides of the roadway, at the bottom of which is laid an open-jointed pipe drain; the remainder of the trench is filled in with large surface-picked flints or hard brick rubble, filling up to the underside of the road crust. The springs I tapped by arterial drains constructed in a similar manner, and made to discharge into the main drain. This is a most effective way of dealing with such conditions, as in the result all suspended moisture is attracted to the open rubble and a dry, hard road is secured, thoroughly drained and permanently safeguarded against any lateral movement, the road being held intact by the interposition of the abutment of coarse material forming the drain.

I have the utmost faith in the value and ultimate economy gained by the increased stability of a solid shouldering; the once-upon-a-time theory held by some that if one made up the centre the sides made up themselves being farcical.

REPAIRS.

In this connection we should always bear in mind the old adage "A stitch in time saves nine," and in its application to road repairs a stone in time probably saves nine. It is here that road craft may be seen to advantage or otherwise, and many are the ways and means employed. The prolific pothole, for example, I have known to be simply filled up with half a shovelful or so of screenings and a little dry road grit. Of course, this was rudely displaced and scattered by the first passing motor car. The system, however, was pursued with a zeal worthy of better results.

Personally, I think that tar-macadam is the best pothole mender. It may not answer so well with a water-bound, untreated surface, but even there, I think it may be used to advantage if it receives a surround of tar dressing. A proper boxing should be made for the reception of the material. Prevention, however, is better than cure, and it is well to look to such details as referred to under the heads of rolling and drainage. The careful removal of mud and other detritus, and the cutting of hedges and trees also, cannot be too closely observed, and a tactful word to the farmer when carting from the fields may save much heartburning.

In conclusion I may, perhaps, be allowed to repeat my assertions as to the consistent efforts made by the road engineer to grapple with this vexatious question. Yet, while granting that much has been accomplished, and that the almost ideal conditions may now be obtained by large expenditure of money, I think it must be admitted that, taken as a broad whole, the road problem still remains unsolved.

West Hartlepool Town Planning Scheme.—The West Hartlepool Corporation have decided to proceed with a town planning scheme for an area of 1,200 acres within the borough, and 4,000 acres without the borough boundaries.

Preliminary Studies in Bridge Design.—This little book,* a reprint of articles which appeared in THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, is intended as the first of a series of similar volumes which, taken together, will form a treatise on the design of ordinary highway bridges of moderate spans. This first volume goes further back in the evolution of the bridge than do most treatises, and considers the bridge in its essential elements, that is as the means of providing a crossing for man and beast across a watercourse. The bridge engineer is apt to forget this primary purpose and to consider his bridge merely as a framework or a carrier of stresses. Mr. Ryves, in a refreshingly original manner, has emphasised the necessity for studying natural and economic predispositions, one might say, of the bridge site, with a view toward producing, not the best type of bridge, but the best method of getting the river and the traffic across one another. . . .—*Engineering News*, New York.

* By Reginald Ryves, ASSOC. M. INST. C.E. London: St. Bride's Press, Limited, 24 Bride-lane, E.C. Price 2s. nett.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. M. INST. C. E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21, Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

393. Surveying.—In carrying out a large survey (by triangulation) describe in full detail how you would use the centre of a tower or shaft as a station on the ground without actually setting up the theodolite inside. (Give proofs of any formulæ involved. (T. W. P., *Bexhill-on-Sea*.)

394. Building Inspection.—In carrying out the duties of a building inspector, state what are the common errors to be looked for when inspecting a deposited plan, and also the chief faults that are met with on the actual building. (T. W. P., *Bexhill-on-Sea*.)

395. Plumbing.—A lead pipe has to convey both hot and cold water in horizontal and vertical directions. Show by a sketch how it should be fixed, and give reasons. (B. W., *Tadcaster*.)

396. Strength of Materials.—A horizontal uniform bar 18 in. long, is laid over two supports, each 4 in. from its ends. Find two points at which the bending moments are zero.

397. Testing Cement.—Explain in detail, giving sketches where necessary, how a sample of cement would be tested in practice. (B. W., *Tadcaster*.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

391. Concrete Floor.—A concrete floor is to be constructed as shown in the sketch, with 4-in. by 3-in.

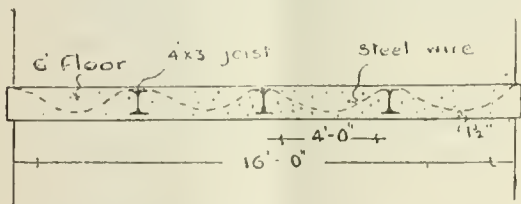


FIG. 1.

R.S. joists, and woven mesh steel wire with a 3-in. lap. The R.S. joists have a 4 1/2-in. wall hold, and the floor a 2-in. wall hold. The size of the room is 16 ft. by 13 ft. Calculate the safe distributed load per super. foot, also the breaking load. (Assistant.)

The strength of the concrete floor shown in the sketch will be equal to the strength of the R.S. joists, plus the additional resistance given to them by being embedded in the concrete. The wire mesh will transfer the load to the joists and bind the floor into a homogeneous mass, tending to localise any cracks which might occur in the concrete; it cannot, however, be taken into the calculations in this instance.

First calculate the safe distributed load on a 4x3x9 1/2 lb. R.S. joist for a span of 13 ft. As the ends have a wall hold of only 4 1/2 in., and this is nearly the same as the depth of the joist, it cannot be considered as having fixed ends. Therefore the maximum bending moment due to a distributed load will be given by the formula—

$$Mb = \frac{w L^2}{8} \times 12 \dots \dots (1)$$

Where w is the load in pounds per foot-run on the joist; L =span in feet.

The resisting moment is given by the expression—

$$Mr = fZ \dots \dots (2)$$

Where f =safe stress on steel in lb./in.², and

Z =modulus of section of the particular joist. Now equating expressions (1) and (2) we get—

$$\frac{w L^2}{8} \times 12 = fZ \dots \dots (3)$$

The safe stress on mild steel may be taken as 7 1/2 tons/in.², or, say, 17,000 lb. in round figures. The section modulus may be found from the dimensions of the joist (see Fig. 2) and it will be sufficiently accurate if we use the approximate method of multiplying the area of one flange by the mean depth from centre to centre of the flanges—*i.e.*—

$$Z = (3 \times 0.34) \times 3.66 = 3.73 \text{ inch units.}$$

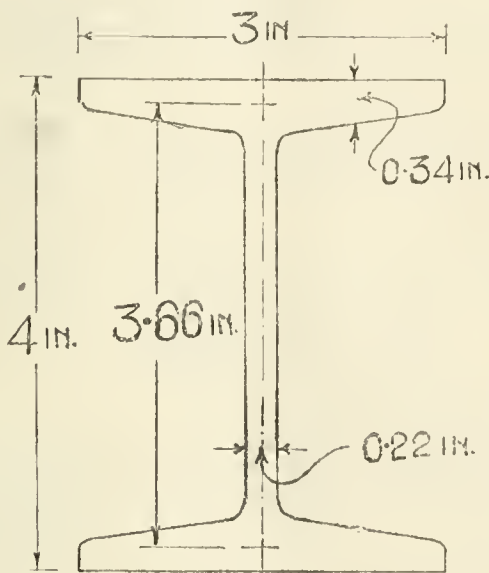


FIG. 2.

By inserting the known figures in expression (3) we now get—

$$\frac{w (13)^2 \times 12}{8} = 17,000 \times 3.73$$

$$\therefore w = \frac{17,000 \times 3.73 \times 8}{169 \times 12}$$

$$= 234.5 \text{ lb. per foot run.}$$

The additional resistance due to the joist being embedded in the concrete depends upon the ratio existing between the thickness of the floor and the depth of the joist, and may be ascertained by multiplying the above figure by the formula—

$$\left(0.6 \frac{t}{d} + 0.6 \right) \dots \dots (4)$$

Where t =thickness of concrete, and d =depth of joist. Therefore we get—

$$234.5 \times \left(0.6 \times \frac{6}{4} + 0.6 \right) = 352 \text{ lb.}$$

This load is distributed over a width of 4 ft., therefore the weight per super. foot will be—

$$352 \div 4 = 88 \text{ lb. ft.}^2$$

The floor itself will weigh about 60 lb./ft.², so that the safe additional load will be about 28 lb./ft.². The breaking load would be between four and five times the total safe load—that is, about 400 lb./ft.². (E. E. W., *Manchester*.)

Hull Municipal Telephones.—The Hull Corporation on Wednesday formally took over the telephones purchased from the Government, and Alderman Brown, the chairman of the Telephones Committee, signed a cheque for £192,423, the purchase price. The amount of capital now invested by Hull in telephones is more than £250,000.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Harrogate T.C. (May 5th. Mr. Edgar Dudley).—This was an inquiry respecting an application for consent to letting, for a term of twenty-one years, a part of the Ripon-road farm for the purposes of a golf course.—The town clerk, Mr. J. Turner Taylor, stated that the farm originally consisted of 308 acres, acquired by compulsory purchase for £19,763, the total cost, with costs of arbitrations, valuations, legal expenses, &c., being £21,861, or a little over £71 per acre. The land was utilised for sewage disposal until 1905, and was afterwards let as a farm to the highest tender, and let at £270 per annum. Mr. Taylor then explained the numerous appeals made by residents for a municipal golf course, but there were difficulties in the way, and the officials of the Local Government Board advised him to advise the council to lease the land to a club or syndicate for the purpose of a golf club. Evidence was given by Mr. F. H. Gray (borough treasurer) and Mr. C. E. Rivers (borough surveyor). It was urged on behalf of the opposition that the land should be laid out for building purposes. The town clerk said there was no likelihood of the land being wanted for twenty-one years for building purposes.

Honley U.D.C. (April 22nd. Mr. M. K. North).—£3,000 for the widening and improvement of Eastgate.—It was explained that Eastgate, or Towngate, was the chief means of access to the town of Honley. It was a very steep road, having in one part a gradient of 1 in 8½, and in another part, where the gradient was 1 in 11½, the road took a sharp turn almost at right angles. The proposed improvement scheme, which had been prepared by the surveyor, Mr. R. Beaumont, involved the removal of certain existing buildings, and the purchase of a total area of 587 sq. yds. of land, inclusive of the land on which the buildings at present stood.

Keighley R.D.C. (April 29th. Mr. M. K. North).—£2,250 for the provision of a cemetery in the township of East and West Morton, and for an order declaring the cost of the provision and maintenance of the cemetery to be special expenses chargeable on the township.—It was stated that the area it was proposed to acquire was 2 acres, and that it would suffice for the needs of the parish for over 100 years.

APPLICATIONS FOR LOANS.

- Antrim C.C.**—£1,300 for converting a building into a technical school.
Garshalton U.D.C.—£540 for rebuilding a bridge.
Coventry T.C.—£331 for a road improvement.
Dublin T.C.—£19,008 for a housing scheme.
Evesham T.C.—£1,800 for the purchase of land for a housing scheme.
Hastings T.C.—£3,535 for a new sea wall.
Marylebone B.C.—£5,524 for electricity plant.
Northam U.D.C.—£6,250 for Appledore improvements.
Oswestry R.D.C.—£1,100 for a water supply for Morda.
Rowley Regis U.D.C.—£10,000 for street improvement works.
St. Asaph R.D.C.—£1,008 for a water supply for Llansannan.
Stoke-on-Trent T.C.—£11,113 for paving certain streets with setts.
Sutton Coldfield T.C.—£2,525 for special instruction centres.
Tamworth T.C.—£1,400 for public walks and pleasure grounds.
Wakefield T.C.—£13,850 for the extension of the infectious diseases hospital.

LOANS SANCTIONED.

- Cheltenham T.C.**—£1,000 for wood paving.
Girencester U.D.C.—£800 for a new fire engine.
Darwen T.C.—£626 for a recreation ground.
Essex C.C.—£3,228 for the enlargement of Chipping Ongar school.
Exeter T.C.—£394 for a handicraft centre.

Hereford T.C.—£1,500 for electrical mains.
Houghton-le-Spring U.D.C.—£11,738 for the erection of fifty two houses.

Hull T.C.—£1,589 for alterations at the Marfleet school.

Lichfield R.D.C.—£7,517 for sewerage and sewage disposal works.

Stoke-on-Trent T.C.—£1,650 for a road improvement, and £1,179 for alterations to Stanfield Hospital.

Torquay T.C.—£11,650 for medical bath buildings and electric lighting, repayable in thirty years; £1,015 for baths and dressing boxes, repayable in twenty years; and £2,305 for boilers, machinery, heating apparatus, hot water supply, and furniture and fittings, repayable in fifteen years.

FORTHCOMING INQUIRIES.

MAY.		£
11.—	Horsham. For the erection of artisans' dwellings (Mr. H. A. Chapman) ...	1,500
11.—	Romford. For road improvement (Mr. F. H. Tulloch) ...	1,974
11.—	Sidmouth. For the provision of pleasure grounds (Mr. W. O. E. Meade-King) ...	4,400
12.—	Bury. For the electricity undertaking (Mr. H. R. Hooper) ...	55,000
12.—	Dolgelly. For works of water supply (Mr. W. M. Cross) ...	1,000
12.—	Grimsby. For works of paving and sewerage (Major J. Stewart) ...	1,733
12.—	Margate. For the provision of a depot (Mr. M. K. North) ...	1,800
12.—	Penrith. For the purpose of water supply (Major C. E. Norton) ...	410
12.—	Watford. For electricity and sewerage works (Mr. T. C. Ekin) ...	18,204
13.—	Dolgelly. For works of water supply (Mr. W. M. Cross) ...	700
13.—	Flaxton. For works of sewerage (Major C. E. Norton) ...	2,200
13.—	Leigh. For electricity works extension (Mr. H. R. Hooper) ...	10,225
13.—	Nottingham. For street improvement (Major J. Stewart) ...	1,600
14.—	Darlaston. For street and recreation ground purposes (Major J. Stewart) ...	1,760
14.—	Deudraeth. For works of sewerage disposal (Mr. W. M. Cross) ...	2,100
14.—	Stockport. For the electricity undertaking (Mr. H. R. Hooper) ...	17,650
14.—	Twickenham. For street improvement (Mr. R. H. Bicknell) ...	4,900
15.—	Clayton. For a sanitary conversion scheme (Major C. E. Norton) ...	1,720
15.—	Coventry. For the purposes of baths, streets, and a recreation ground (Major J. Stewart) ...	20,300
16.—	Bushey. For drainage and street works (Mr. R. H. Bicknell) ...	270
18.—	Heckmondwike. For the provision of a disinfecting station (Dr. F. Seymour) ...	450
19.—	Barking. For street improvement (Major J. Stewart) ...	2,150

Liverpool Corporation Surveyor.—The Liverpool City Council on Wednesday decided to appoint a surveyor—age not to exceed forty-five—at a salary of £1,200 a year, in succession to Mr. T. Shelmerdine, retired.

Newcastle-on-Tyne Town Planning Scheme.—The Local Government Board are understood to have given authority for the preparation of nine further town planning schemes under the Housing and Town Planning Act, 1909. The schemes are authorised to be prepared by the corporations of Manchester, Newcastle-upon-Tyne, and Wrexham; the urban district councils of Beckenham and Oldbury, and the rural district councils of Wrexham and Rotherham. In the case of Newcastle-upon-Tyne the scheme is to extend to an area of 1,265 acres in the eastern portion of the city.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Glasgow, Hastings £3,535, Wallasey; housing and town planning—Bootle, Hereford; roads and materials—Bellast, Bilston, Birmingham £31,612, Grimsby, Liverpool, Wallsend; sewerage and sewage disposal—Bath, Fleet £36,400; water, gas and electricity—Newport (Mon.), Rotherham £8,300; miscellaneous—Rhyl. Particulars of other works projected will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Burnley R.D.C.—The surveyor, Mr. H. Pritchard, has submitted plans and estimate of a proposed new bridge at The Hole, Blacko, and tenders are being invited for the erection of the structure.

Cork T.C.—A special committee has been appointed to go into the question of the site for the proposed cattle market.

Glasgow T.C.—The council have accepted the tender of Messrs. J. Emery & Sons, Potmadie, at £67,124, for the excavation, masonry and brickwork in connection with the extension of the municipal buildings.

Guildford R.D.C.—The tender of Messrs. Kavanagh & Co., of Surbiton, at £1,533, has been accepted for the construction of three bridges in the parish of Send and Ripley, and the tender of Messrs. John Garrett & Son, of Balham-hill, at £1,295, has been accepted for the reconstruction of Broadmead Bridge.

Hastings T.C.—The council have approved a report from the Sea Defence Committee recommending the erection of a new sea wall at Marine-parade and East-parade, at an estimated cost of £3,535. The additional space gained by the proposed demolition of the old wall, which is in a rotten state, will be utilised for widening the roadway, while steps are also to be taken to stop the flooding of the adjoining district.

Hereford T.C.—Plans have been submitted for the improvement of the front of the art school in the Castle Green. The intention is to remove the present unsightly portico, and to erect a new one.

Lewisham B.C.—The London County Council have agreed to contribute one-half (not exceeding £150) of the cost of constructing nine refuges in High-street. The Works Committee recommend the council to establish a tuberculosis dispensary.

Shropshire C.C.—Subject to the co-operation of the Worcester County Council, and sufficient local support being assured, the council have agreed to consider favourably the erection of a bridge over the river Severn near Highley.—It has been agreed to purchase a site for a school in Clun Union area, consisting of 8 acres, for £1,200.

Southampton T.C.—The Baths Committee have been asked to consider the provision of slipper baths for the Shirley district.

Stepney B.C.—It has been agreed to build the new municipal offices on a site in Arbour-square.

Stoke-on-Trent T.C.—The Parks Committee propose to erect a pavilion in Longton Park, at a cost not exceeding £1,500.

Taunton T.C.—The tender of the British Steel Piling Company, at £3,935, has been accepted for the proposed new works on the river Tone, at French Weir.

Tavistock U.D.C.—Mr. I. B. German, a councillor, has presented the council with a pavilion for the recreation ground.

Wallasey T.C.—The tender of Messrs. William Moss & Sons, of Loughborough, at £82,140, has been accepted for the erection of the new town hall. With site and equipment the building is estimated to cost £103,000.

Woodford U.D.C.—It has been decided to erect a new chief fire station, with officers' quarters, at an estimated cost of £820, and to purchase a motor fire engine for £660.

Worcester T.C.—A tender, at £9,073, has been accepted for the erection of a council school in Stanley-road.

Worthing T.C.—The borough surveyor, Mr. F. Roberts, has been authorised to obtain tenders for repairs to the town hall.

HOUSING AND TOWN PLANNING.

Bootle T.C.—The Health Committee have been instructed to take into consideration the question of providing housing accommodation for artisans.

Bridlington T.C.—It is proposed to carry out a housing scheme, at an estimated cost of £2,450.

Eastbourne T.C.—The Housing Committee are considering the purchase of 6 acres of land at the east end of the town for the purposes of a housing scheme, and the borough surveyor, Mr. A. E. Prescott, with the building surveyor, are preparing details of a second scheme for the erection of dwellings at Victoria-drive.

Falmouth T.C.—It has been agreed to proceed with a second scheme for the provision of twenty-two workmen's dwellings.

Hawarden R.D.C.—The council have adopted a housing scheme to consist of forty houses. Twenty of the dwellings are to be let at a rental of 4s. 3d. per week, six at 4s. 9d., and four at 5s. 6d.

Hereford T.C.—The Housing Committee have accepted the tender of Mr. George Field, of Blackheath, near Birmingham, at £10,474, for the erection of workmen's dwellings.

Kilryth T.C.—In a report on the housing problem the burgh surveyor states that to build houses of two or three rooms with modern conveniences at a low rent seems to be impossible under present circumstances.

PARKS AND OPEN SPACES.

Hindley U.D.C.—It is proposed to lease a plot of land for the purpose of a bowling green.

Liverpool T.C.—The council on Wednesday decided to purchase from Lord Derby land at Roby adjacent to the Bowring estate for £4,500. The land will probably be used as an extension of the municipal golf links.

REFUSE COLLECTION AND DISPOSAL.

Risca U.D.C.—The council have decided to alter the system of dust collection by resorting to the contractor, and tenders were received in due course for the work. After discussing the matter, however, it was decided not to accept the proffered tender, but to revert to the system of direct labour.

ROADS AND MATERIALS.

Belfast T.C.—With a view to the improvement of the thoroughfares, it has been agreed to proceed at once with a series of experimental street pavements.

Bilston U.D.C.—A scheme is proposed for the improvement of that portion of the Holyhead road running through Bilston which comprises two of the principal streets in the town Oxford-street and Wellington-road. The estimated cost is £20,000. The Road Board have offered to contribute £5,000 towards the outlay for the principal portion of the work, leaving the net cost at £13,773. The county council are said to approve the scheme.

Birmingham T.C.—The Public Works Committee has been authorised to carry out works for paving portions of Harborne-road, and High-street, Harborne, Ryland-street, Ledsam-street, and a part of Booth-street, Handsworth, at an estimated cost of £31,612. It is proposed to pave Harborne-road from Augustus-road to The Green Man public-house with Durax paving, on concrete foundation; continuing from the Green Man, through the village to the junction with Lordswood-road, with wood paving; and Ryland-street, Ledsam-street, and part of Booth-street with 4-in. by 4-in. by 5-in. granite setts, on concrete foundation.

Blackburn T.C.—The Highways Committee have adopted a scheme for the development of the land lying westward of Revidge, and extending from Preston New-road to Brownhill. The scheme provides for the construction of nine new streets and the widening of two existing highways to 60 ft.

Blackpool T.C.—The borough surveyor, Mr. J. S. Brodie, has received instructions to prepare the necessary plans for making up six streets and three passages.

Bridlington T.C.—A scheme has been adopted for the widening of one of the main thoroughfares to 60 ft., at an estimated cost of £2,500.

Camberwell B.C.—The members of the Works and General Purposes Committee, accompanied by the borough engineer and surveyor, Mr. W. Oxtoby, M.I.N.S.T.C.E., recently visited a number of roads in other metropolitan boroughs, and examined the methods and conditions of the various roadway pavings. They report that they were impressed with the good condition and wearing quality of "Cornastic asphalt," and have instructed the borough engineer to prepare estimates of the cost of paving the following roads with this material—viz.: 'Bus routes—Trafalgar-road, Summer-road (part), and Willowbrook-road; Nunhead-lane (from pitched portion to Nunhead-green), Nunhead-green and Evelina-road (from Nunhead-green to Kimberley-road); South Croxted-road; Crystal Palace-parade; Half Moon-lane and Red Post-hill (Beekwith-road to Dulwich Village). They have also asked the borough engineer to submit an estimate of the cost of laying a trial length of "Lithofalt" blocks in Rye-lane.

Dumbarton C.C.—The widening of the Loch Lomond road south of Tarbet has been completed, the minimum width having been increased from 12 ft. to 16 ft. The cost of the scheme was £5,000, of which the Road Board have consented to pay £1,000. It is intended to tar pave the whole length of the road. The council contemplate extending the widening to Luss village.

Grimsby T.C.—The borough engineer, Mr. H. G. Whyatt, in conjunction with the engineer to the Great Central Railway, is engaged on the preparation of a scheme, estimated to cost £80,000, for linking up Grimsby with Immingham by means of a direct road.

Kirkby-in-Ashfield U.D.C.—A sum of £450 is to be paid in respect of a proposed improvement at Thompson's-corner.

Leek U.D.C.—The surveyor, Mr. W. E. Beacham, has received instructions to prepare a plan and estimate for making up Milk-street from Ball-Hay Green, so far as the roadway is 36 ft. wide.

Leicester T.C.—With regard to the scheme for widening Belgrave Gate it has been agreed to purchase property at a cost of £16,739.

Lewisham B.C.—The General Purposes Committee recommend the council to accept the terms offered by the London County Council with respect to the proposed improvement in Bromley-road, south of Beckenham-lane. These are that the London County Council shall pay two-thirds of the estimated cost (£1,100) of the work.—The London County Council are proceeding with the construction of the Park-road to London-road, Forest Hill, tramways, and the Works Committee of the borough council have directed that advertisements be issued inviting tenders for wood paving the breasts of the carriageway along this route.—The Works Committee recommend the council to accept the offer of the London Asphalt Company, Limited, to lay "Durophalt," 2 in. thick, with a creosoted-timber edging, across Blackheath, at 4s. 10½d. per yard super., and maintain it free of cost for five years.—The Works Committee also recommend that Parkeroff-road, Lee, be paved as a new street, at the cost of the owners.

Liverpool T.C.—The Health Committee propose to construct, at an estimated cost of £67,500, a new street from Matlock-avenue to Walton-vale.

Romford R.D.C.—An improvement is to be effected at the corner of Church-street and Station-lane, Hornchurch, at an estimated cost of £825.

St. Austell R.D.C.—The county surveyor, Mr. A. E. Brookes, wrote last week that the Main Roads Committee were recommending the county council to take over the direct control of the main roads in the eastern division as from April 1, 1915, and that if the district council were not prepared to enter into a contract on the basis of the approved estimate for the maintenance of the main roads for the period expiring on March 31, 1915, they were to be asked to continue the repair and maintenance of the main roads within their district as agents for the county council, such to be carried out under the direction of the county surveyor,

the expenditure to be limited to the amount of the approved estimate except by written permission of the county surveyor. The rural district council decided to agree to the terms of the county surveyor.

Southend T.C.—Tenders have been accepted for making up and sewerage a number of streets, and several other streets have been ordered to be placed on the list of streets to be made up.

Wallsend T.C.—The council on Tuesday resolved to make a start with the construction of the new roads at Willington.

Ware U.D.C.—Negotiations are in progress for the purchase of properties in Star-street for a widening scheme.

SEWERAGE AND SEWAGE DISPOSAL

Bath R.D.C.—The tender of Messrs. Firth & Co., at £19,172, has been accepted for the Monkton Combe sewerage scheme.

Dalkeith T.C.—A new system of dealing with the sewage is to be carried out at an estimated cost of £9,500. The engineers are Messrs. Gilbert Thomson & Ferguson, Glasgow, and the contractor Mr. John Monteith, Dalkeith.

Fleet U.D.C.—The main drainage scheme prepared by Mr. Moss-Flower has been approved, and the Local Government Board are to be asked to sanction a loan of £36,400 for carrying it out.

Loanhead T.C.—It is intended to effect extensions and improvements at the sewage disposal works.

Rugby R.D.C.—The surveyor, Mr. T. W. Willard, is engaged in the preparation of a sewage disposal scheme for Clifton.

Uckfield R.D.C.—The plans for the Waldron drainage scheme are being amended, and will be forwarded to the Local Government Board in due course.

Wallsend T.C.—The tender of Mr. J. Douglas, of Newcastle-on-Tyne, at £1,822, has been accepted for the construction of a new sewer at the colliery houses, and the tender of Mr. J. Ogston, amounting to £413, for a sewage scheme at the Edward Pit.

WATER, GAS, AND ELECTRICITY.

Bexhill T.C.—The electric lighting at Cooden and Little Common is to be improved, at an estimated cost of £2,500.

Carnarvon T.C.—Another year of prosperity in the gas undertaking was reported on Wednesday, it being stated that there was a profit on the twelve months' working of £674.

Chard T.C.—The long-standing difference between the corporation and the rural district council with respect to the proposal of the corporation for bringing water by a gravitation scheme from the village of Combe St. Nicholas, 3 miles from the town, has been settled satisfactorily, and the Local Government Board have notified their consent to the scheme being carried out.

Coventry T.C.—The council on Tuesday decided to allocate £6,000 from the profits of the electricity undertaking in relief of rates, and place £16,250 to reserve fund.

Dundee T.C.—It has been agreed to clean the water mains in Newport, at an estimated cost of £300.

Hayes (Middlesex) U.D.C.—The surveyor, Mr. C. Bidler, has been authorised to purchase hydraulic plant for lifting water from a local well for the purpose of street watering.

Kinross T.C.—As the result of a poll of the rate-payers the council propose to negotiate for the purchase of the undertaking of the local gas company.

Llanvbyther R.D.C.—Writing with reference to the Llanvbyther water scheme, the Local Government Board stated that under sec. 229 of the Public Health Act, 1875, the expenses incurred by a rural district council for providing a supply of water for a contributory place would be chargeable as special expenses. The board, however, pointed out that by the exercise of the powers possessed by the council of charging rates and rents the council might to a large extent throw the cost of the works on the actual consumers of the water. Any deficiency would, of course, have to be met out of revenue.

Newport (Mon.) T.C.—The Water Committee recommend the corporation to apply to Parliament in the session of 1915 for power to construct an additional reservoir at Henllys.

Norton R.D.C.—The engineer, Mr. Henry Tobey, has submitted a revised estimate for the works in connection with the Leavening water supply, amounting to £775, as compared with the previous estimate of £636, and the council have agreed to apply for powers to borrow the difference.

Penistone U.D.C.—The sum of £998 has been allocated to the general rate from last year's profits of the water undertaking.

Pontardawe U.D.C.—An agreement has been reached with the Swansea Corporation for a supply of water.

Rotherham T.C.—The scheme for the new service reservoir, including pump-house and caretaker's lodge, is estimated to cost £8,300. The reservoir will have a storage capacity of 1,000,000 gallons.

St. Asaph R.D.C.—The council have approved the scheme of the sanitary surveyor, Mr. H. F. Evans, for the proposed water supply for Llansannan.

Smethwick T.C.—A new gasholder is to be erected on the High Park-road site, at an estimated cost of £50,000.

Southend T.C.—The borough surveyor, Mr. E. J. Elford, has prepared for the Gas Committee an exhaustive report with regard to the Leigh gasworks, dealing with the question of the possibility of extending the works on the existing site, and on the ground adjoining, purchased by the Leigh Urban Council for the purposes of the gas undertaking, and also upon the question of transferring the works to other sites. Meanwhile instructions were given the borough surveyor to prepare plans for extending the existing retort-house westwards, and to submit the plans to the committee.

West Bromwich T.C.—The Electricity Committee recommend the town council to approve of the installation of a storage battery at an estimated cost not exceeding £5,000, in order to meet next winter's demand for current.

MISCELLANEOUS.

Birkenhead T.C.—It has been decided to construct a model yachting lake at a cost of £283.

Edinburgh T.C.—The Plans and Works Committee recommend that the three remaining horse-driven steam fire engines should be substituted by petrol motor engines fitted with the reciprocating type of pump, also that a motor lorry, which would dispense with an additional pair of horses, should be provided.

Liverpool T.C.—Corporation workmen's wages were on Wednesday raised to a scale equivalent to the rate of 25s. weekly.

Manchester T.C.—It was suggested on Wednesday at the meeting of the council that the time has come when the corporation should seriously consider the desirability of providing municipal crematoria rather than extend the existing cemeteries.

Rhyl U.D.C.—The advice of an expert is to be taken on the question of the erosion of the coast between Rhyl and Prestatyn. The surveyor, Mr. A. A. Goodall, stated that the total width of land eroded since 1871 is about 250 ft. From a point opposite the Rhyl boundary to Ty Coch (near the recently damaged golf links) an area representing 20 acres has disappeared. Not only is erosion taking place at the feet of the sand dunes, but the bed of the shore at low-water mark is considerably lower than a few years ago.

West Hartlepool T.C.—There was a nett profit last year on the tramways undertaking of £1,663, and a loss on the electricity undertaking of £1,878.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times*.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

PERSONAL.

Mr. D. H. Brown, of Preston, was on Wednesday appointed chief engineering assistant to the county surveyor of Durham.

Mr. A. R. Finch, ASSOC.M.INST.C.E., borough engineer and surveyor of Kensington, is to be supplied by the council with an official motor car costing £572.

Mr. Nelson F. Dennis, M.INST.C.E., borough engineer of West Hartlepool, has had his salary increased by £100 per annum, with a further advance of £50 next year.

Mr. H. Percy Boulnois, M.INST.C.E., of 7 Victoria-street, Westminster, has been unanimously elected an honorary member of the Quantity Surveyors' Association (Incorporated).

Mr. John M. Jackson, supervising architect to the Municipality of Singapore, was married recently in Glasgow to Miss Lily Lindsay, youngest daughter of Mr. G. B. Smith, of Glasgow.

Mr. Alfred J. Price, ASSOC.M.INST.C.E., assistant to the borough engineer and surveyor of Eccles, has been appointed resident engineer on the Eccles main drainage scheme, which is estimated to cost £61,000.

Mr. David Davies, county surveyor for the Southern Division of Cardiganshire, and Mr. T. E. Owen, surveyor for the Northern Division, have each received an increased allowance of £40 a year for travelling expenses.

Mr. C. E. Boast, engineering assistant in the city engineer's office, Coventry, read a short paper on "Heading Driving" at a recent meeting of the Birmingham Association of Students of the Institution of Civil Engineers.

Mr. J. T. Hall, M.R.SAN.L., manager of the Staines outfall works, has suffered a bereavement in the loss of his wife, after a painful illness. Mr. E. J. Barrett, surveyor to the Staines Urban District Council, represented the council at the funeral, which took place on Friday last at the Ashford Cemetery, a large gathering testifying to the esteem in which the deceased was held.

Mr. W. J. Isaacs, of Warrington, and Mr. F. L. James, of York, are recommended by the York Streets and Buildings Committee as architectural and engineering assistants respectively in the city engineer's department, each at a commencing salary of £100, rising by annual increments of £10 to a maximum of £150. The city engineer stated that he might very shortly have a vacancy in his office for another engineering assistant, owing to a prospective resignation of one of his staff, and it was decided in such event that the appointment should be offered to Mr. Wm. Walker, of Chesterfield (third of the above selected candidates), at the same salary as the two assistants already mentioned.

Jack of All Trades.—A vacancy having arisen for a roadman, the surveyor to the Linton (Cumbria) Rural District Council proposes to appoint a handy man at 18s. per week who could also do the council's brick-laying, carpentering and blacksmithing!

Municipal Furnished Houses.—The Manchester City Council on Wednesday approved a scheme to provide for the erection, at a cost of £8,973, of furnished houses in Rochdale-road, a thickly populated working-class district. It was stated that the estimated number of people using lodging-houses in Manchester is from 60,000 to 80,000, and that something must be done for this roving population of casual labour. It was the problem of the man who, during his lifetime until his death, had not sufficient goods to fill a handcart. A large number of houses in Manchester have been condemned as insanitary and demolished. This scheme for municipal furnished houses (the *Yorkshire Post* states) is purely experimental. It is proposed to build houses with three independent living-rooms, and each room will be let at a nominal rent by the day or the week. Nearly all the furniture will be fixtures. It is further proposed to provide cookery utensils and crockery. The opponents of the scheme maintained that the rooms would not be used by those for whom they were intended. A deputation of clergy recently waited upon the Lord Mayor and denounced the system. They feared that a percentage of the houses would be hotbeds of vice.

COLCHESTER BOROUGH SURVEYORSHIP.

SELECTED CANDIDATE WITHDRAWS.

A report of the Colchester Town Council in committee, presented at a subsequent ordinary meeting on Wednesday, stated that Mr. C. Owen Baines, engineer and surveyor to the Paignton Urban District Council, who had been recommended for appointment as borough engineer and surveyor, had withdrawn his candidature. The committee recommended that the matter should be referred back to the Roads and Drainage Committee, with power to review the applications received, and to select candidates for consideration by the council in committee.

Applications to the number of 141 (not including four received after the stipulated time) were submitted for the position, which was recently vacated by Mr. H. Goodyear. Of seven candidates interviewed by the Roads and Drainage Committee, Messrs. Baines, Harold Collins, deputy city engineer of Norwich, F. M. Harvey (Great Yarmouth), and Eric A. Slater, acting borough surveyor of Colchester, were in the first place selected, the first-named, as stated, finally being recommended for appointment.

Municipal Daylight Saving.—The municipal staffs at the Wood Green Town Hall have been permitted by the district council to adopt a "daylight saving" scheme of their own. Instead of beginning work at 9 and finishing at 5 they now start at 8 and leave off at 4.

FOR OTHER ADVERTISEMENTS

See End of Paper.

BOROUGH OF CHESTERFIELD. JUNIOR ASSISTANTS, SURVEYOR'S DEPARTMENT.

The Corporation invite application for two Junior Assistants in the Surveyor's Department. Salary £78 per annum.

Applications in candidate's own handwriting, stating age, experience, and accompanied by copies of not more than 3 recent testimonials, to be sent to Vincent Smith, Borough Surveyor, endorsed "Junior Assistant," not later than Friday, the 22nd of May, 1914.

JOHN MIDDLETON,
Town Clerk.

Chesterfield.
May 6, 1914. (1,594)

COUNTY OF SOMERSET. MENTAL DEFICIENCY ACT, 1913.

Wanted, by the County Council of Somerset, a person to undertake the duties of Clerk to the Committee for the Care of the Mentally Defective.

The salary will commence at the sum of £130 per annum inclusive. An office will be provided at, and the person appointed will be required to reside in or near, Weston-super-Mare in the first instance, and all reasonable office and travelling expenses will be paid.

Candidates must have had some previous experience of the law and practice of local government administration, and of general office work, and the duties of the officer will be (subject to the control of the Clerk of the County Council) to transact the whole of the business of the County Council relating to the mentally defective.

The appointment will be determinable by three calendar months' notice on either side.

The officer will be required to give the whole of his time to the business of the County Council.

Applications, stating candidate's age, present occupation, qualifications and experience, to be sent to the undersigned by the candidate, with copies of not more than two recent testimonials, not later than noon on Saturday, 23rd instant.

Personal canvassing of members of the County Council will be deemed a disqualification.

G. I. SIMEY,
Clerk of the County Council.

Sidney House, Boulevard,
Weston-super-Mare.
May 6, 1914. (1,592)

COUNTY OF WEST SUSSEX.

Applications are invited for the appointment of an Assistant to the County Surveyor. Salary £130 per annum, rising by annual increments of £5 to £150 per annum.

Preference will be given to candidates who have passed the examination of the Institution of Municipal and County Engineers, and who have had experience in up-to-date methods of road construction. Applications, in the candidate's own handwriting, stating age and qualifications, accompanied by three recent testimonials, and endorsed "Assistant," to be sent to the undersigned not later than Friday, May 15th, 1914.

Canvassing, either directly or indirectly, will disqualify.

H. W. BOWEN, M.INST.C.E.,
County Surveyor.

North-street,
Horsham.
Sussex. (1,595)

COUNTY OF DURHAM. APPOINTMENT OF COUNTY SURVEYOR AND ARCHITECT.

The County Council of Durham are prepared to receive applications for the position of County Surveyor and Architect.

The person appointed will be required to devote the whole of his time to the duties of the office, and the annual salary will be at the rate of £800 per annum, to be increased to £900 per annum on the 1st April, 1916, and to £1,000 per annum on the 1st April, 1918.

The appointment will be subject to four calendar months' notice on either side.

Applicants must have special qualifications as to the construction of roads and bridges, and preference will be given to those who are under the age of 45 and who are corporate members of the Institution of Civil Engineers.

Applications, endorsed "County Surveyor," together with copies of not more than five recent testimonials, to be sent to the undersigned not later than Monday, the 25th day of May, instant, from whom a Statement of the duties and conditions of the office may be obtained.

Canvassing will be deemed a disqualification, but candidates may circulate copies of their applications and testimonials.

(By order)
HAROLD JEVONS,
Clerk of the County Council.

Shire Hall, Durham.
May 6, 1914. (1,593)

COUNTY OF HERTFORD. APPOINTMENT OF COUNTY SURVEYOR.

The Hertfordshire County Council invite applications for the appointment of County Surveyor.

Applicants must be not less than 30 or more than 45 years of age. Commencing salary, £800 a year. Offices and staff will be provided, and all reasonable travelling expenses and other disbursements will be borne by the County Council. The County Surveyor will also be provided with a motor car and chauffeur free of expense to him.

An applicant must either be a Member or an Associate Member of the Institution of Civil Engineers, or be serving under the Road Board or under some County Council or other Local Authority.

Applications must be accompanied by a summary of particulars as to previous service, &c., to be inserted in a form which can be obtained from the undersigned, and by copies of not more than three recent testimonials.

Candidates may send printed copies of their applications, and of any statement or testimonials they desire to send, to the Members of the Finance and General Purposes and Highways Committees, a list of whom can be obtained on application.

The person appointed will be required to commence his duties on the 1st October, 1914, and to devote the whole of his time to the duties of his office.

Applications must be sent in to the undersigned not later than the 4th June, 1914.

Further particulars of the terms of the appointment can be obtained from the undersigned.

CHARLES E. LONGMORE,
Clerk of the County Council.

Clerk of the Peace Office,
Hertford.
May 4, 1914. (1,591)

The Control of Stream Pollution.*

By PAUL HANSEN, Engineer, State Water Survey, Urbana, Ill.

In uninhabited, or even rural, districts the evil results of stream pollution are practically negligible, but in urban districts streams are rendered exceedingly foul by the enormous quantities of sewage and industrial wastes poured into them from city sewers. These streams become totally unfit for pleasure purposes, the land along the banks is depreciated in value, and public water supplies drawn from the streams may be grossly contaminated and constitute an extreme danger to public health. An enormous toll in human lives is annually exacted as a result of polluted streams, not to mention the economic loss due to depreciation in property values.

To prevent the evils of stream pollution gaining too great headway, central governmental control, backed by an intelligent public opinion, is essential. The moulding of an intelligent public opinion is, however, a rather difficult matter, for even among persons who have given considerable thought to sanitary subjects there exist gross misconceptions as to the logical and practicable way to treat the problem of stream pollution. There has been a tendency to permit sentimentality to get the upper hand, and this has resulted in giving wide currency to some extravagant demands that are wholly impracticable. There is, however, a group of sanitary engineers who have come into intimate contact with actual problems relating to the prevention of stream pollution, and among these engineers there has gradually come about a unanimity of opinion regarding certain essential factors relating to the stream pollution problem. It will be the object of this paper to present these opinions, and the statements made will be largely based upon recent careful inquiries among sanitary engineers and others interested in sanitation.

The subject may best be treated by first considering in a broad way what the functions of a stream really are. Having reached a satisfactory conclusion upon this point, it will be possible to consider certain special uses of streams with respect to stream pollution.

GENERAL FUNCTIONS OF STREAMS.

The proper conception of a stream recognises the dual function of watering and draining the country through which it passes. Some pollution of streams is inevitable, for with increased density of population, increased cultivation of the soil and increased numbers of urban communities, it is practically impossible to prevent the discharge of all deleterious matter into streams. It is only reasonable to require that the pollution of streams be maintained at less than a certain fixed maximum, and this permissible maximum pollution must vary according to the character of the stream, the population along the banks of the stream and the uses to which the waters of the stream are placed.

STREAMS USED AS SOURCES OF PUBLIC WATER SUPPLIES.

Since streams in the ordinary course of events must receive more or less contamination, it follows that public water supplies drawn from surface streams must of necessity be polluted, and should not be delivered to the consumers unless the water is first adequately purified. One exception may be made to this general rule—namely, in the case of water supplies diverted from streams draining comparatively small watersheds. In such cases it is sometimes feasible for the water supply authorities to own the entire watershed, and control it in such manner as to make contamination of the watercourses impossible. But in general we have this question to contend with: How much pollution may be permitted to enter a stream before the water thereof is polluted to a point beyond redemption by water purification methods? This is a question that taxes the greatest ingenuity of sanitary experts, and it is always necessary for any specific problem to be considered on its particular merits in order to obtain what is the best and most economical solution.

Notwithstanding the great difficulty in defining that degree of pollution which is permissible in streams which are to be used as public water supplies after

purification, there would seem to be an advantage in attempting to approximate a general rule for the control of such streams. A rule has been formulated in the light of the present available evidence, but it must be admitted that this rule is not based upon any very scientific data, and it can, therefore, only be put forward tentatively, with the expectation that it will be modified from time to time as more and more experience is acquired. This rule may be stated as follows:—

The time in hours required for the passage of a particle of water from a sewer outlet to the point of waterworks intake during high water, multiplied by the dilution available during low water in cubic feet per second per 1,000 persons tributary to the sewers, should equal a constant, and this constant should not equal less than 40. This may be expressed mathematically as follows:

$$T + D = C$$

in which T = time in hours required for the passage of a particle of water from the sewer outlet to the waterworks intake at high water;

D = dilution available during low water in cubic feet per second per 1,000 persons tributary to the sewers; and

C = constant which it is recommended be not less than 40.

The above formula applies to streams in which there is no appreciable increase in volume of flow between the sewer outlet and the point of waterworks intake. In the case of streams which receive the discharge of large tributaries between the point of sewer outlet and the point of waterworks intake the formula must, of course, be modified. Generally, it will be merely necessary to assign a value of D which represents the mean of the quantity of water flowing past the sewer outlet and that flowing past the waterworks intake. If the factor of safety proves to be more than 40, purification of the sewage will not be necessary for the protection of the water supply. If the factor of safety is less than 40, some form of purification will be necessary, and this may vary all the way from plain sedimentation to intermittent sand filtration followed by sterilisation.

The formula, of course, is intended to be used merely as a rough guide, and it is conceivable that there are instances where it will not apply. Take, for example, the case of a very large stream, where a sufficiently large factor of safety may be obtained with the sewer outlet at a very short distance above the point of waterworks intake, and on the same side of the stream; here it is manifest, due to the impracticability of securing a mixture of the sewage with the entire volume of the stream, that the sewage must receive treatment or the waterworks must be extended to a point above, or at any rate beyond, the influence of the sewer outlet. As a rough guide, however, such a formula may serve a useful purpose in narrowing down the widely divergent practice of the present time.

FISH AND SHELLFISH.

Many streams are valuable to the community on account of their fish life. It may be said, in general, that there is rarely necessity for so polluting a stream as to endanger fish life, though there are some circumstances where the continuance of certain liquid waste-producing industries injurious to fish is of so great importance to the general welfare that fish life in certain streams must be sacrificed.

The maintenance of fish life does not necessarily imply an unpolluted stream. It is merely necessary that the alkalinity of the water be maintained, and that the pollution be not so great as to absorb the dissolved oxygen in the water to an extent that will suffocate the fish. The fact is that a moderate degree of pollution favours fish life, in that it favours the growth of microscopic aquatic organisms which constitute valuable fish food. Certain difficulties have been encountered in the contamination of fish by polluted water which causes the fish to decay rapidly and become unfit for human consumption. The danger of infection of human beings with specific disease through eating fish taken from polluted streams is almost negligible, for the reason that, in

* From a paper read at a recent convention of the Illinois Academy of Science.

this part of the world, at any rate, fish are not eaten raw. With shellfish, however, the case is quite different, because they are very frequently eaten raw. The problem of protecting the shellfish industry is a very complicated one, and all its intricacies have not been worked out. Here, again, the services of experts are needed to study each zone of shellfish pollution in the light of diverse local conditions.

DISCHARGE OF MANUFACTURING WASTES INTO STREAMS.

Many of our important industries, such as paper mills, woollen mills, dye works, starch factories and tanneries require large volumes of water to carry on their industrial operations, and they also produce large volumes of waste which are capable of undergoing offensive putrefaction. The discharge of these waters into streams often causes unsightly and malodorous conditions; yet, with the exception of tanneries, these waters do not menace the public health, since they do not contain the specific infections of disease. (Tannery waters may contain anthrax bacilli.) In fact, some of the processes are such that the wastes are quite inimical to the existence of disease germs. In some cases it is practicable to treat the wastes so that offensive conditions in a stream may be in part or wholly relieved, but for certain industries such treatment of the wastes is prohibitively expensive.

Enjoining industries against causing objectionable stream pollution may, and in some instances actually has, necessitated the shutting down of works. It is conceivable, in the case of large industries upon which are dependent a considerable population, that an order to cease stream pollution, which is virtually an order to shut down the works, might result in great hardship without adequate returns accruing from the cleaner conditions of the stream. There may be instances, therefore, where a limited few of the streams of the country may legitimately be turned over to the manufacturing interests. Now that the stream pollution problem has become more acutely an issue, and the disadvantages of filthy streams are better understood, it would not seem wise to permit waste-producing industries to be located upon any but very large streams which have an ample volume to dilute the wastes to an inoffensive condition. That is to say, the streams which are now clean should be maintained clean, for the reason that we have an ample number of large streams which can effectually take care of wastes from waste-producing industrial plants for an indefinite period in the future.

LEGAL CONTROL OVER STREAM POLLUTION.

A discussion of stream pollution would not be complete without some consideration of legal control. As already indicated, the cleanness of streams cannot be conserved unless under a central governmental supervision. If left to individual communities very little could be expected in the way of results. Communities are not likely to be altruistic enough to spend large sums of money for sewage purification works to protect neighbours on the stream below, unless such altruism is induced by damage suits which render sewage purification the cheapest way out of the difficulty. But lawsuits are costly if long drawn out, and the results are often unsatisfactory.

For successful solution it is essential that specific problems relating to stream pollution be placed in the hands of experts. It is therefore necessary, or at least strongly advisable, that every State have an expert commission. Among many there is a strong prejudice against commissions, inasmuch as the multiplication of commissions is looked upon as a delegation of legislative and executive powers to others than direct representatives of the people. This need not necessarily be so, however, for a law may be framed requiring in general terms that streams must be maintained in an inoffensive condition, and that they shall not be detrimental to health. This leaves to the commission not arbitrary powers, but the simple function of determining points of fact within limits prescribed by prior legislative enactment. That is to say, the commission will determine when a stream is in danger of being made offensive and when it is in danger of being made detrimental to health, and thereupon decide what purification of sewage and industrial wastes is necessary, whether water supplies may or may not be taken from streams, and to what extent they must be purified. Such a commission should be supplied with ample appro-

priations to enable it to obtain all necessary information for its guidance, whether this consists in maintaining laboratories or in carrying on experimental research work. As even the best of commissions may at times grow arbitrary, or become unduly biased in its views, there should always be made provision for ready appeal from the decisions of a commission to an independent special arbitration board of experts, and, of course, there must exist the inalienable right of appeal to the courts.

MOTOR 'BUSES AND ROAD MAINTENANCE.

MIDDLESEX COUNTY COUNCIL'S ATTITUDE.

Evidence was taken on Tuesday by the Select Committee of the House of Commons, presided over by Colonel A. B. Bathurst, who have under consideration the Bill authorising the Middlesex County Council to construct a new road, about 5 miles long and 20 ft. wide, beginning with a junction with the High-road in Chiswick, passing through Brentford, Osterley, Lampton and Heston, into the main Bath-road. The estimated cost of the project is £562,000.

Mr. H. T. Wakelam, M.INST.C.E., the county engineer, after giving it as his opinion that the scheme proposed by the Bill was the best possible, taking into account the contour of the country, proceeded to quote figures in support of the clause in the Bill which provides for vehicles such as motor 'buses contributing specially to the maintenance of the new road if they wish to use it. His view was that Middlesex had probably had more experience of damage done by motor-'bus traffic than any other county. They had had to spend £33,000 on the resurfacing of the Bath road owing to damage by motor 'buses, and were reconstructing the Golders Green-road to the north-east at a cost of £55,900. On the St. Albans-road works were in progress, because of motor-traffic damage, which would entail an expenditure of £14,000. The council had before the Road Board schemes which would cost £372,000 for resurfacing roads. During the two years ending March, 1913, Middlesex had ten roads affected by motor-'bus traffic. Previous to motor-'bus traffic coming on these roads the average expenditure was 6'16d. per yard per annum. After a year, or two years, the expenditure increased to 12'85d. Giving further particulars as to the damage done by motor 'buses, Mr. Wakelam mentioned the incurring of expenditure in Richmond and Isleworth to the amount of £8,600, and stated that four months after a certain thoroughfare at Wood Green had been relaid with wood blocks, owing to motor 'buses the blocks began to move in all directions. It was necessary to repave another section of the same road, and expenditure was incurred to the amount of £4,622. The damage caused by motor-'bus traffic on the roads of Middlesex had already run into hundreds of thousands of pounds.

Mr. Wakelam, cross-examined by Mr. Balfour Browne, K.C., on behalf of the London General Omnibus Company, said that taxicabs would pass freely on the road, also vegetable carts on the way to Covent Garden. There was not a continuous user in the case of these, and they did not damage the road as motor 'buses did. Asked whether motor 'buses had not a right to go free on every road out of London, he replied that it was a right which ought not to be allowed. On the question as to whether motor 'buses were not doing a great service to the public, Mr. Wakelam answered: "So are the tramways, but they have to pay for the maintenance of the roads."

Mr. Balfour Browne: Are not the tramways a little out of date?

Mr. Wakelam: I think not.

A Cumberland Water Scheme.—Representatives of interested localities at Wigton (Cumberland) last week considered a proposed comprehensive gravitation water scheme for a large area of North-West Cumberland, to cost about £20,000. The proposal is to tap the Aspatria, Silloth, and District Joint Water Board's main at Watch Hill, and convey the water a distance of 40 miles to ten Wigton district parishes right on to Bowness-on-Solway. There is also a possibility of a further extension of the scheme in the Holm Cultram district. If the proposal goes through, it will replace a scheme already under consideration to supply Bowness, Kirkbride, and Aikton parishes from the Carlisle Corporation's main.

A FORWARD STEP IN GAS MANUFACTURE.

(Communicated.)

The recent decision of a House of Lords' Committee, presided over by Lord Clinton, upon the methods to be adopted in future for ascertaining the quality of coal gas, marks an era in the history of the gas industry.

Hitherto, and ever since gas testing methods were prescribed by Parliament (for the protection of the public), the standard by which the quality of gas was judged was the amount of light given by a flame.

So long as the only method of obtaining light from gas was by burning it as a luminous flame, and its use as a fuel for cooking, heating and power had not been fully developed, this test for "illuminating power" was both scientific and equitable.

Since the famous discovery of the incandescent mantle by Welsbach, following upon the equally famous invention of the atmospheric or non-luminous burner by Bunsen, made the only economical and sensible method of obtaining light from gas dependent upon the heating power of the flame (which, though burnt so as to give no light itself, raises the mantle to a glowing heat), and since the use of gas for fuel in both home and factory has become almost universal, the only practical standard by which gas can be judged is its heating power, or, as scientists and technicians would say, its "calorific value" as expressed in British thermal units per cubic foot of gas burnt.

That is what the House of Lords' Committee, on the evidence of Sir Corbet Woodall, B.Sc., and other eminent experts, have now agreed shall be the standard of the future, so far as the largest company in the world is concerned; and this decision will speedily be applied to the gas undertakings of the country as a whole.

The result will be, no doubt, to effect material economies in the cost of gas manufacture, from which, under the wise provisions of the sliding scale system (by which increased dividends are made to depend upon decreased prices to the consumer), the public will benefit to the extent of about five-sixths of any savings made.

With almost every commodity of household and industrial consumption tending to rise in price—and not least the other forms of fuel—it is good news for the public that Parliament has determined to abolish an out-of-date method of gas testing, and to substitute one which, while meeting all practical requirements of to-day, relaxes in no way the stringent stipulations as to purity laid down in former days, and yet secures economy in production with resultant gain to the purchaser.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

The Fire Resistance of Partitions.—The British Fire Prevention Committee has issued a volume recording the results of its earlier fire tests with partitions, the results of the tests being presented in tabular form which facilitates comparison and makes the record particularly useful for reference purposes. These earlier tests, which were conducted between 1898 and 1905, have been forgotten by many, yet they deal with many materials used to-day, in respect to which particulars are required. The seventeen partitions dealt with in the report are grouped according to their classification under the British Fire Prevention Committee's Standards of 1903. They vary in thickness from 2 in. to 5½ in., but for modern everyday uses those of from 2 in. to 3½ in. thickness merit primary attention. Among these, a 2½ in. porous terra-cotta partition obtained the 2½-hour classification of affording "Full Protection," and a 3½-in. pumice slab partition the classification of affording "Partial Protection" on a 2-hour test. The fire tests are run up to temperatures of about 2,000 deg. Fahr., and are followed by the application of water under pressure. The issue of the volume is intended mainly for the committee's subscribers, but a small edition will also be available for the public (at 10s. 6d.) after May 11th, and will be obtainable at the committee's Waterloo-place offices.

BUILDING REGULATIONS IN SHANGHAI.

EVADING THE BY-LAWS.

In his report for 1913—some extracts from which appeared in our last issue—Mr. Charles H. Godfrey, M.INST.C.E., engineer and surveyor to the municipal council, emphasises the necessity for the proper supervision of the erection of buildings in Shanghai. The tendency among the landlords of the settlement at present is to cover every available foot of their property which is permissible under the building rules, and although sufficient open space is always provided for each block, generally by courtyards, an alleyway at the rear is often omitted on account of the high price of the land upon which the houses are erected. It is no uncommon occurrence for plans for a large building to be prepared by an architect who receives payment for his services as soon as a permit to build has been obtained. The plans as submitted may be quite in order, but as soon as operations are commenced the contractor and the owner think of nothing but scamping the work, and endeavouring to rush through certain alterations which would be prohibited by the building rules.

A recent case in point is a large Chinese hotel, where the partitions between the rooms were shown on the plans to be constructed of brickwork. Within the space of only two or three days the majority of the partitions were rushed up, but were constructed of lath-and-plaster hollow partitions, which would not only be dangerous from a fire point of view, but would also help to harbour rats and vermin. When complaint was made to the owner he appeared to feel injured, and suggested that he ought to have been told before that lath-and-plaster partitions would not be allowed, and promptly proceeded to complete the work. He was then informed that, unless the hollow partitions were either removed or rendered ratproof, a licence would not be issued for the hotel when building operations were completed. This caution apparently had the desired effect, as shortly afterwards portions of the partition were removed to allow coke-breeze concrete to be rammed between the lathing, each 4ft. of filling being then inspected by the district building inspector, and passed as satisfactory when properly completed, the result being a solid partition of light construction with no spaces in which rats can form a run. "It is, of course, quite possible," observes Mr. Godfrey, "that the owner had no idea that hollow partition walls are not allowed in houses of Chinese construction. The 'architect' for the buildings, being a Chinese, would naturally omit from the plans anything which might tend to prevent the early issue of the permit, as his entire responsibility ceased after the permit had been obtained and handed over to the owner, in whose name it was made out. The present system of Chinese 'architects' preparing plans and having the application form for a permit 'chopped' by the owner, causes a great deal of unnecessary trouble to the department, as frequently, when the building work is bad, or not in accordance with the by-laws, it is very difficult to find the owner, who, in many cases, is away from Shanghai, and the 'architect' frankly admits that it is none of his business to supervise the work.

"The remedy for this unsatisfactory state of affairs is registration of architects, as, had this incident happened with the work under the supervision of a registered architect, the consequences to him might have been serious. It is true . . . that the council is empowered to pull down any work being done without a permit, or in contravention to the building rules, and this means has been resorted to on several occasions, but the procedure has the appearance of high-handedness, and is lacking in dignity. Arrangements have been made—at any rate temporarily—to detail two district inspectors for nothing but building inspection work in the areas where the majority of building operations are going on, but this means increasing the salary list of the department. In other words, the public is providing and paying for supervision which should be provided and paid for by the owners. Some improvement might be effected by charging a very much higher permit fee, unless a declaration was lodged with the application that the work was to be supervised by an architect to be approved by the council."

Surveyors' Institution: Country Meeting.—The council have accepted the invitation to hold the next country meeting at York on May 22nd and 23rd.

SKEGNESS MUNICIPAL WORK.**SURVEYOR'S ANNUAL REPORT.**

Mr. R. H. Jenkins, in his report for 1913, as surveyor to the Skegness, Lincs. Urban District Council, states that the rapid growth of that popular holiday resort continues, adding that the rateable value has risen from £21,958 to £24,205.

With regard to roads, he mentions that the total cost of maintenance during the period with which he deals was £643 17s. 9d., which equals £177 per mile. Now that nearly all the roads in the district are either tar-macadam or tar-painted, there is very little binding material for road making available, and slag chippings have had to be used for this purpose. A total area of 39,258 super. yds. were tarred during the year, gasworks and distilled tar and Fluxphalte and Tarvia being used, the analysed cost-per yard being as follows: Gasworks tar tar 0.36d., slag chippings 0.20d., labour and fuel 0.23d., total 0.79d.; distilled tar tar 0.75d., slag chippings 0.38d., labour and fuel 0.19d., total 1.32d.; Fluxphalte Fluxphalte 0.93d., slag chippings 0.37d., labour and fuel 0.22d., total 1.52d.

Mr. Jenkins states that the total cost of disposal of the sewage, exclusive of loan repayments and interest for the year, was £727, which is equal to 13s. 2d. per house. The loan repayments and interest on this account for the year ending March 31st last amount to £831, which is equal to just over 15s. per house, or the cost, including loan repayments and interest, is equal to a rate of nearly 1s. 5d. in the £.

The cost of house refuse removal was 9s. 8½d. per house per annum, exclusive of loan repayments for the destructor. In this connection it is noted that, as the result of Mr. Jenkins' advice that the emptying of privies attached to houses within 100 ft. of the sewers should be discontinued the privies have been abolished and connections made to the sewers.

A complete reorganisation of the lighting department is reported, a consequence of this being a very considerable saving, and an improvement in the lighting—which is by gas—has been effected. The total cost, excluding capital charges, is at the rate of £2 1s. per burner.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

DOVER MEETING.

A meeting of the institution is to be held in the South-Eastern District at Dover to-morrow (Saturday), May 9th.

PROGRAMME.

11.30 a.m. Members will assemble at the town hall. Welcome by His Worship the Mayor (Mr. Councillor E. W. T. Farley, J.P.).

District business (council chamber).

1 p.m.—Members will partake of luncheon at the Grand Hotel, facing the Granville Gardens. (Tickets 3s. per head.)

2 p.m.—Start from Grand Hotel and proceed:

(1) To inspect the ferro-concrete viaduct and workmen's dwellings, in course of construction in the pier district (W. C. Hawke, Assoc.M.INST.C.E., borough engineer).

(2) To inspect the new Marine Station, in course of construction on the Admiralty Pier, by the kind permission of Mr. P. C. Tempest, M.INST.C.E., engineer, S.E. and C. Rly.

Mr. A. T. Walmsley, engineer, Dover Harbour Board, will briefly explain the provision of a site for this station in the area reclaimed by the Harbour Board.

3 p.m. The Dover Harbour Board have kindly granted the use of one of the tugs for an inspection of the National Harbour works (Captain Iron, harbour master).

5 p.m. Members will partake of tea at the town hall as guests of the mayor.

Other works of interest to surveyors and engineers in Dover: The waterworks, pumping station, Castle Hill; slipper and

Turkish baths and electricity station adjoining the town hall; swimming baths, sea front; sewage pumping station, pier district.

Arrangements can be made for any members who desire to do so to inspect any of the above works of interest.

H. W. BOWEN, ASSOC.M.INST.C.E.,
Hon. District Secretary.

County Surveyor,
West Sussex, Horsham.

SALISBURY MEETING.

A meeting of the institution is to be held in the Southern District at Salisbury on Saturday, May 16th.

PROGRAMME.

11.30 a.m.—Reception in the council chamber by the Right Worshipful the Mayor of Salisbury, Mr. Councillor J. Macklin, J.P.

Papers by Mr. W. J. Goodwin, Assoc.M.INST.C.E., city engineer, "Some Notes on the Municipal Works of Salisbury"; and Mr. J. H. Blizard, Assoc.M.INST.C.E., on "The Bemerton and Wilton Pumping Station for Sewage Disposal."

Discussion.

1.15 p.m.—Lunch in the banqueting room at the invitation of the Right Worshipful the Mayor.

2.15 p.m.—Leave council house in motor char-à-banc to visit the following works—viz., Salisbury sewage disposal works and refuse destructor.

3.15 p.m. Leave for Salisbury waterworks, chief pumping station.

3.45 p.m.—Leave for Bemerton pumping station.

4.15 p.m.—Return to council chamber, where tea will be provided, at the invitation of Mr. Alderman C. J. Woodrow, J.P., chairman of the Salisbury Sanitary Committee. (Cost of conveyance, 2s. each.)

By the kind consent of the chief officer of the fire brigade, the fire station will be open all day for inspection.

DISTRICT MEETING.

Members of the Southern District are asked to assemble in the council chamber at 11.10 a.m., to elect the Executive Committee and to consider any other district business.

F. R. PHIPPS, ASSOC.M.INST.C.E.,
Hon. District Secretary.

Town Hall,
Basingstoke.

EASTERN DISTRICT.

An Eastern District Meeting is to be held at Ipswich on May 16th.

PROGRAMME.

12 noon.—Meet at town hall. Business meeting: Read minutes; elect sub-district secretary for counties of Norfolk, Suffolk and Cambridge.

Afterwards, Mr. John R. Mead will describe the proposed accommodation which is about to be provided for the Ipswich medical officer of health, which includes the school clinic and tuberculosis dispensary. After this, he will open a discussion on road making, road maintenance, and the use of dust palliatives.

1.15 p.m.—Luncheon. (Tickets, 2s. each.)

2.15 p.m. Visit Ipswich sanatorium, recently completed.

3.30 p.m.—Visit new vertical retort-house at gasworks.

4.30 p.m.—Visit St. Helens School, recently completed at a cost of £13,000; accommodation provided for 1,900 children.

5.30 p.m.—Tea. (Tickets, 1s. each.)

J. A. WEBB, H. T. WAKELAM, M.I.C.E.,
Hon. District Secretary. District Chairman.

WEST MIDLAND DISTRICT.

A meeting of the West Midland District is to be held at Birmingham on May 23rd.

SCOTTISH DISTRICT.

The annual Scottish meeting of the institution will be held in Dunfermline on June 5th and 6th.

The following papers will be read—viz.:—

"A Town Planning Scheme: Its Effects on Housing and Architecture," by Mr. Raymond Unwin.

"Edinburgh and Its Early Examples of Town Planning," by Mr. A. Horsburgh Campbell.

"Town Planning from a Lawyer's Point of View," by Mr. John L. Jack.

"The Advantages of Steam Tractor Haulage over Team Labour for Road Material," by Mr. W. L. Gibson.

On the first day the members are to be entertained to luncheon by the corporation of the city of Dunfermline. On the second day, by the courtesy of the Admiralty and Messrs. Easton, Gibb & Co., the members are to be permitted to visit the works at Rosyth.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on Saturday, June 13th.

ANNUAL GENERAL MEETING AND TOWN PLANNING, HOUSING AND ROAD CONFERENCES.

The forty-first annual general meeting of the institution will be held at the Town Hall, Cheltenham, on Wednesday, Thursday, Friday and Saturday, June 24th, 25th, 26th and 27th. Conferences will take place with delegates from the various corporations and local authorities of the United Kingdom and representatives of the different bodies interested in the subjects of town planning, housing and roads. An important exhibition of plans, maps and models of town planning and housing schemes has been arranged, and it is believed that the collection will be one of great educational and practical value. The exhibition will be open during the four days of the meeting. Ladies are invited to attend the meeting, visits and annual dinner, and the permission of the president may in their case be assumed, but due notice must be given on the reply form.

PAPERS.

The following papers for discussion will, as far as possible, be taken in the order in which they appear, and at the sessions referred to in the programme; but the chairman of each section may vary the sequence at his discretion. Should the papers be taken as read, each author will be asked to give a brief *résumé* of his paper.

Town Planning and Housing:—

(1) "Town Planning and Architectural Issues," by Prof. S. D. Adshad, Liverpool University.

(2) "Town Planning Amended Procedure Regulations," by H. E. Stilgoe, M.INST.C.E., city engineer, Birmingham.

(3) "Town Planning Procedure," by Fred W. Pearce, F.S.I., surveyor to the Twickenham Urban District Council.

(4) "Summary of Final Scheme of Town Planning, Ruislip-Northwood," by W. Louis Carr, surveyor, Ruislip-Northwood Urban District Council.

(5) "The Abnormal Development of Coventry, and Some of its Town Planning and Housing Problems," by J. E. Swindlehurst, M.INST.C.E., city engineer, Coventry.

(6) "Town Planning Large Areas," by R. A. Reay-Nadin, town clerk, and W. A. H. Clarry, Assoc.M. INST.C.E., borough surveyor, Sutton Coldfield.

(7) "The Housing, Town Planning, &c., Act, 1909 (Part II), as Applied to Commercial and Industrial Districts," by J. C. Midgley, deputy city surveyor, Newcastle-upon-Tyne.

(8) "The Latest Practice of Town Planning in the United States," by C. M. Robinson, Rochester, N.Y.

(9) "Housing in Rural Districts," by E. Holloway, surveyor to the Evesham and Pebworth Rural District Councils.

(10) "Town Planning Practice in Canada," by J. P. Hynes.

Roads:—

(11) Paper by Sir George Gibb, chairman of the Road Board.

(12) "The Training of the Highway Engineer of the Future," by H. Percy Boulnois, M.INST.C.E., London.

(13) "Some Notes on Highway Law as Affecting the Municipal Engineer," by S. G. Turner, Barrister-at-law, London.

(14) "The Control, Management and Maintenance of Rural Roads," by J. Fred Hawkins, county surveyor, Berkshire.

(15) "The Prevention of Sub-crust Movement in Roads," by E. S. Sinnott, M.INST.C.E., county surveyor, Gloucestershire.

(16) "The Economics of Modern Methods of Road Construction," by Francis Wood, M.INST.C.E., borough engineer, Fulham.

(17) "Some Notes on Grouting and Penetrating Methods of Road Surfaces," by Geo. Green, M.INST.C.E., borough engineer, Wolverhampton.

General Subjects:—

(18) "The Organisation of a Municipal Engineer's Department," by E. Willis, Assoc.M.INST.C.E., surveyor to the Chiswick Urban District Council.

(19) "The City of Worcester Sewage Disposal Works," by T. Caink, Assoc.M.INST.C.E., city engineer, Worcester.

(20) "Notes on the Protection of the Foundations of Chepstow Bridge, over the River Wye, in Ferro-concrete," by E. S. Sinnott, M.INST.C.E., county surveyor, Gloucestershire.

(21) "Applied Geology in Municipal Engineering," by H. Lapworth, D.Sc., Assoc.M.INST.C.E.

(22) "Descriptive Paper on Municipal Works of Cheltenham," by the president.

Members unable to attend are invited to send typewritten remarks on any of the papers. These will be read at the discussions should time permit. The contributions should be brief, and delivered to the secretary not later than three days prior to the meeting.

PROGRAMME OF MEETINGS AND CONFERENCES.

Wednesday, June 24th.

9.30 a.m. Meeting of subscribers to the Orphan Fund.

9.30 a.m.—Finance Committee meeting.

10 a.m.—Council meeting.

10.30 a.m.—Assemble in supper-room.

Members will be welcomed by the Mayor of Cheltenham, Mr. Alderman W. Nash Skillicorne, J.P., C.C.

ANNUAL GENERAL MEETING.

Chairman, the Outgoing President, Mr. J. W.

Cockrill, M.INST.C.E., A.R.I.B.A.

Minutes of last annual general meeting.

Annual general meeting adjourned.

Annual report of the council (to be taken as read).

Annual general meeting, to be adjourned.

Special meeting—Alterations in Articles of Association.

Annual general meeting resumed.

Alterations in by-laws.

Presentation of premiums.

Presidential address.

1 p.m.—Adjournment.

CONFERENCES.

TOWN PLANNING AND HOUSING.

(In Supper Room.)

Chairman: The President.

2.30. Opening Address by Mr. Thos. Adams (representative of the Local Government Board).

Mr. Adams will reply to questions arising from his remarks.

Discussion on Paper No. 1.

1 p.m.—Exhibition of town planning and housing schemes in Large Hall. Afternoon tea.

7 for 7.30 p.m.—Annual dinner in the Town Hall (delegates and visitors are invited to attend).

Thursday, June 25th.

CONFERENCES.

TOWN PLANNING AND HOUSING.

(In Supper Room.)

Chairman: The President.

10.0. Discussion on Papers Nos. 2, 3 and 4.

1 p.m.—Luncheon in Large Hall given by the mayor to members, delegates and visitors.

2.30 p.m.—Visit to destructor, concrete slab factory and electricity works, and new sewage purification works.

Tea at sewage works by invitation of mayor.

ROADS.

(In Drawing Room.)

Chairman:

Mr. H. T. Wakelam, M.INST.C.E. (vice-president).

2.30. Opening Address by the Chairman.

Discussion on papers Nos. 9 and 10.

ROADS.

(In Drawing Room.)

Chairman:

Mr. H. T. Wakelam, M.INST.C.E. (vice-president).

Discussion on Papers Nos. 13, 14 and 15.

8 p.m.—Exhibition of town planning and housing schemes in Large Hall.

Friday, June 26th.

CONFERENCES.

TOWN PLANNING AND HOUSING (In Supper Room). <i>Chairman:</i> The President.	ROADS AND GENERAL SUBJECTS (In Drawing Room). <i>Chairmen:</i> Mr. H. T. Wakelam, M.INST.C.E. (vice-president), Mr. T. W. A. Hayward (vice-president).
10.0 to 1.0. Discussion on Papers Nos. 5 and 6.	Discussion on Papers Nos. 16, 17 and 18.
2.30. Discussion on Papers Nos. 8, 9 and 10.	Discussion on Papers Nos. 19, 20 and 21.

4.30 p.m.—Votes of thanks to mayor and corporation, authors of papers and exhibitors (in Supper-room).

8 p.m.—Open-air entertainment, Montpellier Gardens.

Saturday, June 27th.

10 a.m.—Assemble at the Town Hall. Visit to Cheltenham Corporation waterworks at Tewkesbury and Tewkesbury Abbey, returning to Cheltenham by 4 p.m.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

J. W. DUDLEY ROBINSON, B.SC.(LOND.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

COUNCIL MEETING.

At a meeting of the council, held in London on April 29th, the following applicants were recommended for admission:—

To Membership: Messrs. W. J. Edwards, assistant surveyor, Carnarvonshire County Council, and E. Hanson, deputy borough surveyor, Macclesfield.

Transferred to Membership: Mr. F. A. Rawlin, King-street, Hoyland, near Barnsley.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

To Studentship: Mr. Cyril Beaumont, assistant surveyor, Thurnscoe Urban District Council.

New Members, &c.—From the applicants recommended for admission at the last meeting, two members and one associate-member were elected, and one associate-member was transferred to membership.

Defence Fund.—Two applications from members were considered by the council, and the secretary was instructed to lay the cases before the solicitors of the institution for their opinion.

Nominations for Council.—Nominations for ordinary members of council must now be deposited with the secretary by June 20th in each year. Nomination forms may be obtained on application.

Applications for Admittance.—It was resolved: "That all applications for admittance to the membership and other classes of the institution be submitted, before consideration by the council, to the respective district committees in whose districts candidates may be, provided that, in any case where no reply may be received from a district committee within one month, the application be considered in the ordinary way."

The next meeting of the council will be held in London on Wednesday, May 27th.

NORTHERN DISTRICT.

Meetings will be held in Cumberland in June, at Alnwick on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Hull on Saturday, May 16th.

A Northern District meeting, in combination with

Yorkshire, will be held at Harrogate on Saturday, September 12th.

NORTH-WESTERN DISTRICT.

A visit will be paid to the Oldham sewage disposal works on Saturday, May 16th.

PROGRAMME.

3 p.m.—Meet at Middleton Junction Station.

3.15 p.m.—Arrive at Oldham sewage works, where members will be received by Dr. J. B. Wilkinson, medical officer of health, Oldham, and Dr. Grossmann, licensee of the grease extracting plant which has been described by him in a paper read before the institution.

5.15 p.m.—Tea.

R. J. MCKENN.

Hon. District Secretary

Heywood.

WESTERN DISTRICT.

A Western District meeting will be held at Tisbury on Saturday, June 13th, when the municipal works of the town will be inspected and a paper, "Wiltshire Roads, Past and Present," will be read by Mr. E. Plummer Davies (member).

EASTERN AND NORTH-EASTERN DISTRICTS.

A joint Eastern and North-Eastern District meeting will be held at Hunstanton in July.

GENERAL MEETINGS.

A meeting will be held at the Institution of Electrical Engineers, Victoria Embankment, W.C. (corner of Savoy-street, Strand), on Monday next, at 7.30 p.m., for the discussion of a paper,

GREATER NEW YORK'S WATER SUPPLY SCHEME, which has been presented for that purpose by Mr. William T. Taylor, Fellow A.M.I.E.E., M.I.E.E., M.A.M. SOC.M.E.E., A.M.I.MECH.E., F.R.G.S. (Member).

The meeting is being held jointly with the Society of Engineers.

A visit will be paid to the works of the General Electric Company, Limited, Witton, Birmingham, on Thursday, May 21st.

Members will meet at the offices of the company at Witton at 1.45 p.m., proceeding at 2 p.m., on the kind invitation of the company, on an inspection of the engineering works, small motor, switchboard and switchgear departments, foundry, test-house, and conduit works. The works are among the first and best equipped in the country, and the visit will be one of extreme interest, and should command a large attendance.

B. WYAND,

39 Victoria-street, S.W.

Secretary.

INSTITUTION OF WATER ENGINEERS.

SUMMER MEETING AT STOCKPORT.

The annual summer meeting of the Institution of Water Engineers will be held this year on June 11th, 12th and 13th at Stockport (headquarters at Midland Hotel, Manchester). Candidates for election at the council meeting to be held on June 11th should see that their proposal forms (duly filled in and signed) are received by the secretary, Mr. Percy Griffith, 20 Victoria-street, Westminster, S.W., not later than June 1st.

CONCRETE INSTITUTE.

FORTHCOMING MEETINGS.

The next meeting of the Concrete Institute will take place at Denison House, Vauxhall Bridge-road, S.W., on Thursday next, at 7.30 p.m., when a paper on "Sand and Coarse Material and Proportioning Concrete" will be read by Mr. John A. Davenport, M.Sc.(VICT.), B.ENG.(LIVERPOOL), ASSOC.M. INST.C.E., A.M.I.MECH.E., M.C.I., and Prof. S. W. Perrott, M.A.(DUBL.), M.INST.C.E., Professor of Engineering at Liverpool University, M.C.I.

The fifth annual general meeting of the institute will take place on Thursday, May 28th, at 4.30 p.m., and the fourth annual dinner will take place on the evening of the same day at 8 p.m., at the Connaught Rooms, Great Queen-street, W.C., Prof. Henry Adams presiding.

H. KEMPTON DYSON,

Secretary.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

CLERK OF WORKS.—May 9th.—Horsforth Urban District Council.—Mr. J. Davidson, clerk.

CLERK OF WORKS.—May 9th.—Guildford Rural District Council. £3 10s. per week.—Mr. John Anstee, engineer, Commercial-road, Guildford.

CLERK OF WORKS.—May 9th.—Yeoil Education Committee. £2 10s. per week.—Mr. H. C. Batten, town clerk.

ROAD SURVEYOR'S CLERK.—May 9th.—Durham County Council. £80 per annum.—Mr. W. Crozier, county surveyor, Shire Hall, Durham.

CLERK OF WORKS.—May 11th.—Visiting Committee of the East Riding Asylum.—Mr. C. W. Hobson, clerk, 26 and 28 Laingate, Beverley.

ELECTRICAL ENGINEER.—May 11th.—Corporation of Greenock. £450 per annum.—Mr. C. MacCulloch, town clerk.

INSPECTOR OF NUISANCES.—May 11th.—Runcorn Rural District Council.—Mr. G. F. Ashton, clerk, 71 High-street, Runcorn.

INSPECTOR OF NUISANCES AND BUILDING SURVEYOR.—May 11th.—Saddleworth Urban District Council. £104 per annum.—Mr. E. Rowbotham, clerk, Uppermill, near Oldham.

QUANTITY SURVEYORS.—May 12th.—Glamorgan County Council. £140—£170; £11 13s. 4d. per month.—Mr. D. Pugh-Jones, county architect, Cardiff.

SURVEYOR OF MAIN ROADS.—May 12th.—Monmouthshire County Council. £190—£230 per annum.—Mr. H. Stafford Gustard, clerk, Newport, Mon.

CLERK OF WORKS.—May 13th.—Gloucester County Asylum. £180—£200.—Medical Superintendent, County Asylum, Gloucester.

ARCHITECTURAL ASSISTANT.—May 13th.—Bolton Town Council. £120 per annum.—Mr. Samuel Parker, town clerk.

SEWAGE WORKS MANAGER.—May 13th.—Bilston Urban District Council. £2—£2 5s. per week, with house, rates, and water free.—Mr. Joseph L. Arlidge, clerk.

BUILDING INSPECTOR.—May 13th.—Corporation of Halifax. £110 per annum.—Mr. P. Saunders, town clerk.

BOROUGH SURVEYOR.—May 14th.—Corporation of Bridlington. £275—£350 per annum.—Mr. A. E. Matthewman, town clerk, Town Hall, Bridlington.

SURVEYOR'S (Temporary) GENERAL ASSISTANT.—May 16th.—Hindley Urban District Council. £78 per annum.—Mr. Thomas Robey, clerk, Council Offices, Hindley, near Wigan.

ROAD SURVEYOR.—May 16th.—Highland District of Perthshire. £350 per annum.—Mr. H. Mitchell, district clerk, Pitlochry, Perthshire.

SURVEYOR.—May 18th.—Kingswood (near Bristol) Urban District Council. £150—£180 per annum.—Mr. Percy Baldwin, clerk.

CITY SURVEYOR AND SANITARY ENGINEER.—May 18th.—Corporation of Lichfield. £200 per annum.—Mr. Herbert Russell, town clerk.

SURVEYOR'S GENERAL ASSISTANT.—May 18th.—Whitley and Monkseaton Urban District Council. £104 per annum.—Mr. Augustus Whitehorn, clerk, 60 Saville-street, North Shields.

CLERK OF WORKS.—May 19th.—East Sussex County Council. £3 10s. per week.—Mr. F. J. Wood, county surveyor, County Hall, Lewes.

WATERWORKS ENGINEER-MANAGER.—May 21st.—Epsom Urban District Council. £200—£250, with house and motor-car allowance.—Mr. E. G. Wilson, clerk, Church-street, Epsom.

SURVEYOR AND INSPECTOR OF NUISANCES.—May 23rd.—Bollington Urban District Council. £140 per annum.—Mr. Samuel Knight, clerk.

SURVEYOR.—June 15th.—Board of Trustees for the Improvement of Calcutta. 600—800 rupees per month (rupee valued at 1s. 4d.). Chairman, Calcutta Improvement Trust.

COUNTY SURVEYOR'S ARCHITECTURAL ASSISTANTS.—Flintshire County Council. £3 per week.—Mr. S. Evans, county surveyor, bridgmaster, and architect, County Buildings, Mold, Flint.

SURVEYOR'S ASSISTANT.—Blackwell Rural District Council. £75—£90 per annum.—Mr. H. Silcock, surveyor, 67 Westgate, Mansfield, Notts.

ASSISTANT ENGINEERS.—Government of East Africa. £300—£400, with allowances.—Crown Agents for the Colonies, Whitehall Gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

WEMBLEY.—May 12th.—Designs for a rustic pavilion at the recreation ground for the Wembley Urban District Council. Cost not to exceed £300.—Mr. C. R. W. Chapman, engineer and surveyor, Public Offices.

SUNDERLAND.—June 23rd.—Designs for a secondary school for 600 scholars, for the Corporation of Sunderland. Premiums, £100, £50, and £25.—Mr. J. W. Moncur, borough engineer and surveyor, Town Hall.

MIDDLETON.—July 16th.—Designs for a town hall, the cost of which must not exceed £18,000. Premiums £100, £50, and £25.—Town Clerk.

LONDON.—September 7th.—Designs for elementary schools, for the London County Council.—Education Officer, Education Offices, Victoria-embankment, W.C.

BELPER.—Designs and estimates for the erection of a bridge over the River Derwent, for the Belper Rural District Council.—Mr. Robert C. Cordon, surveyor, Duffield, near Derby.

CHESTER.—Designs for working-class dwellings, for the Corporation of Chester. Premiums, £50, £25, and £10. Mr. Patrick Abercrombie, M.A., Liverpool University School of Civic Design, has been appointed assessor.—Mr. J. H. Dickson, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

CARLISLE.—May 11th.—For alterations to buildings, for the corporation.—Mr. H. C. Marks, city engineer and surveyor.

SHREWSBURY.—May 11th.—For the erection of boundary walls and wrought-iron fences, for the corporation.—Mr. A. W. Ward, borough surveyor.

GUILDFORD.—May 11th.—For the erection of twenty cottages, for the corporation.—Mr. C. G. Mason, borough engineer.

FARINGDON.—May 11th.—For works of water supply and sewerage, for the rural district council.—Mr. H. Glynn Warne, engineer, Faringdon, Berks.

ILKLEY.—May 11th.—For the erection of an electricity generating station, for the urban district council.—Mr. George Wilkinson, consulting engineer, Beech Mount, Harrogate.

NEWCASTLE-ON-TYNE.—May 11th.—For converting certain premises into cottage baths, for the corporation.—City Estate and Property Surveyor's Office, Town Hall.

WAKEFIELD.—May 11th.—For building a boundary wall, for the corporation.—City Surveyor.

SAMFORD.—May 11th.—For constructing a water supply, for the rural district council.—Mr. H. J. Wright, architect, 4 Museum-street, Ipswich.

CHORLEY.—May 11th.—For alterations and renovation at the council chamber and offices, for the rural district council.—Mr. A. Jolly, surveyor.

DUNDALK.—May 12th.—For building extension and the installation of electricity plant, for the urban

district council.—Mr. P. A. Spalding, engineer and manager, electricity works.

MACCLESFIELD.—May 12th.—For the reconstruction of a bridge, for the corporation.—Borough Surveyor.

HANTS.—May 12th.—For the erection of a school, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

BARNES.—May 12th.—For the erection of a mortuary, for the urban district council.—Mr. G. B. Tomes, surveyor, Council House, High-street, Mortlake.

BALROTHERY.—May 13th.—For sinking wells and lining them, and setting therein cast-iron pumps, for the rural district council.—Mr. J. Stack, clerk, Lusk, co. Dublin.

WALLASEY.—May 13th.—For the erection of a central fire station, for the corporation.—Borough Engineer and Surveyor.

ABERDEEN.—May 13th.—For the construction of a reinforced concrete roof and contingent works at a reservoir, for the corporation.—Water Engineer, 41½ Union-street, Aberdeen.

ESSEX.—May 14th.—For additions to a school, for the Education Committee.—Mr. G. T. Forrest, architect, 73 Duke-street, Chelmsford.

BELFAST.—May 15th.—For the erection of a public convenience, for the corporation.—City Surveyor.

LEICESTERSHIRE.—May 15th—23rd.—For the enlargement of a public school, for the Education Committee.—Architect, 33 Bowling Green-street, Leicester.

LEEDS.—May 15th.—For the erection of a house and premises, for the Parks Committee.—Mr. G. F. Bowman, architect, 5 Greek-street, Leeds.

ACCRINGTON.—May 16th.—For alterations and extensions of a building, for the Education Committee.—Mr. W. J. Newton, architect, Town Hall.

TYNEMOUTH.—May 16th.—For the construction of retaining walls and reinforced concrete platforms, for the corporation.—Mr. J. E. Smilie, borough surveyor.

WEST RIDING.—May 16th.—For the erection of a police station, for the Standing Joint Committee.—West Riding Architect, County Hall, Wakefield.

BRIGHTON.—May 18th.—For the erection of a department for infants at Coombe-road school, for the Education Committee.—Messrs. T. Simpson & Son, 15 Ship-street, Brighton.

SALFORD.—May 18th.—For the erection of a sub-station, for the corporation.—Messrs. C. S. Allott & Sons, 46 Brown-street, Manchester.

LEDBURY.—May 18th.—For the construction of a reinforced concrete open-air swimming bath, with dressing-boxes and corrugated iron fencing, for the urban district council.—Mr. R. G. Gurney, surveyor.

SOUTHAMPTON.—May 18th.—For the erection of four cottages, for the corporation.—Waterworks Engineer, 33 and 35 French-street.

DURHAM.—May 19th.—For the erection of a school, for the county council.—Mr. A. J. Dawson, clerk to the Education Committee, Shire Hall, Durham.

OLDHAM.—May 20th.—For the supply and fixing of equipment for a public wash-house, for the corporation.—Borough Surveyor.

WEST RIDING.—May 22nd.—For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

DUBLIN.—May 23rd.—For alterations and additions to public baths and washhouses, for the corporation.—Mr. M. J. Buckley, borough surveyor, Castle-street.

ABERDARE.—May 25th.—For the erection of a refuse destructor, for the urban district council.—Mr. D. L. Griffiths, clerk.

DUBLIN.—May 25th.—For the erection of 113 cottages, blocks of flats, and eight-roomed houses, for the corporation.—City Architect, City Hall.

DEVON.—May 25th.—For the erection of a police station, for the Standing Joint Committee.—Mr. E. H. Harbottle, County Chambers, Exeter.

BIRMINGHAM.—May 25th.—For constructional works at generating station, for the corporation.—Electric Supply Department, 14 Dale-end.

WEST SUSSEX.—May 26th.—For alterations and additions to the Midhurst Grammar School, for the Joint Education Committee.—Mr. Haydn P. Roberts, county education architect, Thurloe House, High-street, Worthing.

WEST SUSSEX.—May 26th.—For alterations and improvements to the Shoreham council school, for the Joint Education Committee.—Mr. Haydn P. Roberts, county education architect, Thurloe House, High-street, Worthing.

WEST HAM.—May 26th.—For painting, cleansing, and repairing public buildings in the borough, and certain other institutions, for the corporation.—Mr. J. G. Morley, borough engineer.

CLONMEL.—For the erection of a retort-house and store, for the Gas Committee.—Mr. H. O'Connor, engineer, 1 Drummond-place, Edinburgh.

HOLLAND (Lincs).—For the erection of five houses and other buildings, for the Small Holdings Committee.—Mr. B. J. A. Christie, Sessions House, Boston.

Iron and Steel.

PENZANCE.—May 11th.—For the renewal and repair of steel girders and plates at Swingbridge, for the corporation.—Mr. F. Latham, borough engineer.

PENRITH.—May 13th.—For the supply of a stoking machine, for the urban district council.—Messrs. F. Newbigging & Son, engineers, 5 Norfolk-street, Manchester.

MANCHESTER.—May 19th.—For the supply of steel girder tramway rails, for the Tramways Committee.—Mr. J. M. McElroy, general manager, corporation tramways, 55 Piccadilly.

GRAYS.—May 20th.—For the supply of 1,000 yds. of 3-in. diameter cast-iron pipes, for the rural district council.—Mr. C. F. W. Marsh, engineer, Grays, Essex.

BURY.—May 20th.—For the supply of floor girders, stanchions, and staircase and chequered plates at the generating station, for the corporation.—Town Clerk.

MARKET HARBOROUGH.—May 22nd.—For the erection of a brick and puddle gasholder tank, for the urban district council.—Mr. A. T. Harris, engineer, Gas Offices.

GLOUCESTER.—May 25th.—For the installation of pumping machinery, for the corporation.—Messrs. Fox, Moore, Bateman & Fox, 5 Victoria-street, Westminster, S.W.

MADRAS.—June 17th.—For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer, and Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

BRITON FERRY.—May 19th.—For the supply of 2,337 lin. yds. of cast-iron plates 7 in. in diameter, 1,317 lin. yds. 6 in. in diameter, and 15 lin. yds. 3 in. in diameter, for the urban district council.—Mr. Alex. Clarke, engineer and surveyor.

BRITON FERRY.—May 19th.—For laying, jointing and completing cast-iron pipes, for the urban district council.—Mr. H. Alex. Clarke, engineer and surveyor.

Roads.

SOUTHAMPTON.—May 11th.—For laying about 4,000 super. yds. of tar paving, for the corporation.—Borough Engineer.

HORNCASTLE.—May 11th.—For the supply of 340 tons of X granite, 220 tons of XX granite, 115 tons of X slag, and 90 tons of slag chips, for the urban district council.—Mr. F. Weber, surveyor, Foundry-street, Horncastle.

MIRFIELD.—May 11th.—For the supply and delivery of about 800 tons of 4-in. and 6-in. granite setts within the next four months, for the urban district council.—Mr. Edwin Gill, Council Offices.

HARPENDEN.—May 11th.—For making up part of Spencer-road, for the urban district council.—Mr. John H. Leverton, surveyor.

FAREHAM.—May 11th.—For the supply of granite, basalt, or other hard stone, for the rural district council.—Mr. J. F. Whitcar, surveyor, Southampton-road, Fareham, Hants.

WARRINGTON.—May 11th.—For the supply of 1,000 tons of granite or syenite setts, for the corporation.—Borough Surveyor.

SOUTHAMPTON.—May 11th.—For laying 4,000 super. yds. of tar paving, for the corporation.—Borough Engineer.

LEEDS.—May 11th.—For surfacing work with tar-macadam, for the corporation.—Highways Committee.

SKIPTON.—May 11th.—For making up certain streets, for the urban district council.—Mr. A. E. W. Aldridge, engineer and surveyor.

SWANSEA.—May 12th.—For the execution of private street works, for the corporation.—Mr. George Bell, borough surveyor, 13 Somerset-place, Swansea.

WHITSTABLE.—May 12th.—For the supply of picked flints, hoggin, and crushed flints, for the urban district council.—Mr. F. Laurens, surveyor.

LITTLEBOROUGH.—May 12th.—For making up certain streets, for the urban district council.—The Surveyor.

SOUTHAMPTON.—May 12th.—For the execution of private street works, for the corporation.—Borough Engineer.

ASHTON-UPON-MERSEY.—May 12th.—For laying tar-macadam and asphalt, for the urban district council.—Mr. F. Hutton, surveyor.

COLCHESTER.—May 12th.—For the construction of tar-paved roads and surface-water drainage, and the supply of material for bottoming and surface metalting, for the Committee of Visitors of the Essex and Colchester Lunatic Asylum.—Mr. H. H. Gapp, clerk, 57 New-street, Chelmsford.

MOUNTAIN ASH.—May 12th.—For the execution of private street works, for the urban district council.—The Surveyor.

BRIGG.—May 12th.—For the supply of 400 tons of 2½-in. granite to be delivered during the year for the urban district council.—Mr. G. S. Sowter, clerk.

SOUTHALL-NORWOOD.—May 12th.—For works of road widening, for the urban district council.—Mr. R. Brown, engineer and surveyor.

COLCHESTER.—May 12th.—For making up tar-paved roads, paths, and surface-water drainage, for the Committee of Visitors of the Asylums.—Mr. H. H. Gepp, clerk, 57 New-street, Chelmsford.

ST. MELLONS.—May 12th.—For widening and improving part of Lighthouse-road, for the rural district council.—Mr. Gomer S. Morgan, engineer, Pontypridd.

WOOLWICH.—May 12th.—For resurfacing roads in Woolwich, Plumstead, and Eltham with asphalt, asphalt macadam, and wood and other material, for the borough council.—Mr. J. Rush Dixon, borough engineer.

FULHAM.—May 13th.—For making up two roads, for the borough council.—Mr. F. Wood, borough surveyor.

STOKE-ON-TRENT.—May 13th.—For making up certain streets, for the corporation.—Borough Surveyor.

LITTLEHAMPTON.—May 13th.—For scarifying and surfacing work, for the urban district council.—Mr. H. Howard, surveyor.

BARNET.—May 13th.—For the supply of any quantity up to 1,100 tons of 2½-in. broken granite of approved quality, for the urban district council.—The Surveyor, 49 High-street, Barnet.

HESTON AND ISLEWORTH.—May 14th.—For laying wood paving, for the urban district council.—Mr. J. G. Carey, engineer and surveyor.

REIGATE.—May 15th.—For the execution of private street works, for the rural district council.—Mr. Arthur J. Head, surveyor.

GRAVESEND.—May 15th.—For the supply of Kentish ragstone and hassock, for the Commissioners of Sewers.—Mr. A. C. Hurtzig, engineer, 2 Queen Square-place, Queen Anne's Mansions, Westminster, S.W.

SOUTHBOROUGH.—May 16th.—For the supply of 800 tons of basalt or granite, for the urban district council.—The Surveyor.

HALIFAX.—May 16th.—For the construction of a tar-macadam road, for the corporation.—Mr. J. Lord, borough engineer.

NORTH WALSHAM.—May 16th.—For the supply of granite, tar and road rolling, for the urban district council.—Mr. J. W. Stevens, surveyor.

BOGNOR.—May 18th.—For the supply of granite chippings, for the urban district council.—Mr. O. A. Bridges, surveyor.

BELCHAMP.—May 19th.—For the supply of broken slag, for the rural district council.—Mr. S. Allpress, surveyor.

KENT.—May 20th.—For the supply of about 11,000 yards of Guernsey, Norwegian, Pennant, Scottish or other kerb, for the county council.—County Surveyor, St. Peter-street, Maidstone.

RAWTENSTALL.—May 20th.—For paving and sewerage certain streets, for the corporation.—Mr. J. Johnson, borough surveyor.

ROWLEY REGIS.—May 25th.—For work of road improvement, for the urban district council.—The Surveyor.

WEST HAM.—May 26th.—For making up part of Saville-road, part of Leonard-street, Eclipse-road, part of Cumberland-road, part of Chadwin-road, and part of Varley-road, for the corporation.—Borough Engineer.

TANGIER.—June 8th.—For the construction of about 10 miles of road, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

EPSOM.—June 16th.—For making up Leigh-road, School-road and Spencer-road, for the rural district council.—Mr. T. E. Ware, surveyor of highways, Waterloo-road, Epsom.

SKIPTON.—For the supply of a portable stone-drying and tar-macadam mixing plant, for the rural district council.—Mr. A. Rodwell, surveyor.

Sanitary.

WARMINSTER.—May 11th.—For the construction of stoneware pipe sewers, for the urban district council.—The Surveyor.

NEWPORT (Mon.).—May 11th.—For the construction of stoneware pipe and cast-iron pipe sewer, for the corporation.—Borough Engineer.

GRIMSBY.—May 11th.—For the construction of 160 yds. of 24-in. diameter earthenware sewer, for the corporation.—Mr. H. Gilbert Whyatt, borough engineer and surveyor.

WOOLWICH.—May 12th.—For the construction of main and subsidiary sewers, for the borough council.—Mr. J. Rush Dixon, borough engineer.

GATESHEAD.—May 12th.—For the supply of disinfectants, for the corporation.—Mr. H. G. Whyatt, borough engineer and surveyor.

LITTLEBOROUGH.—May 12th.—For the construction of a 9-in. pipe sewer, for the urban district council.—The Surveyor.

RICHMOND.—May 12th.—For the supply of Welsh steam coal, house coal, lime for precipitation, lime for sludge pressing, sulphate of ammonia, green copperas, and filter press cloth, for the Main Sewerage Board.—Mr. William Fairley, engineer, West Hall-road, Kew Gardens.

KINGSTON-UPON-THAMES.—May 13th.—For the supply of 300 tons of bauxite for the sewage works, for the corporation.—Mr. R. Hampton Clucas, borough surveyor.

WARE.—May 13th.—For laying foul and surface-water sewers, and constructing manholes, for the urban district council.—Mr. H. Fox Hill, surveyor.

CHEADLE.—May 14th.—For the construction of about 519 yds. of 9-in. sewer, with manholes, for the urban district council.—Mr. E. Sykes, surveyor.

RHYMNEY.—May 18th.—For the construction of outfall sewer, storage tank, discharge pipe, and storm overflow pipe, for the Sewerage Board.—Mr. J. S. Alford, 9 Victoria-street, Westminster, S.W.; Messrs. Wilcox & Raikes, 63 Temple-row, Birmingham; and Mr. T. J. Thomas, 36 High-street, Bargoed.

BRADFORD.—May 19th.—For emptying middens and ashpits, for the corporation.—Mr. F. Stevens, town clerk.

PETERBOROUGH.—May 22nd.—For the construction of Eye drainage works, with manholes, flushing chamber, and ventilating pipe, for the rural district council.—Mr. G. A. Penwill, 33 Queen-street, Peterborough.

ECCLES.—May 23rd.—For the construction of outfall sewer, storm overflow manhole, junction manhole, screening and raking apparatus, detritus elevators, machinery, engines, penstocks, and circular storm-overflow sewer, for the corporation.—Mr. Thomas S. Picton, borough engineer.

DURSLEY.—May 23rd.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. G. P. Milnes, 7 Rowercroft, Stroud.

LEEK. May 25th.—For laying and jointing about 2,840 yds. of 9-in. and 6-in. stoneware pipe sewers, and constructing manholes, flushing chambers, engine house, pump well, liquefying tanks, bacteria beds, sludge beds, approach road, and other works, for the rural district council.—Messrs. Willeox & Raikes, 63 Temple-row, Birmingham.

DEUDRAETH. May 25th.—For laying glazed stoneware and cast-iron socket-pipe sewers, and constructing manholes and other works, for the rural district council.—Mr. L. Lloyd Jones, Lloyd's Bank Chambers, Carnarvon.

WAKEFIELD. May 25th.—For the construction of a main outfall sewer, comprising 4,000 yds., or thereabouts, of pipe sewers, pumping station, and subsidiary branch sewers, comprising 5,800 yds., or thereabouts, of pipe sewers, for the corporation.—Mr. A. G. Alibone, town clerk.

WARBLINGTON.—May 25th.—For laying laterals or branch drains from the public sewers, and the connection of existing drains, with all necessary inspection chambers and other works, for the urban district council.—Mr. Arthur J. Martin, engineer, 7 Victoria-street, Westminster, S.W.

CHEPPING WYCOMBE.—May 28th.—For the supply and erection of steam engines, air compressors, air lifts, ejectors, and all necessary appurtenances in the extension of the sewage outfall works at Wycombe Marsh, for the corporation.—Mr. T. J. Rushbrooke, borough engineer and surveyor.

DEWSBURY.—May 30th.—For the construction of sewage disposal works, for the corporation.—Mr. Henry Dearden, borough engineer.

Stores.

MILNROW.—May 14th.—For the supply of kerbs, flags, granite, limestone macadam, sanitary pipes, pitch and creosote oil, for the urban district council.—Mr. R. Jones, clerk.

BELFAST. May 14th.—For the supply of stores, for the Gas Committee.—Engineer and Manager, Gas-works.

BRIERLEY HILL.—May 18th.—For the supply of Rowley ragstone setts, chippings, broken furnace slag, blue kerbs, paving bricks, hard burned and common bricks, scavenging brushes, shovels, picks, gully grates, stoneware pipes, sanitary articles, and disinfectants.—Mr. William Waldron, clerk.

WALSALL. May 18th.—For the supply of requisites for the gas department.—Town Clerk.

Miscellaneous.

DUNDALK.—May 12th.—For the supply of electricity plant, for the urban district council.—Mr. P. A. Spalding, engineer and manager, Electricity Works.

MADRAS.—June 1st.—For the supply of two petrol-driven motor fire engines, for the corporation.—Mr. James R. Coats, engineer.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

BLAYDON.—For making up certain streets, for the urban district council.—Mr. G. Symon, surveyor:

STREET AT BLAYDON (WHITMORE-ROAD).

J. Friend, Blaydon	£391
G. Armstrong, Whitley Bay	384
E. R. Davison, Blaydon	325
E. Edgar, Gosforth*	324

FIVE STREETS AT WINLATON.

G. Armstrong, Whitley	£914
E. Edgar, Gosforth	882
J. Friend, Blaydon	786
E. R. Davison, Blaydon*	711

BOURNEMOUTH.—For extensions to main and outfall sewers, for the corporation.—Mr. F. W. Lacey, borough engineer:—

F. Bevis, Limited, Portsmouth.
T. Wilkinson & Co., Bournemouth.*
R. C. Brebner & Co., Edinburgh.
T. Swah, Southwick, Sussex.
Playfair & Toole, Southampton.
Grounds & Newton, Bournemouth.

CHELMSFORD. Accepted for stone paving certain foot-paths, for the corporation.—Mr. P. T. Harrison, borough engineer:—

Patent Victoria Stone Company, Limited, London, E.C.—Paving, 4s. 7d. per yard; kerbing, 7s. 5d. per yard; channelling, 7s. 3d. per yard; paving material, 3s. 9d. per yard.

CHELMSFORD.—For sinking a 14-in. borehole, for the corporation.—Mr. P. T. Harrison, borough engineer:—

Le Grand & Sutcliffe, London, E.C.	£1,313
T. Tilley & Co., Limited, London, S.W.	1,232
G. Y. Murray, London, S.W.	1,195
A. C. Potter & Co., London, S.E.	1,090
C. J. Ell, Luton	1,085
C. Chapman & Sons, Salford	904
F. Smith & Son, Grimsby	722

EASTBOURNE. For the erection of boundary wall and drainage work at hospital, for the corporation.—Building Surveyor, Town Hall:—

M. Hookham, Eastbourne.— Walls, £629; drains, £198.
J. Bodlee & Addison, Eastbourne.— Walls, £638; drains, £206.
J. Martin, Eastbourne.— Walls, £517; drains, £250.*
W. & J. Newman & Sons, Eastbourne.— Walls, £589.

GREENWICH. For the supply of one 6-h.p. screw-cutting lathe, required in connection with the equipment of the boiler-house workshop at the Greenwich generating station, for the London County Council:—

W. Muir & Co., Limited, Manchester	£111
W. Muir & Co., Limited, Manchester (alternative)	108
H. W. Ward & Co., Limited, Birmingham	105
J. Lang & Sons, Glasgow	103

GREENWICH.—For the supply of one 10-h.p. three-phase motor, and one 2-h.p. three-phase portable motor, in connection with the equipment of the boiler-house workshop at the Greenwich generating station, for the London County Council:—

Siemens Brothers, Limited, Upper Thames-street, E.C.	£127
Electric Construction Company, Limited, Wolverhampton (alternative)	114
British Westinghouse Electric and Manufacturing Company, Limited, Manchester	107
Electric Construction Company, Limited, Wolverhampton	106
General Electric Company, Limited, Queen Victoria-street, E.C.	100

ST. PANCRAS.—For remodelling Burghley-road school, St. Pancras, for the London County Council:—

Thomas & Edge, Woolwich	£19,198
W. King & Son, Vauxhall Bridge-road	19,030
Rowley Brothers, Wood Green	18,967
McCormick & Sons, Limited, Essex-road	18,733
G. E. Wallis & Sons, Limited, Haymarket	18,656
J. Smith & Sons, Limited, South Norwood	18,548
J. Chessum & Sons, South-place	18,388
W. Lawrence & Son, Finsbury-circus	17,872
C. P. Roberts & Co., Dalston	17,844
L. H. & R. Roberts, Lower Clapton-road	17,654
Brand, Pettit & Co., Tottenham	17,368
J. Willmott & Sons, Hornsey	17,289
J. & C. Bowyer, Limited, Upper Norwood †	17,167
Architect's estimate, £17,985.	

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MAY.

- 9.—Institution of Municipal and County Engineers: Meeting at Dover.
- 11.—Institution of Municipal Engineers (with Society of Engineers): Mr. W. T. Taylor on "The Greater New York Water Supply Scheme." Institution of Electrical Engineers. 7.30 p.m.
- 11.—Institute of Sanitary Engineers: Mr. Guy E. Grave on "A London Builder's Experiences with Sanitary Officials in the Metropolis." 8 p.m.
- 13.—Royal Sanitary Institute: Annual Dinner, Langham Hotel.
- 14.—Concrete Institute: Mr. J. A. Devonport and Prof. S. W. Perrott on "Sand and Coarse Material, and Proportioning Concrete." 7.30 p.m.
- 16.—Institution of Municipal and County Engineers: Meetings at Salisbury and Ipswich.
- 20.—Institute of Sanitary Engineers: Visit to Metropolitan Water Board's Reservoirs at Chingford.
- 23.—Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham; Mr. A. S. Parsons on "Bridge Construction."
- 21.—Institution of Civil Engineers (Students' Meeting): Mr. A. A. Hudson, k.c., on "Engineering Contracts." 8 p.m.
- 27.—Institute of Sanitary Engineers: Visit to Eton Rural District Council's sewage outfall works at Gerrard's Cross. Train from Marylebone, 2 p.m.
- 28.—Concrete Institute: Annual General Meeting, 4.30 p.m.; Annual Dinner, Connaught Rooms, 8 p.m.

JUNE.

- 5-6.—Institution of Municipal and County Engineers: Meeting in Dunfermline.
- 6.—Institution of Municipal and County Engineers: Meeting at Southend.
- 11-13.—Institution of Water Engineers: Summer Meeting at Stockport.
- 13.—Institution of Municipal Engineers: Western District Meeting at Tisbury. Mr. J. Plummer Davies on "Wiltshire Roads, Past and Present."
- 17.—Royal Institute of British Architects: Annual Dinner, Hotel Cecil.
- 24.—Institute of Sanitary Engineers: Visit to Luton sewage farm. Train from St. Pancras, 2.50 p.m.
- 24-27.—Institution of Municipal and County Engineers: Annual Meeting and Town Planning, Housing and Road Conference at Cheltenham.

JULY.

- 4-11.—Royal Sanitary Institute: Annual Congress and Exhibition at Blackpool.
- 6-10.—Institution of Mechanical Engineers: Summer Meeting in Paris.

SEPTEMBER.

- 26.—Institution of Municipal and County Engineers: Meeting at Scarborough.

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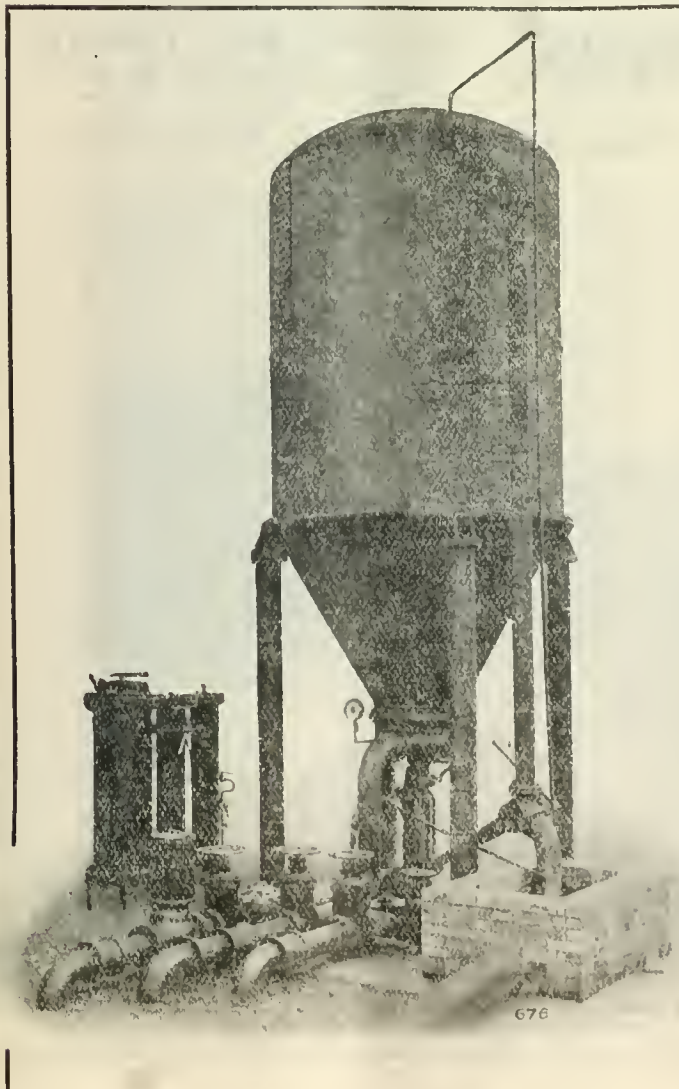
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APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

URBAN DISTRICT OF BILSTON. SEWAGE WORKS MANAGER.

The Council invite applications for the appointment of Sewage Works Manager.

Wages £2 per week, rising by 2s. 6d. per week per annum, to a maximum of £2 5s., with house, rates, and water free.

Applicants must have held a similar appointment, and be capable of making the usual analyses.

Particulars of duties and conditions of appointment will be forwarded on application.

Applications, accompanied by copies of not more than three recent testimonials, should be delivered to the undersigned not later than the 13th May, 1914.

Canvassing, directly or indirectly, will be a disqualification.

JOSEPH L. ARLIDGE,

Clerk to the Council.

Town Hall, Bilston.

April 28, 1914.

(1,570)

EPSOM URBAN DISTRICT COUNCIL. WATERWORKS.

The above Council invite applications for the position of Engineer-Manager for the Waterworks of the town.

The Works, which at present supply a population of about 20,000 persons, comprise Pumping Machinery actuated by steam suction gas, and electric current, and applicants must have had a thorough mechanical training and experience of such Plant, as well as the ordinary routine work of main laying, plumbing, waste prevention, control of workmen, and the usual office work of a Waterworks Undertaking.

The person appointed must devote the whole of his time to the duties of the office as may be required

by the Council, and the applicant must not exceed 45 years of age.

The salary will be £200 per annum, rising, subject to approved service, by annual increments of £12 10s. per annum to a maximum of £250, with house, rates and taxes thereon, fuel and light free, and £27 6s. per annum motor car allowance (if used).

Applications, stating age, present employment, salary and other emoluments, and previous experience (with copies only of not more than three testimonials of recent date), must reach me not later than Thursday, the 21st day of May, 1914, at 9.30 a.m., endorsed "Waterworks Engineer-Manager."

Canvassing, either directly or indirectly, will be a disqualification.

Dated this 1st day of May, 1914.

E. G. WILSON,

"Duncannon,"

Church-street,

Epsom.

Clerk.

(1,585)

BOROUGH OF BRIDLINGTON. BOROUGH SURVEYOR.

The Corporation invite applications for the post of Borough Surveyor, at a salary of £275, rising by annual increments of £25 to £350 per annum.

Particulars and Forms of application may be obtained from me on receipt of stamped addressed foolscap envelope.

Applications, stating age, experience, and qualifications, together with copies of not more than three recent testimonials, must be received by me before 3 p.m. on Thursday, the 14th of May.

Canvassing Members of Council will disqualify candidates.

(By order)

A. E. MATTHEWMAN,

Town Clerk.

Town Hall, Bridlington.

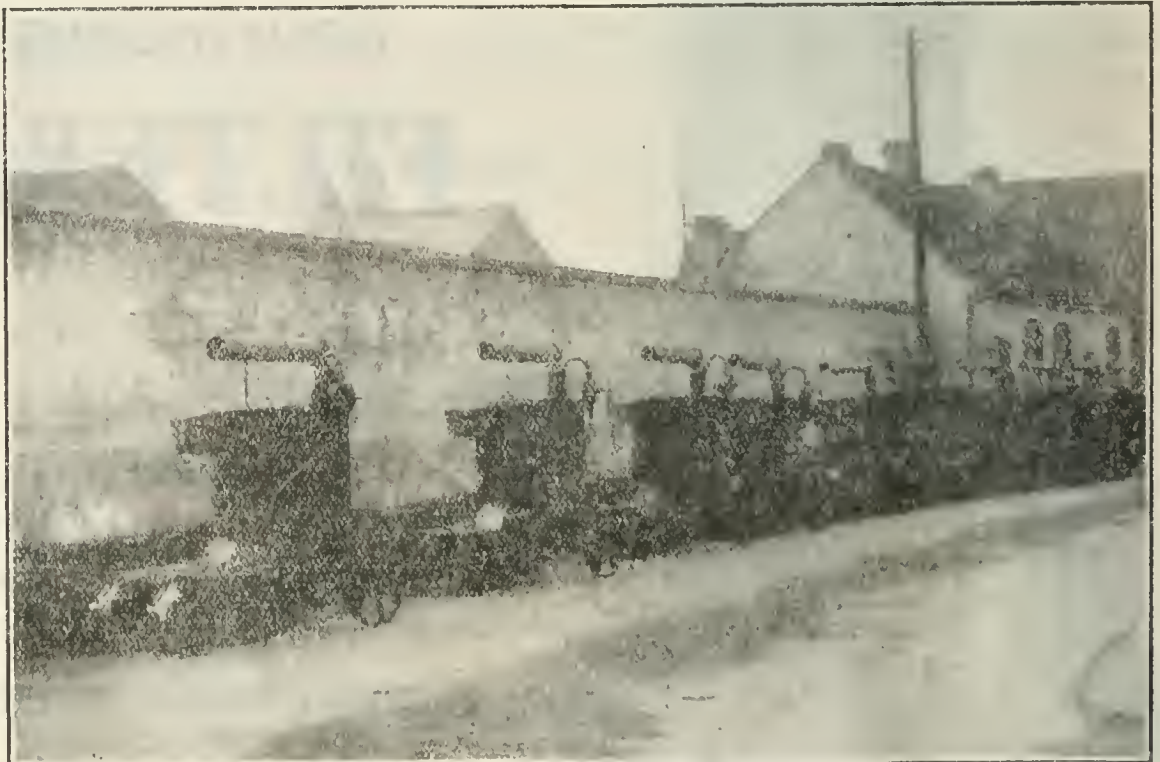
May 1, 1914.

(1,578)

ENGINEER AND SURVEYOR to District Council has a vacancy for Articled Pupil. Water and Sewerage Works, and good general experience.—Box 1,386, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,370)

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The Surveyor

And Municipal and County Engineer.

Vol. XLV.

MAY 15, 1914.

No. 1,165.

Minutes of Proceedings.

The Proposed Revival of the Toll Gate System.

The Bill promoted by the Middlesex County Council for the construction of the Great West Road was reported for third reading last Friday by the House of Commons Committee, which has accepted a clause empowering the council to impose upon the omnibus companies using the road a toll of 3d. per vehicle-mile. It is to be hoped that Parliament will not accept this clause, the principle of which is opposed to the equalising tendencies of other proposals for the redistribution of the burdens of road maintenance. The Chancellor of the Exchequer has accepted the recommendations of the Departmental Committee on Local Taxation with respect to Exchequer contributions towards the cost of maintenance of main roads, and it can hardly be doubted that Parliament will pass the necessary measures for putting these proposals into effect. The sum so to be administered is estimated at nearly £4,500,000, a very substantial proportion of the whole cost of main road maintenance, and the Great West Road, or the greater part of it, will presumably fall into the first class, half the cost of maintenance of which will be borne by the Exchequer. Under the circumstances it seems most undesirable to superimpose another method of reducing the cost to the ratepayers, unless this method be adopted generally, in the form, for instance, of an additional fuel tax, a wheel tax, or what might be quite as effective, regulations for wheel diameters and tyre widths. We hold no brief for the motor vehicle, but feel bound to point out that the imposition of differential taxes can be carried too far. The extent to which a vehicle wears the road cannot be the only criterion of liability to tax or toll—else why should those ratepayers who own no vehicles pay road rates? The roads have to be maintained for the public at large, and it is not equitable to raise funds for road maintenance without regard to this broad fact. Further, as regards this particular proposal, there seems to be no justification for the selection of this one type of motor vehicle: the point is, rather, that without the use of toll gates the other classes cannot be charged with a share of the cost of road maintenance. The passengers who travel by motor omnibus are to be made to pay more than others pay for the use of the road because there is an easy way of making them pay. Already the motor omnibus pays more than any other vehicle towards the improvement of roads, since the consumption of petrol is much greater, in proportion to the "passenger-comfort-mile," in the case of a vehicle which has to stop and start frequently and rapidly, and keep to a regular timetable in all weathers, than it is in the case of a private motor carriage, or even in that of a delivery

van, relatively to the importance of the load carried.

Sources and Objects of Contributions.

The toll-gate principle is not essentially unsound, and it is successfully applied in some countries, notably in India: but, although tolls are graduated in proportion to the sizes of vehicles and the average amounts of the loads carried, there is, so far as we know, no country in which a particular kind of vehicle is made to pay tolls while other vehicles go free. It is true that tramway undertakings have to pay for roads, but these payments are mainly based upon the extent of the alterations necessary in order that the road may be made fit for tramways, and upon the extent to which the tramway is a railway carried along the road and altering its highway character. Payments with respect to maintenance are, by many municipal engineers, held to amount to no relief of the cost of maintenance to the road authority, and even if it be held that tramways contribute substantially towards the cost of road maintenance, this is not the same thing as saying that they ought to do so, or that the principle should be extended to vehicles which are not in fact strictly tied to particular routes. If, on the whole, the wear per vehicle caused by motor omnibuses justifies a special tax upon them, this tax should be a general one, collected by existing machinery, and not such as to give to a county road authority the character of a turpuke trust. The payment, by Government, of half the cost of maintenance, and the payment to Government of the petrol tax, for road funds, provide for the equitable adjustment of road maintenance burdens in such cases, and generally. At present the petrol and vehicle taxes are expended on road "improvement," but the artificial and arbitrary distinction between improvement and maintenance, and the separation of Road Board grants from other grants cannot be justified, and will no doubt disappear in the near future. The allocation of the proceeds of certain taxes to the Road Board, and for alterations as distinguished from upkeep, was a matter of guesswork, and the respective amounts of Road Board revenue, Exchequer grants, and loan funds (if such be provided) will not be so adjusted as to be proportionate respectively to the expenses of current alterations, ordinary maintenance, and special alterations. All these funds will probably be administered by the Road Board, and that body should be free to decide what proportion, up to some maximum, may be spent on alterations. It is really highly illogical to apply petrol and vehicle taxes to improvement as distinct from upkeep.

The idea that the Great West Road may be

treated as an undertaking in itself rather than as a part of the general network of highways is unsound—it is too much of the John Company order. The motor omnibuses using this road will no doubt go further afield, and it would not be equitable to allow a toll to be imposed on a road subsidised up to half the cost of maintenance, no toll being paid on roads receiving only a quarter of the cost, or nothing at all. Moreover, the proposed toll is very high. A ten-minute service both ways at 3d. per mile amounts to over £100 a mile per annum; and although such a service might raise the cost of a narrow and weak road by such an amount, this could hardly be the case on a first-class main road of ample width and used by many other vehicles. But if it were so it would not be fair to charge motor omnibus passengers, who are by no means a wealthy class, nor one burdensome as regards municipal and police funds, with the whole cost of maintenance due to their travelling along the road. At the most they should not pay for more than the excess wear due to their choosing a vehicle of a particular type. It may also be contended that motor omnibus passengers do not wear the roads more per head than do those who travel in other vehicles—a heavy and luxurious limousine motor carriage, for instance. The weight of a motor omnibus per passenger is probably lower than that of any other ordinary vehicle. If, however, a special tax is to be imposed upon motor omnibus passengers, it should be a part of a general scheme for the details of which the Road Board would be responsible, and in which any unfair burden on tramway passengers would be readjusted. Certainly no such tax should be specially imposed with respect to a road one-half of the cost of the maintenance of which will be paid out of Imperial funds; and should this proposal take effect, the Middlesex County Council would no doubt be satisfied to see their special tax disallowed. On district roads maintained, as a rule, wholly at the cost of the ratepayers, heavy delivery vans, and, in many counties, carts and wagons with absurdly narrow tyres, are allowed to travel without paying anything for the extra wear and tear of the roads. If a central authority would make it obligatory for county councils to pass by-laws regulating the dimensions of wheels and tyres, it would then be reasonable to insist also on certain changes being made in motor omnibus design, which changes, especially an increase in wheel diameters, would have the effect of considerably reducing the wear and tear of the roads traversed by these vehicles, an effect possibly startling to some vehicle designers and road engineers. The whole subject demands the attention of the authorities, the first step, we may suggest, being a report to be made to the Road Board by two or three engineers conversant with the principles involved and with the facts. In the meantime, attempts to impose such tolls as can be imposed, rather than await a general settlement, are much to be deprecated; and, in view of the far-reaching proposals of the Budget, local authorities will no doubt see the force of this contention.

* * *

Drainage By-laws in London. On Monday last the Institute of Sanitary Engineers listened to a paper by Mr. Guy B. Grave, entitled "A London Builder's Experiences with Sanitary Officials in the Metropolis." The title suggests that the author is a man with a grievance, so that it is without surprise that we observe that the paper concludes with a sigh of relief at having secured an opportunity of communicating that grievance to others. Mr. Grave has evidently not formed too high an opinion of the way in which those who are responsible for sanitary administration discharge their duties. On the whole, their task is one of great delicacy and difficulty, but the paper contained not a word concerning the ingenuity so often displayed by builders who are

anxious to evade by-laws or to avoid inspection altogether. Nor was anything said as to the burden which is being borne by the present generation of ratepayers in the repair of pipes which, though technically "sewers," are in reality "drains," the legal character of which has been changed by the surreptitious execution of unlawful work. So far as the paper is descriptive of the author's personal experiences it is, of course, impossible to criticise it, except by pointing out that it is not entitled to any more weight than that which usually attaches to an *ex parte* statement. We take leave, however, to differ entirely from his legal expositions, being emboldened to do so by his own admission that not only is he not a lawyer, but, further, that he is "not particularly well versed in legal enactments." Thus there are some notable omissions in his review of the sanitary legislation affecting the Metropolis. But this is comparatively unimportant. What is of much greater consequence is the misapprehension under which Mr. Grave evidently labours as to the scope and effect of the drainage by-laws made by the London County Council in 1901. He expresses surprise that a sanitary inspector should have told him that the powers of a borough council went beyond these by-laws, and inasmuch as misunderstanding on this point appears to be widespread, it may not be out of place to review the actual state of the law.

The drainage by-laws just referred to were made by the London County Council pursuant to their powers under sec. 202 of the Metropolis Management Act, 1855, and they are in force throughout the county. By sec. 76 of the same Act, however, before making a drain, notice must be given to the borough council, "and every such drain shall be made in such direction, manner, and form, and of such materials and workmanship . . . as the borough council shall order . . ." Now, the question as to whether or not a borough council, acting under sec. 76, have power to make requirements which are in excess of the London County Council by-laws has been determined by the High Court in *London v. Westminster City Council* (1909), 7 L.G.R., 446. In that case the city council had made requirements in regard to ventilation which were in excess of the strict requirements of the by-laws, and the Court held that they were perfectly entitled to do so. One other matter needs some explanation. Mr. Grave told of an official who had to his knowledge seriously expressed the opinion that he could demand a silver soil pipe, if such were thought by the borough council to be necessary. Provision is made for meeting extravagant or improper demands of this kind by sec. 211 of the Act of 1855, which empowers any person who deems himself aggrieved by any order of a borough council in regard (*inter alia*) to the construction or repair of a drain to appeal to the Appeals Committee of the London County Council. The matters with which Mr. Grave dealt are of some difficulty and complexity, and we are not here concerned to defend the system as it now exists. It is as well to remember, however, that the success of this or of any other system must depend to a large extent upon a mutual good understanding between officials and those whose work they are called upon to supervise.

* * *

New York Water Supply. The extraordinarily rapid growth of Greater New York has necessarily involved the solution of many engineering problems of great magnitude and difficulty, but none of them probably has been more gigantic than the inauguration of a scheme of water supply from the Catskill Mountains, 127 miles distant from the city. The tremendous character of the task which the engineers responsible for this work were called upon to undertake may be gathered from the paper on "Greater New York's Water Supply

Scheme," by Mr. William T. Taylor, which was read and discussed on Monday last at a joint meeting of the Institution of Municipal Engineers and the Society of Engineers. The watersheds from which the supply to the city is at present derived have already been developed practically to the economic limit, and with a normal annual increase of population of something like 135,000 persons, it has for some time been recognised that additional sources of supply would have to be sought. The scheme which has been undertaken is estimated to cost no less than £35,000,000 sterling, and it is interesting to observe that the city authorities had to secure the approval of the State Water Supply Commission before commencing the work. The supply will ultimately be drawn from four drainage areas having an aggregate extent of nearly 900 square miles. Of these, only one—the Esopus watershed—is being developed immediately, but the Ashokan reservoir, the only one belonging to this area, is by far the largest and most important of the whole scheme. It is situated in the foothills of the Catskill Mountains, and has a total capacity of no less than 132,000,000,000 gallons, and a water surface of nearly 13 square miles. From this enormous lake the water will have to travel for a distance of 127 miles—approximately a three days' journey—before it is available for use in the city. To use Mr. Taylor's own words, "In traversing this distance the Catskill aqueduct skirts along many a steep hillside, pierces mountains, descends between rivers and wide, deep valleys, and crosses the narrows of New York Harbour." The story of the conception and construction of these gigantic works is indeed one of the romances of engineering. The aqueduct is the longest and deepest in the world, having an easy flow of 500,000,000 gallons a day. This water is at a natural pressure sufficient to force it to the eighteenth story of the city "skyscraper." The tunnel under the city of New York is 34 miles in length—being the longest in the world—and lies from 200 ft. to 750 ft. below the street level. Altogether, we may say that Mr. Taylor's paper gives a very good description of a most fascinating work. It is reproduced in the present issue, and next week we propose to give a report of the excellent discussion—unavoidably held over this week owing to lack of space—which followed its reading at Monday evening's meeting.

* * *

An Extraordinary Traffic Case.

Judgment was given this week in the High Court in a case of some interest (*Ledbury Rural District Council v. Lady Henry Somerset*), in which the plaintiffs claimed a sum of £1,233 in respect of extraordinary expenses which they had incurred in repairing a certain road, alleged to have been damaged by extraordinary traffic passing over it by the order of the defendant. It appears that Lady Henry Somerset is the proprietor of a stone quarry adjoining the road in question, and that from June, 1912, until May, 1913, stone from this quarry was conveyed along the road by means of a traction engine. The evidence was to the effect that other persons, including the local authority, also conveyed stone over the same road in a similar manner, the quantity sent by the defendant being larger than that of any other single person, and slightly more than half the total traffic. The road was well adapted to traction traffic, had been used for it for many years, and there was no sudden increase in such traffic. The learned Judge gave judgment for the defendant on the dual ground that her business was a recognised local industry, and that the road in question was properly adapted to or used for the traffic which was put upon it. The cases on this subject are by no means easy to reconcile, but we still regard the judgment of Justice Wills in *Hemsworth Rural District Council*

v. Micklethwaite as being authoritative. The learned Judge there said: "Traffic must of necessity, as time goes on, vary in its character, according to the development of the various industries in the neighbourhood, and traffic which in one year or at one given time may be extraordinary traffic will, in the course of time—and it may be in the course of a comparatively short time—become ordinary traffic. Therefore I think that, in considering whether traffic is extraordinary or not, it is not sufficient to take simply the year to which the question relates, and compare other traffic on the road during that year with the traffic complained of. That would be a fallacious test. The test is whether the particular traffic in question has, by the usage of trade and of society, and by the varying circumstances applicable to the case, by that time, become such as can fairly be called ordinary traffic."

* * *

A Holiday for Roadmen.

At a recent meeting of the Repton Rural District Council it was reported that the Highways Committee had given consideration to an application of the roadmen in the employment of the council that they should be allowed to cease work on Saturdays at 1 o'clock, instead of 10 o'clock as hitherto, and had come to the conclusion that an alteration on the lines suggested would be undesirable, in view of the fact that farm-hands in the district were obliged to work on Saturday afternoons. The discussion of this motion was made the occasion of certain observations which can only be described as at once outside the jurisdiction of the council and calculated to cast gratuitous reflection upon the conduct of its workmen. Mr. G. L. White, a member of the council, questioned whether the men would be any better off for the three hours' extra leisure, or whether it would not be a case of "Satan finding some mischief still for idle hands to do," and he suggested that some of the men might be inclined to spend their time and money at the public-house. Mr. White's speech drew from one of the men a letter of protest to the *Burton Mail*, a local newspaper, and the matter has received further comment in an open letter addressed to Mr. White, and appearing in the columns of *John Bull*. That letter puts the matter in characteristically blunt fashion, but we are not disposed to disagree with its substance. In addressing Mr. White, *John Bull* says: "I do not understand what business it is of the council how the men spend their money whether on Saturday afternoons or any afternoon in the week; indeed, it is no more a concern of yours than how you spend your money is a concern of theirs."

* * *

New York Sewage Disposal.

The tidal phenomena of New York Harbour are the subject of the seventeenth preliminary report of the Metropolitan Sewerage Commission of that city. The nett result of all the tidal studies is in harmony with the opinions derived from the exhaustive analytical investigations of the water which the commission has carried on. Every essential fact that has been capable of withstanding serious criticism indicates that the nett or resultant flow seaward of water from the most congested parts of the harbour is small and not to be depended upon as a means of carrying the sewage of New York promptly to the open sea. The water oscillates under the tidal influences in such manner as to cause the sewage substances which are discharged into the Harlem, Lower East River and some other parts of the harbour to remain for long and indefinite periods. The disposal of the sewage, in so far as it disappears, is ascribable chiefly to natural assimilative processes which the commission has described in its reports under the general title of Digestion.

Greater New York's Water Supply Scheme.*

By WILLIAM T. TAYLOR, Fellow AM.I.E.E., A.M.I.MECH.E., M.A.M.SOC.M.E., F.R.G.S.

The total estimated cost of the Panama Canal is £75,000,000, as compared with the estimated cost of the world's greatest water supply system—the creation of the Catskill aqueduct and the Ashokan reservoir, for the city of New York, which is £35,400,000.† However, as an exploit of purely technical engineering, the creation of the Catskill aqueduct and the Ashokan reservoir exceeds that of the Panama Canal. Apart from the unique methods of handling materials on the Panama Canal, it may be roughly stated that



[Apart from his engineering experience, Mr. Taylor, in spite of his comparative youth—he is only thirty-six years of age—has had a not uneventful military career. A native of Burnley, Lancashire, he went to South Africa in 1896, and, serving with the Kimberley Light Horse in the Bechuanaland Campaign, was present at the battle and the death of the native chief Galishu, which ended the rebellion. During the South African War he served with the Imperial Light Infantry, and was present at the battles of Spion Kop and Laing's Nek, and at the relief of Ladysmith. As a member of the Standerton mounted police he saw further active service, in the course of which he was wounded and contracted enteric fever. He has the Bechuanaland Medal, with one clasp, and the Queen's Medal, with five clasps, in respect of the South African Campaign. Mr. Taylor has regularly followed the practice of mechanical, hydraulic, and electrical engineering since 1897, in South Africa, England, the United States, Mexico, India, Brazil, Chili, and Peru. He is a member of the American and British Institutions of Electrical Engineers, the Institution of Municipal Engineers, and the American Society of Mechanical Engineers, and is an associate-member of the Institution of Mechanical Engineers, and a member of the Royal Society of Arts. He is the author of a text-book, "Transformer Practice," and has contributed various papers to the proceedings of the Institution of Electrical Engineers, the Institution of Municipal Engineers, and the Royal Society of Arts. It may be added that Mr. Taylor is the inventor of an alternating current apparatus, the manufacture of which has been carried on since 1907 by a Pittsburg firm. For a collection of art treasures and curios from India, Mexico, and Peru, which he presented to the borough of Burnley, and which are installed in the Towneley Hall art gallery and museum, a "Taylor" Room was dedicated to him by the corporation. Mr. Taylor is now engaged in practice in New York.]

the problem meant merely digging out earth and rock on a larger scale and dredging channels; to build the aqueduct meant piercing mountains and undermining rivers, traversing deep, broad valleys, and tunnelling through the bowels of the city of New York from end to end. The tunnel alone is 34 miles long—the longest in the world—and lies 200 ft. to 750 ft. below the city streets.

In a few months the first link of the world's

* Paper read at a joint meeting of the Institution of Municipal Engineers and the Society of Engineers, held on Monday evening in London.—The author made several inspection trips over the most important parts of the scheme, with engineers of the works and also with excursionists from engineering societies.

† Up to January 12, 1914, no fewer than 283 men have been killed, and 8,833 injured, while engaged on the works; also, up to this date, the estimated cost of the undertaking and the actual amount spent for the work is £40,000,000 (nearly).

greatest water system will be completed.* One hundred and twenty-seven miles away the water will begin its three days' journey to the southernmost end of the Metropolis from Ashokan reservoir in the Catskill Mountains, and, running through a giant aqueduct, pass down the westerly side of the Hudson River, cross under through a huge, deep syphon at Storm King, thence to the Croton reservoir system, and through the present distribution pipes to New York. The aqueduct, the longest and deepest in the world, outrivalling those of ancient Rome, which have stood unsurpassed through the centuries, has an easy flow of 500,000,000 gallons a day. Present natural pressure only carries the city water to the sixth story, but the new scheme, which is 590 ft. above tide water, will force water to the eighteenth story of New York's skyscrapers under natural pressure. The number of labourers employed on the whole undertaking was 17,240; they have been working slightly over seven years, and they are estimated to finish the undertaking in the year 1915.

It has been estimated that the population of Greater New York will be 7,000,000 by the year 1930. To supply such a community with 100 gallons per capita per day would require 700,000,000 gallons, and to meet an average demand for 150 gallons would require 1,050,000,000 gallons per day. New York at present obtains practically all its water from the Croton and Bronx watersheds in Westchester, Putnam and Dutchess counties, and the Ridgewood watershed in Nassau county. Each of these watersheds has already been developed to practically the economic limit, and with the city's growth the draft on them has come to be an excess of their safe yield during a period of dry years. On account of the already high development of these catchment areas very little more water could be obtained from them by the construction of additional works. Greater New York's total average daily consumption of water is at present over 500,000,000 gallons, from all sources. Its population is 5,373,000, exclusive of the hundreds of thousands of "commuters" and other "transients."

To keep pace with its growth of approximately 135,000 persons per year, it was long ago recognised that additions to the city's water supply system would be inevitable. On October 9, 1905, the Board of Water Supply submitted for approval to the Board of Estimate and Apportionment a plan for obtaining from the Esopus, Rondout, Schoharie and Catskill creeks a supply of not less than 500,000,000 gallons of water daily, at an estimated cost of £35,000,000. On October 27, 1905, this plan was unanimously approved by the Board of Estimate and Apportionment, and on November 3rd of that year application was made to the State Water Supply Commission for its approval, as provided by law. On May 14, 1906, this approval was granted, and in less than six months the first construction contract, for 11 miles of aqueduct, was let.

CATSKILL WATER SYSTEM.

There are four drainage areas from which the supply under development is to be drawn. These watersheds are situated west of the Hudson River in the Catskill Mountains, and lie between lines 75 and 135 miles from New York's city hall. This region is practically unsettled. In the aggregate these watersheds have an area of nearly 900 square miles, and individually as follows: Esopus, 255 square miles; Schoharie, 228 square miles; Rondout, 131 square miles; Catskill creek, 163 square miles; to which can be added several small contiguous areas, helping to make up the grand total. From this it is estimated that even in a series of dry years 770,000,000 gallons daily can unfailingly be drawn the year round. To collect these waters for the city's use several large impounding reservoirs are to be created from time to time, as found necessary, and interconnected by aqueducts. Only the Esopus watershed is being developed now, but its only reservoir, known by the Indian name of Ashokan, is to

* Mayor Mitchel, of New York, blew up the last ledge with the blast that will mark the official opening of the great underground passageway—this occurred Saturday morning, January 10, 1914. This final shot—439 ft. below the street surface—opened the greatest tunnel in the world.

be by far the largest and most important of them all. From this reservoir the Catskill aqueduct will convey the water into all the five boroughs of the city. Although in a series of dry years the Esopus watershed cannot be depended upon to supply more than 250,000,000 gallons each day, the Catskill aqueduct is, for economic reasons, being constructed of 500,000,000 gallons daily capacity.

Developments have been in progress for seven years, and the aqueduct is now nearly completed to some of the boroughs. From the Ashokan reservoir, situated in the foothills of the Catskill Mountains, it is almost a three-days' journey for the water, at the average velocity of flow through the aqueduct, to the borough of Richmond, which is Staten Island, surrounded by the sea, at the southerly entrance of New York bay. In traversing this distance of 127 miles the Catskill aqueduct skirts along many a steep hillside, pierces mountains, descends between rivers and wide, deep valleys, and crosses the Narrows of New York Harbour. From Ashokan reservoir to the city's northern boundary there are 92 miles of aqueduct, and between that reservoir and Croton Lake, the principal basin on the Croton watershed, there are 64 miles. All the engineering, legal, and other difficulties and problems have been met and overcome.

The principal quantities of work and materials

For the construction of the main dams of the Ashokan reservoir the following are the quantities as given in the engineers' approximate estimate:—

- Earth excavation, 2,055,000 cub. yds.
- Rock excavation, 425,000 cub. yds.
- Embankment and refilling, 7,200,000 cub. yds.
- Portland cement, 1,100,000 barrels.
- Masonry, all classes, 874,000 cub. yds.
- Rubble paving and riprap, 105,000 cub. yds.

For the construction of the Hill View reservoir, the principal items of work include the following:—

- Excavation, 3,200,000 cub. yds.
- Embankment, 2,800,000 cub. yds.
- Concrete in walls and lining, 130,000 cub. yds.
- Concrete masonry in tunnels and shafts, 14,400 cub. yds.
- Portland cement, 215,000 barrels.

The Board of Water Supply consists of three commissioners, who were appointed by the Mayor of New York. Its forces, shown in Fig. 1, are divided into Administration, Real Estate, Police and Engineering Bureaus. In the former are the secretary, the auditor, the chief clerk, in charge of pay-rolls, emergency expense accounts and purchasing of supplies, the examiner of real estate and damages, a real estate claim officer, the adjuster of taxes and assessments, and the superintendent of the aqueduct patrolmen. The engineering bureau is composed of five departments—namely, headquarters, reservoir,

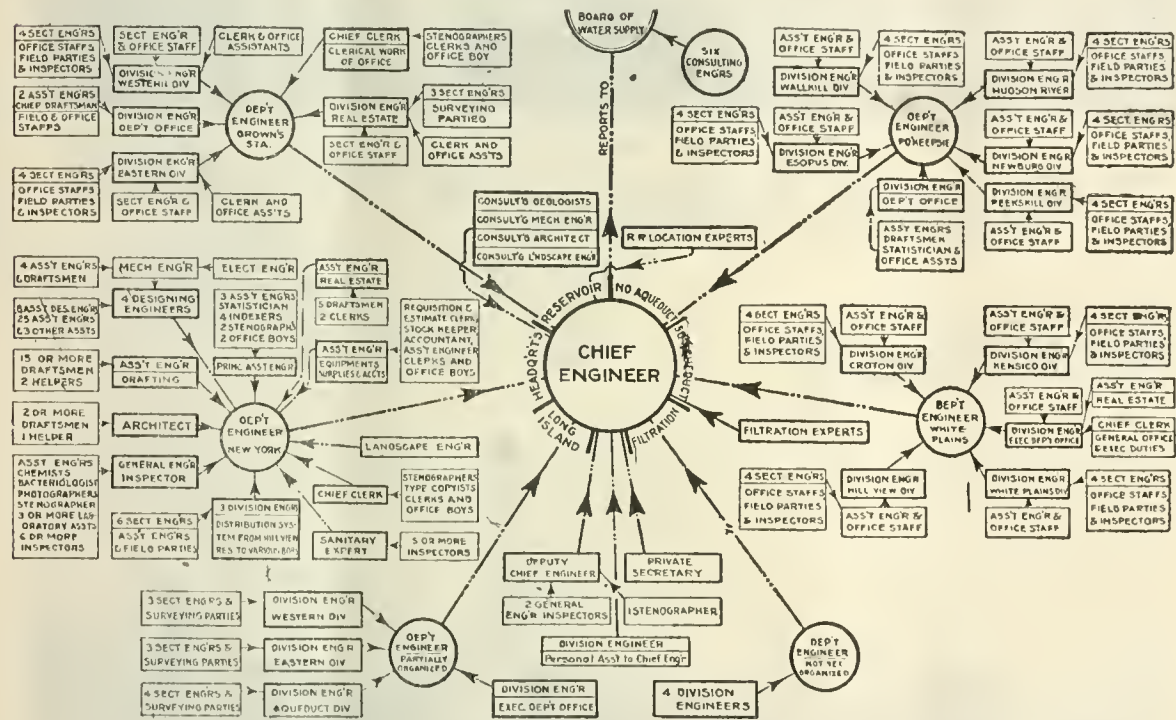


FIG. 1.—ENGINEERING BUREAU ORGANISATION.

involved in the Catskill system, as planned for the first development from the Ashokan reservoir to Hill View, are approximately as follows:—

Cyclopean masonry in dams	1,425,000	Cub. yds.
Other masonry in dams and gate-houses	425,000	
Concrete in core walls of earthen dams	325,000	
Concrete masonry in cut-and-cover aqueduct	1,525,000	
Concrete masonry in grade tunnels	250,000	
Concrete masonry in pressure tunnels and shafts	480,000	
Total masonry	4,430,000	
Excavation earth for dams	6,670,000	
Excavation rock for dams	820,000	
Excavation for open cut aqueduct	7,665,000	
Excavation for grade tunnels	835,000	
Excavation for pressure tunnels	1,180,000	
Total excavation	17,170,000	
Embankment (rolled) for dams	8,080,000	
Embankment (other) for dams	4,335,000	
Embankment (aqueduct) for dams	6,010,000	
Total embankment	18,425,000	
Tons of steel-pipe and other metals	21,250 tons.	
Barrels of Portland cement	5,450,000 barrels.	

Very good progress has been maintained on practically all contracts, and what are believed to be three interesting monthly peaks of work are:—

- Hard rock tunnelling in one heading, 468.5 ft. per month.
- Shaft sinking in one shift, 138.0 ft. per month.
- Cubic yards of masonry placed in dam, 35,260.0 per month.

northern aqueduct, southern aqueduct, and city aqueduct.

During the past five years of active construction operation the contractors' forces have ranged from a minimum of 500 to a maximum of 17,240, counting only men actually and directly at work for the contractors. To these must be added men engaged upon incidental work, the men in camp, but for one reason or another idle on any given day, and the large number of men in cement, metal and other manufacturing establishments, widely scattered over the country, engaged on the production of materials, equipment and supplies for the work. It is safe to say that, in addition to the above number of men, thousands of persons have been indirectly employed upon this great undertaking of the city of New York, aggregating about a maximum total of 25,000 men.

THE ASHOKAN RESERVOIR.

This is situated about 14 miles west of the Hudson, at Kingston, and is being built under contracts amounting, together with the expense for relocating highways and the Ulster and Delaware Railroad, to nearly £3,600,000. The Olive Bridge Dam across Esopus Creek, the Beaver Hill and Hurley Dykes across smaller streams and gaps between the hills forming the natural walls of the reservoir, the dividing wall and weir dividing the reservoir into two basins, and the waste weir over which the surplus flood waters may safely be discharged, are the principal structures

of the reservoir. Up to the end of 1912 fully 73 per cent of the work on these structures was completed.

The general statistics of the Ashokan dam are:—

- Capacity, total, 132,000,000,000 gallons.
- Capacity, available, 128,000,000,000 gallons.
- Water surface, 12.8 sq. miles, or 8,180 acres
- Land acquired, 15,222 acres.
- Elevation of water (full reservoir), above tide, 590 ft.
- Elevation of top of dam, above tide, 610 ft.
- Length of reservoir, 12 miles.
- Length of shore-line, 40 miles.
- Length of dam and dykes, 5.5 miles.

will contain several months' supply of Catskill water, and will act as an emergency storage reservoir, so that the supply will not be interrupted in case of inspection, cleaning or accident to the 77 miles of aqueduct between it and the Ashokan reservoir. It is being constructed under contracts amounting to nearly £1,700,000. It will be formed by the Kensico dam across the valley of the Bronx River, about 3 miles north of White Plains and 14 miles north of Hill View reservoir. Its normal flow line will be at an elevation of 355 ft. above mean sea level, and will



FIG. 2.—SKYSCRAPERS, LOOKING DOWN-TOWN.

County Court House (foreground), City Hall and Post Office (centre); on back row, left to right, *World*, *Tribune*, American Tract Society, *Times* (down-town building), Park Row, St. Paul, Singer Tower, City Investing, Hudson Terminal (extreme right background), Postal Telegraph, and Home Life Insurance Company (with pointed black top). Site of Woolworth building across Broadway from Post Office.

- MAIN DAM.
- Length, 4,650 ft.
 - Height, 220 ft.
 - Thickness at base, 190 ft.
 - Thickness at top, 23 ft.
 - Width of reservoir (maximum), 3 miles.
 - Width of reservoir (average), 1 mile.

cover 2,218 acres. Its total capacity will be nearly 40 billion gallons, and the available capacity will be 29 billion gallons, or about sixty days' continuous supply at 500 million gallons daily, the present approximate total consumption of Greater New York.



FIG. 3.—SKYSCRAPERS, LOOKING UP-TOWN.

Tall building in the centre shows the Metropolitan Tower building; "Flat-iron" building to the right. Panorama showing the city pressure tunnel. The tower to the left-centre shows the famous Madison-square roof garden.

- Depth of reservoir (maximum), 190 ft.
- Depth of reservoir (average), 50 ft.
- Villages to be submerged, 7.
- Cemeteries removed, 32.
- Bodies reinterred, 2,800.
- Railroad being relocated, 11 miles.
- Highways to be discontinued, 64 miles.
- Highways to be built, 40 miles.
- Bridges to be built, 4.
- Earth and rock to be excavated, 2,936,000 cub. yds.
- Embankment to be placed, 8,069,000 cub. yds.
- Masonry to be placed, 984,000 cub. yds.
- Cement to be used, 1,187,000 barrels.
- Maximum number of men employed, 3,000.

THE KENSICO RESERVOIR.

East of the Hudson is the Kensico reservoir, and 30 miles from the city hall (New York). This reservoir

The maximum depth of water behind the dam will be 155 ft.

General statistics of the Kensico reservoir are:—

- Capacity, total, 38,000,000,000 gallons.
- Capacity, available, 29,000,000,000 gallons.
- Water surface, 2,218 acres.
- Land acquired, 4,500 acres.
- Elevation of water (full reservoir), above tide, 270 ft.
- Elevation of top of dam, above tide, 370 ft.
- Length of reservoir, 4 miles.
- Length of shore-line, 40 miles.
- Length of dam and dykes, 3,300 ft.

MAIN DAM.

- Length, 1,843 ft.
- Height, 300 ft.
- Thickness at base, 280 ft.

Thickness at top, 28 ft.
 Width of reservoir (maximum), 3 miles
 Width of reservoir (average), 1 mile.
 Depth of reservoir (maximum), 155 ft.
 Depth of reservoir (average), 100 ft.
 Highways to be discontinued, 14 miles.
 Highways to be built, 9 miles.
 Bridges to be built, 4.
 Earth and rock to be excavated, 2,496,000 cub. yds.
 Embankment to be placed, 2,003,000 cub. yds.
 Masonry to be placed, 1,286,000 cub. yds.
 Cement to be used, 1,224,000 barrels.
 Maximum number of men employed, 1,000.

The work on the Ashokan dam has employed an army of 3,000 men, who have lived, many of them with

tractors at the Ashokan dam and the Kensico reservoir was, approximately, £500,000. The assembled plant of the Kensico reservoir, consisting of machinery, railroads, derricks, &c., owned by the contractors, cost about £200,000, while the plant for carrying on the work of the Ashokan dam cost much more than this amount.

When completed the Kensico dam will be a masonry structure 1,843 ft. in length, with a maximum height of about 300 ft. It will be more than 170 ft. high for 1,000 ft. of its length. The top thickness of the dam just under the coping will be 28 ft., and at the base



FIG. 4. -CATSKILL WATERSHED AND AQUEDUCT.

their families, in a camp built by the contractors near the work. The work on the Kensico reservoir employed 1,000 men, who, with their families, lived a few hundred feet on the downstream side of the dam site. An interesting feature of both these camps is a

of the maximum section will be more than 250 ft. It will contain about 1,000,000 yds. of masonry. It will be a gravity masonry dam of cyclopean concrete. The downstream side will be of concrete blocks. The concealed portion of

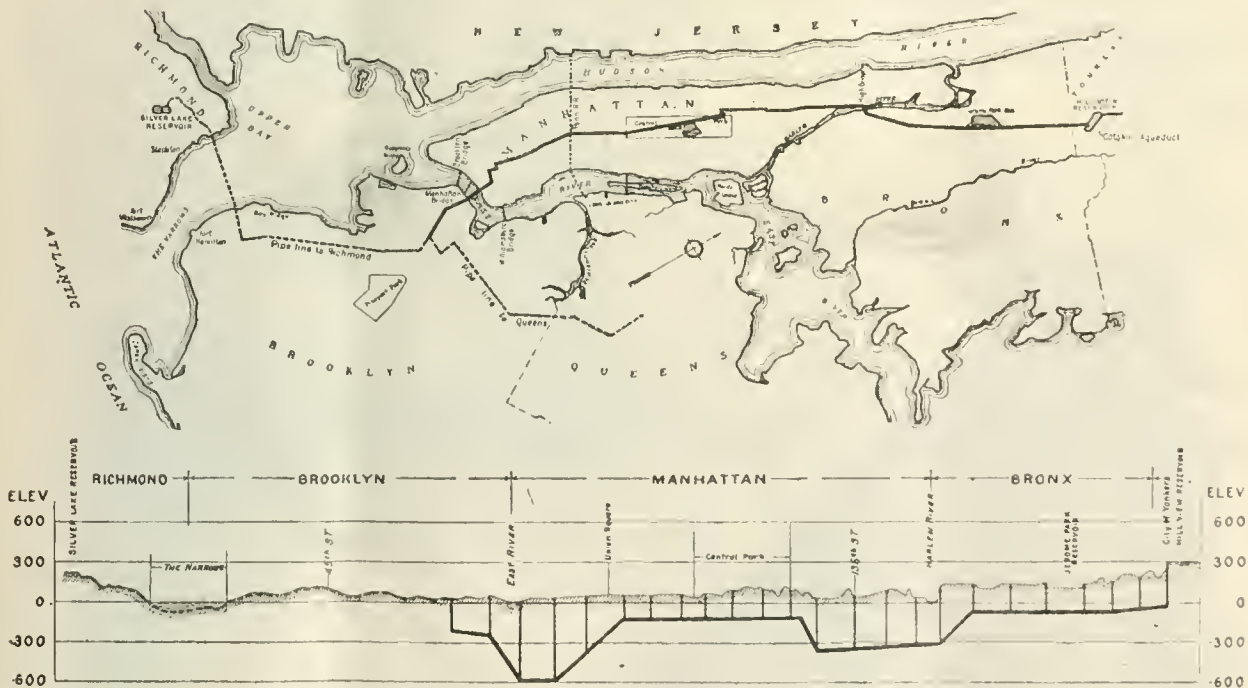


FIG. 5. NEW YORK AQUEDUCT, SOUTH OF HILL VIEW.

night school for the men. The school is operated by the Civic League of North America, and is encouraged and personally assisted by the commissioners. Other interesting features of these two camps are a savings bank, churches, hospitals, post-office, police and fire protection, children's day school, and a Young Men's Christian Association.

The cost of construction plant owned by the con-

the downstream face below the final grading will be moulded against forms, above which the remainder of this face will be of cut-stone masonry. The exposed portion will have a height exceeding 170 ft. for more than 1,000 ft. of its length. The entire dam is divided into sections by transverse expansion joints about 79 ft. apart longitudinally; these expansion joints will be faced on one side with concrete

blocks forming a series of vertical tongues and grooves against which the masonry of the inner side will be built. Near the upstream face a copper strip will be built across the expansion joint to act as a water

upstream face to an inspection gallery near the level of the reservoir bottom, which in turn connects with a transverse drainage gallery leading to the downstream face of the dam.

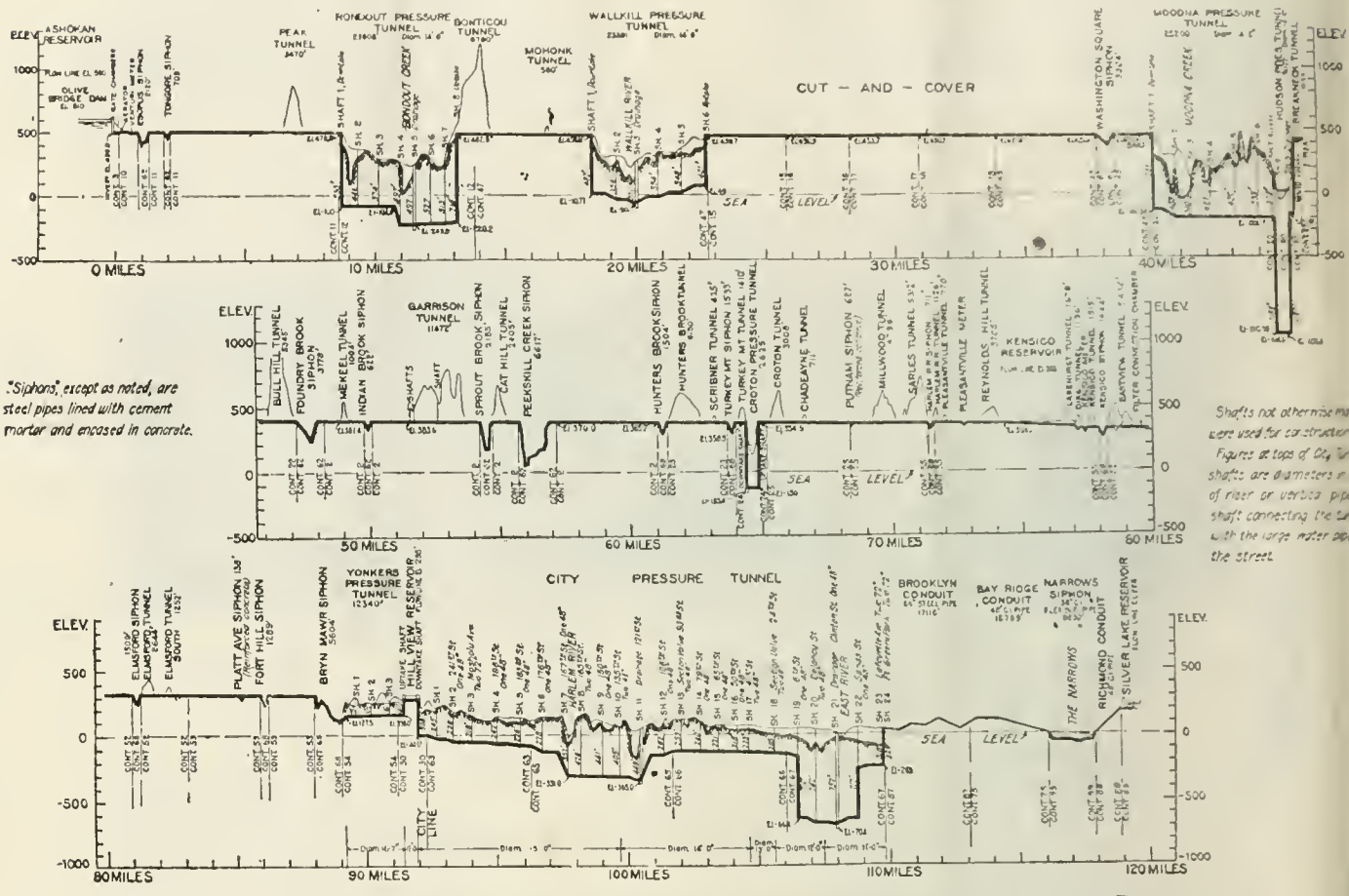


FIG. 6.—CATSKILL AQUEDUCT: PROFILE FROM ASHOKAN RESERVOIR TO SILVER LAKE RESERVOIR.

stop, continuous from bottom to top. Drainage wells 15 ft. apart, longitudinally, formed of porous concrete blocks, will extend from the top of the dam near the

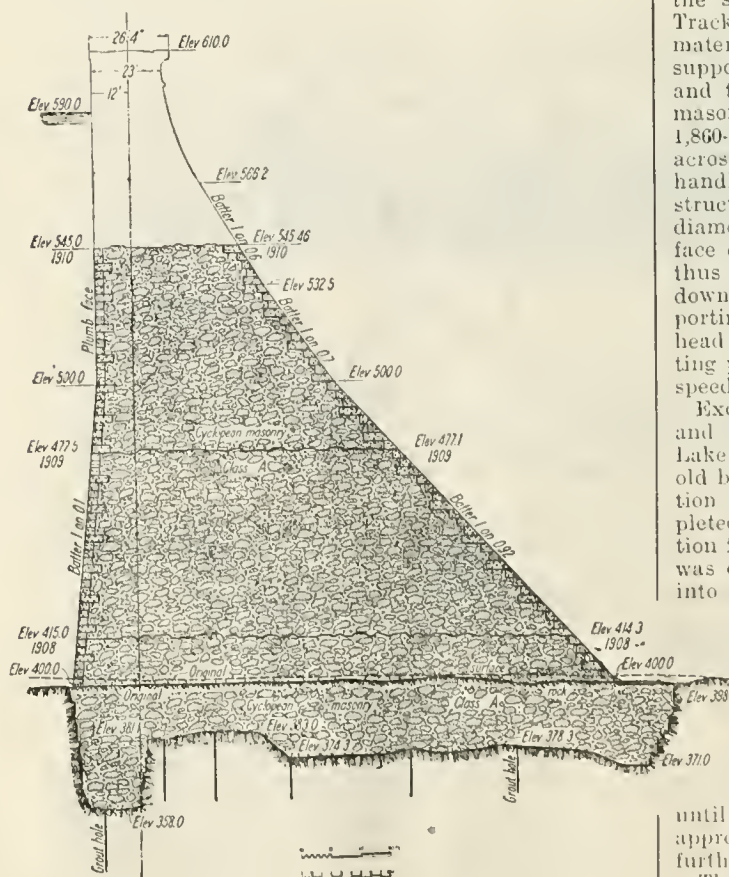


FIG. 7.—OLIVE BRIDGE DAM: PROGRESS IN LAYING MASONRY TO JANUARY, 1911.

The lower part of the dam is being built by travellers, each equipped with two derricks, four travellers in a group of pairs facing each other across the space between the adjacent expansion joints. Tracks for these travellers, and for the cars bringing materials to them, extend across the valley, and are supported on concrete piers. This system of tracks and travellers is elevated from time to time as the masonry progresses. Two movable cableways of 1,860-ft. span, on timber towers 125 ft. high, stretch across the dam site, these being used principally for handling the equipment used on the masonry construction. The cables are of lock-bar type, 2 1/2 in. in diameter. The towers can travel from the upstream face of the dam for a distance of 220 ft. downstream, thus covering all of the dam site except the extreme downstream toe in the gorge. The lifting of the transporting apparatus is operated by wire rope from the head towers at the east end of the dam. The operating plant for each cable consists of an electric two-speed double-drum hoist.

Excavation for the Kensico dam was begun in 1911, and at the beginning of 1912 the old dam forming Lake Kensico had been breached, excavating in the old bed of Lake Kensico was in progress, the excavation of a flume for carrying off the water was completed, and the flume about two-thirds built. Excavation for a length of 250 ft. at the west end of the dam was carried on by hand, the material being loaded into 2-yd. skips, and removed by guy-derricks. At first the excavated material was used for grading for the cableway tail towers, but later it was used for fill below the dam. On May 20th the West Lake drive was closed, and the excavation was extended east. For 1,000 ft. across the bottom of the Kensico lake the excavation was largely with steam shovels. The shovels removed both earth and rock, after the rock had been blasted, until the general level of the bottom had been approximately reached, after which the bottom was further excavated by hand.

The Catskill water conduit consists of four distinct types of aqueduct—namely, cut-and-cover, grade tunnel, pressure tunnel, and steel-pipe siphon. The cut-and-cover forms 55 miles of the aqueduct, is of

horseshoe shape, in cross-section, 17 ft. high by 17.5 ft. wide inside, and constructed of concrete. As com-

pleted, it is covered with an earth embankment. This is the least expensive type, and so is used wherever

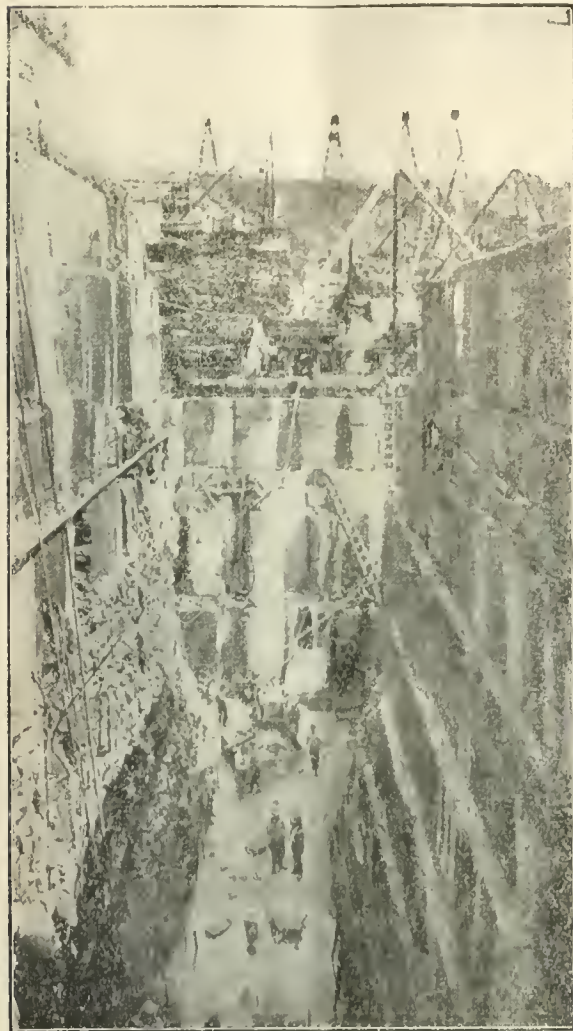


FIG. 8.—OLIVE BRIDGE DAM. COMPLETED CUT-OFF TRENCH LOOKING NORTH.

pleted, it is covered with an earth embankment. This is the least expensive type, and so is used wherever

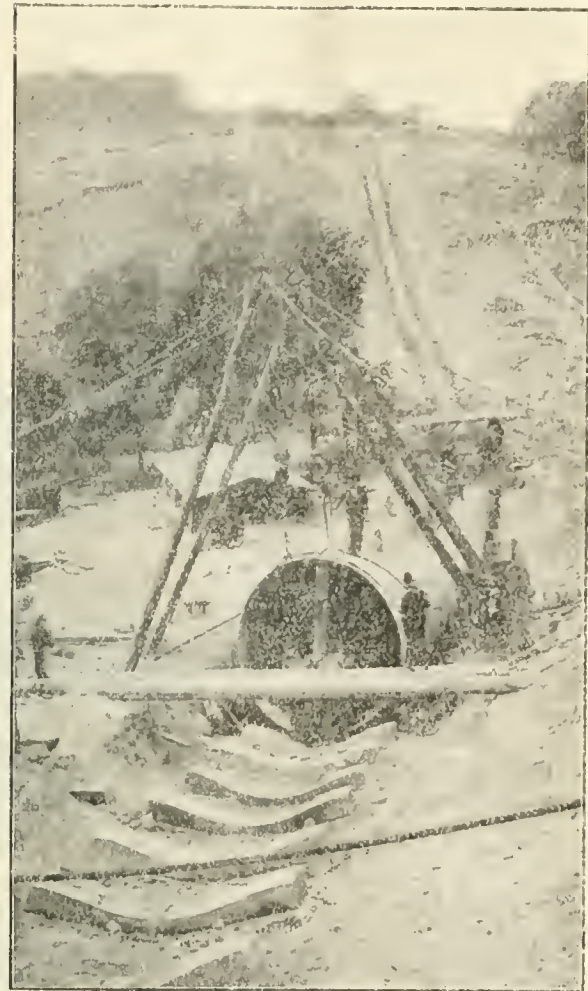


FIG. 10.—HUNTER'S BROOK STEEL PIPE SYPHON: ERECTING STEEL PIPE ON CONCRETE CRADLES PREVIOUSLY PLACED. (Pipe will be embedded in concrete.)

impossible to circumvent them, tunnels at the natural elevation of the aqueduct are driven through them.



FIG. 9.—OLIVE BRIDGE DAM: BLOCK YARD AND CEMENT STORAGE FROM CONCRETE PLANT. (Tracks at right lead to Sand Pits and Quarry.)

There are twenty-four of these grade tunnels, aggregating 14 miles. These, also, are horse-hoe shape, 17 ft. high by 13.38 ft. wide, and lined throughout with concrete. Where deep and broad valleys must be crossed, and there is suitable rock beneath them, circular tunnels have been driven deep in the rock and

of all waters encountered in tunnel work. A number of these waters were found to contain sulphates and chlorides of magnesium and calcium in such concentration as to be injurious if such waters were permitted to percolate through concrete for protracted periods. Special precautions were therefore taken to

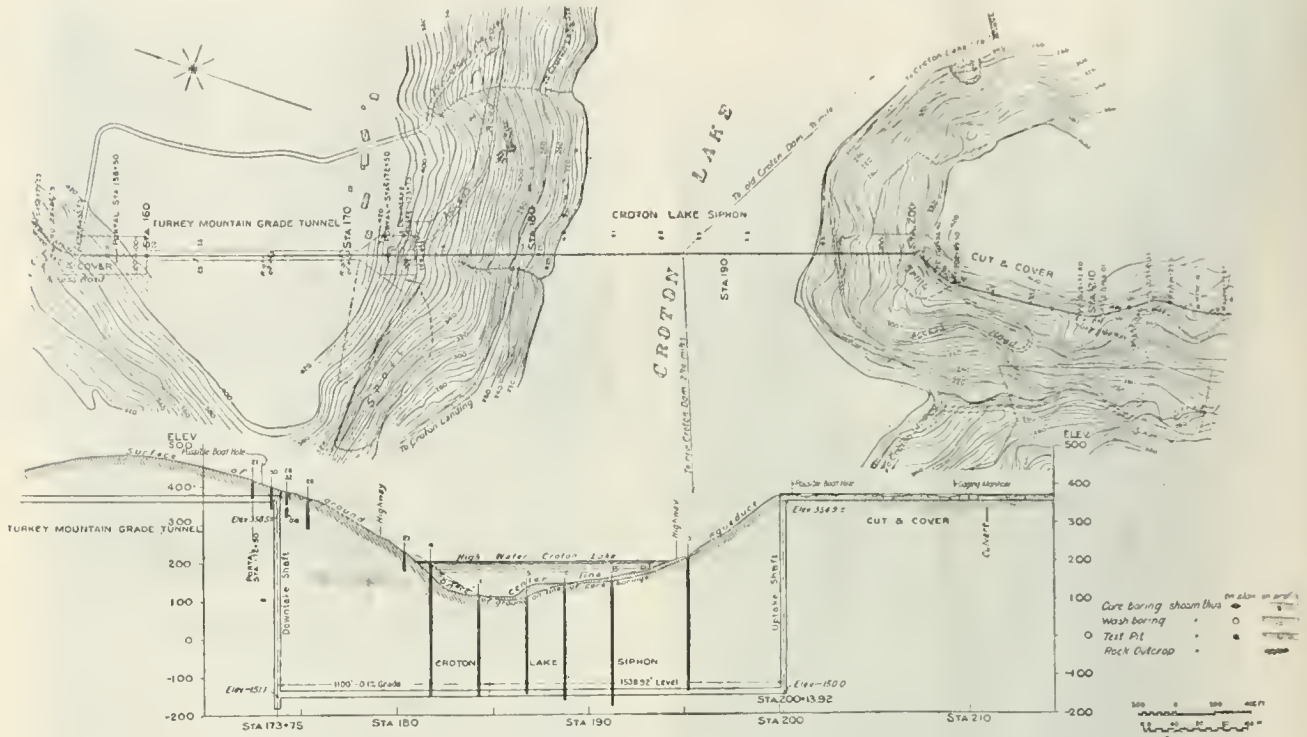


FIG. 11.- CROTON LAKE SYPHON PLAN AND PROFILE.

lined with concrete. There are seven pressure tunnels, totalling 17 miles, with a diameter of 14 ft.

Where the rock is not sound, or where, for other reasons, pressure tunnels would be impracticable, steel-pipe siphons are used. These steel pipes are made of plates riveted together, from 7.68 in. to 0.75 in. in thickness, and are 9 ft. and 11 ft. in diameter. They are lined with 2 in. of cement mortar, embedded in

get dense and impermeable concrete in those portions of the tunnels in which such injurious waters were met. These waters were generally neutral or slightly alkaline in character, with the single exception of a water from one part of the city aqueduct, which showed an acidity equivalent to 8 parts per 1,000,000 of sulphuric acid. In order to discover what effect, if any, the water coming from the rock in the Hudson

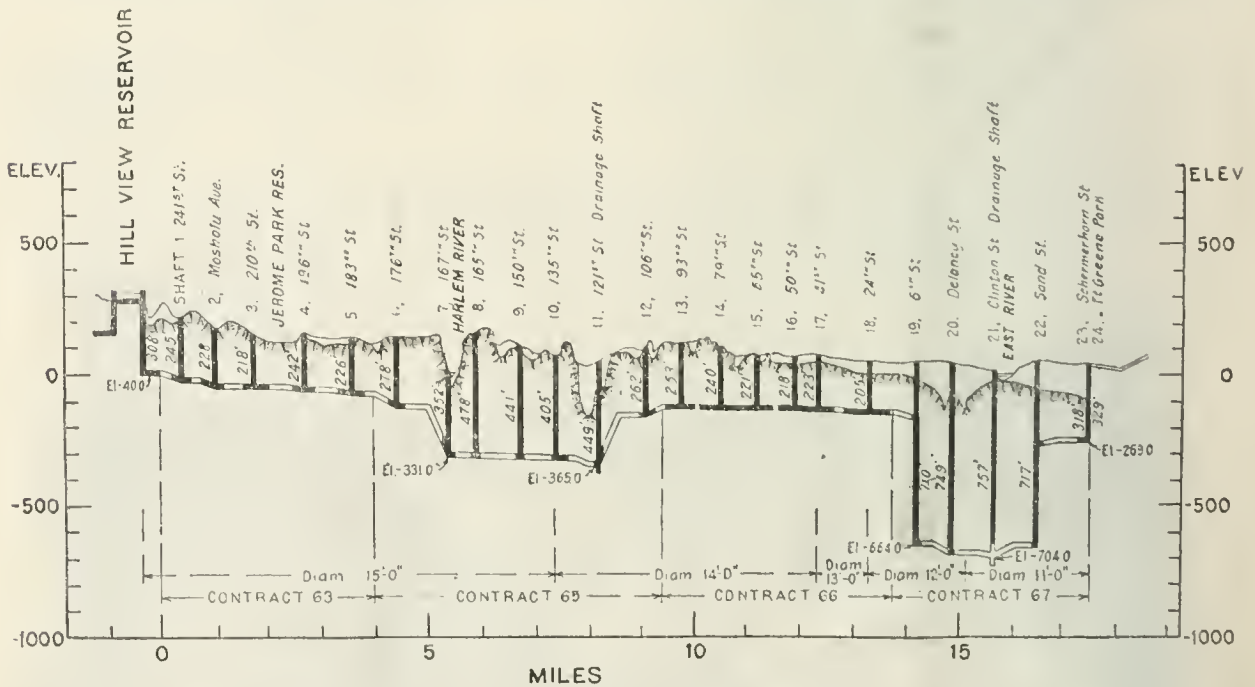


FIG. 12. PROGRESS IN EXCAVATION FROM HILL VIEW RESERVOIR TO TERMINAL SHAFTS IN BROOKLYN, SHOWN BY FULL BLACK SECTION.

concrete and covered with an earth embankment. There are fourteen of these siphons aggregating 6 miles. Three pipes are required in each siphon for the full capacity of the aqueduct.

SOME CONCRETE AND METAL TESTS.

In the year 1912 a systematic examination was made

siphon would have on the concrete linings of the shafts, six 8-in. by 16-in. concrete cylinders of 1:1.96:4.24 mixture were immersed in the running rock water of one of the shafts of the Hudson pressure tunnel for two years. A similar set of six specimens was stored in the ordinary way in damp sand in the laboratory for the same period. When these speci-

mens were crushed the two sets gave almost identical results, showing that immersion of this rich, dense concrete in the shaft water had not had the least effect upon it. The shaft water was of such character that considerable deterioration would undoubtedly have resulted if the water had percolated through the concrete, as was indicated by experiments carried out in previous years. In these experiments small specimens of concrete, purposely made lean as well as permeable by the use of sand composed of grains of practically uniform size, were found to be materially weakened after a year's percolation under pressure.

CEMENT TESTS.			
	1910.	1911.	1912.
Barrels of cement tested ..	1,175,800	1,820,550	1,288,300
Per cent accepted ..	95.44	90.31	93.46
Per cent rejected (low strength)	1.09	0.43	1.03
Per cent rejected (lack of increase between 7 and 28 days)	0.85	2.15	1.05
Per cent rejected (excess in anhydrous sulphuric acid and magnesia)	1.70	4.31	—
Per cent rejected (quick setting)	0.74	1.87	1.15
Per cent rejected (falling off of strength)	0.18	—	—
Per cent rejected (unsoundness)	—	0.60	3.31
Per cent rejected (all causes)	4.56	9.69	6.54

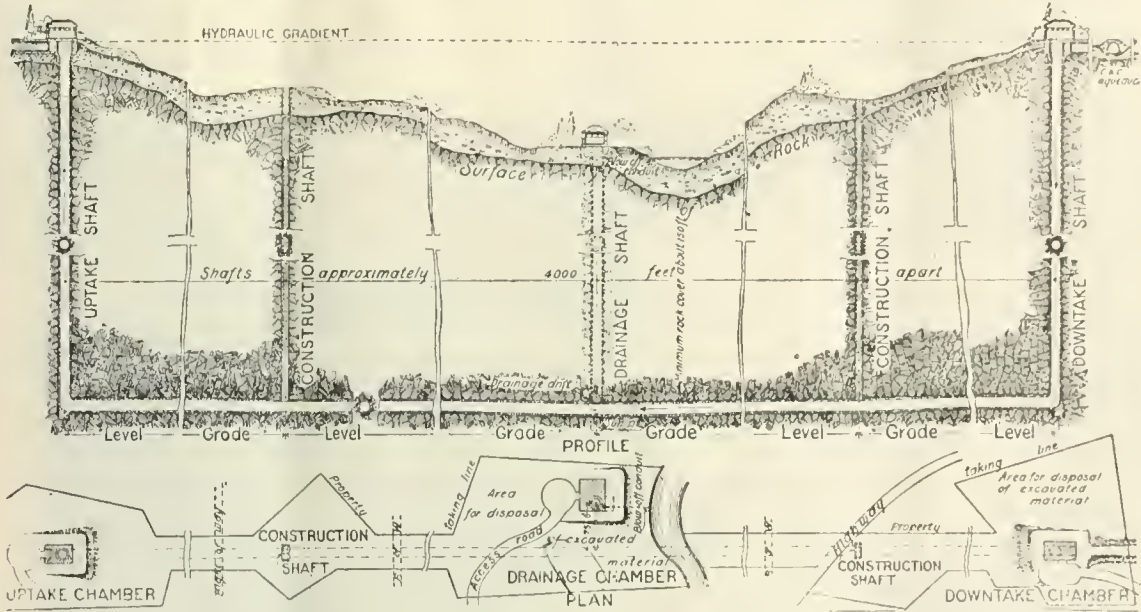


FIG. 13.—CATSKILL AQUEDUCT: TYPICAL PRESSURE TUNNEL.

For the Department of Bridges sixty-four concrete specimens were tested. To determine the suitability of materials for construction fifty-six tests were made of specimens of concrete used on aqueduct construc-

A series of experiments was undertaken to determine the relative deterioration a metal suffers from corrosion when embedded in concrete alone and in contact with another metal. Weighed specimens of

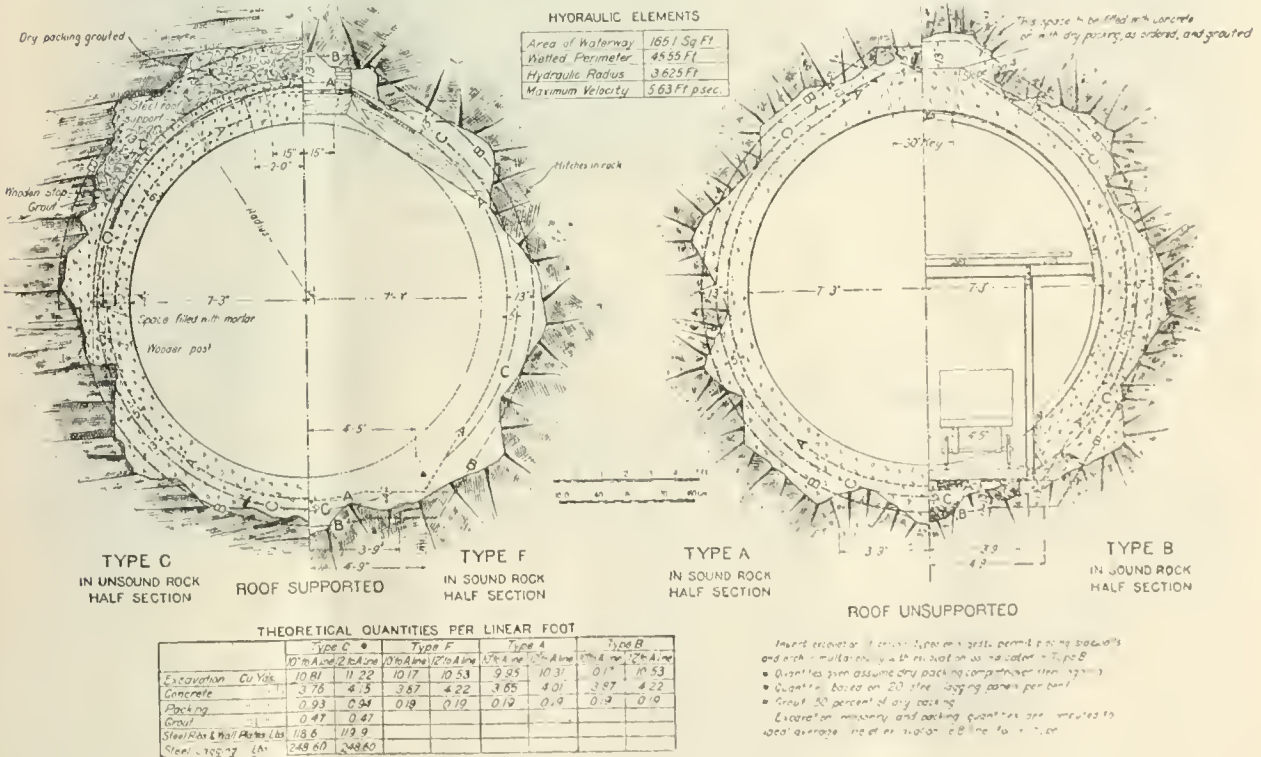


FIG. 14.—TYPES OF PRESSURE TUNNEL FOR CROSSING DEEP DEPRESSIONS IN AQUEDUCT LINE.

tion, and 714 tests were made of concrete aggregates from localities along the aqueduct, including strength tests of mortar and concrete. All cement used in construction was inspected and tested, the records of these tests being:—

steel, manganese bronze, lead, copper and Monel metal were embedded in damp concrete singly, and in couples in contact. At the end of two months the concrete blocks were broken and the metals removed, cleaned, dried and reweighed. The resulting losses

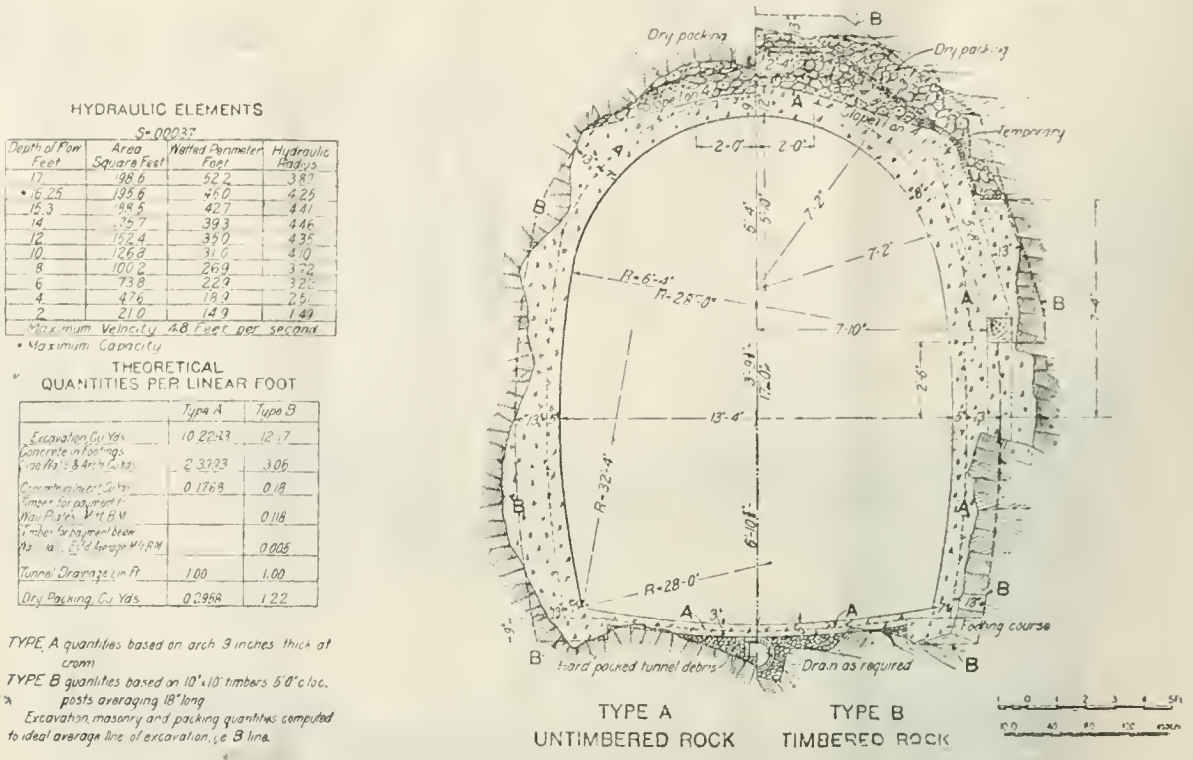


FIG. 15.—TYPES OF CONSTRUCTION OF TUNNEL AT HYDRAULIC GRADE.

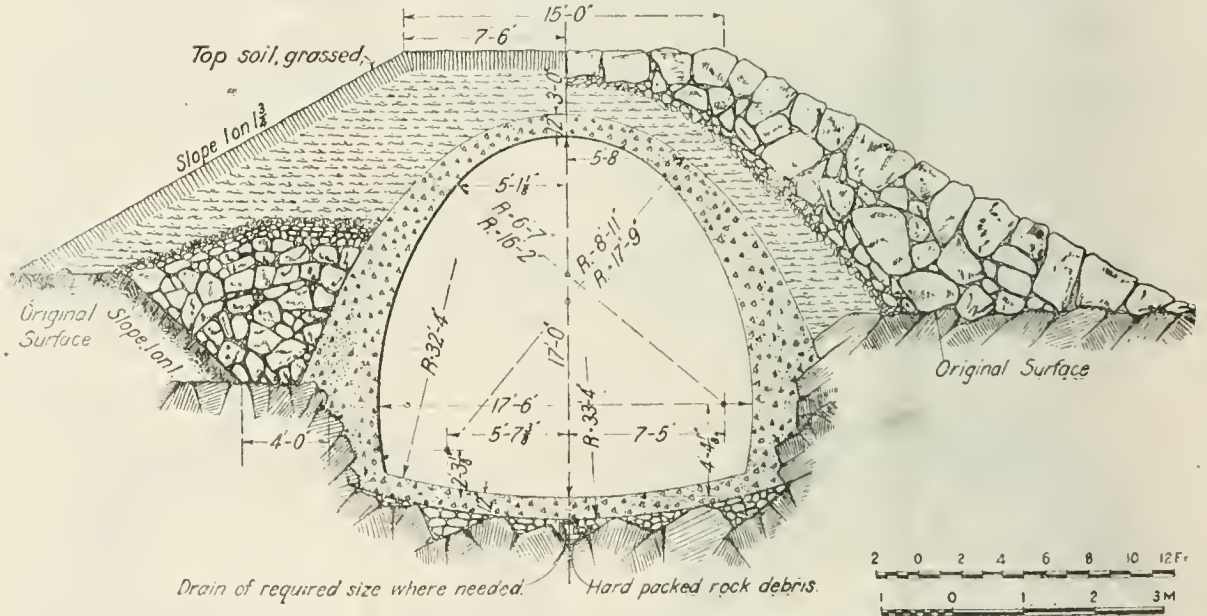


FIG. 16.—TYPICAL CUT-AND-COVER CONSTRUCTION IN PARTIAL AND TOTAL ROCK TRENCH.

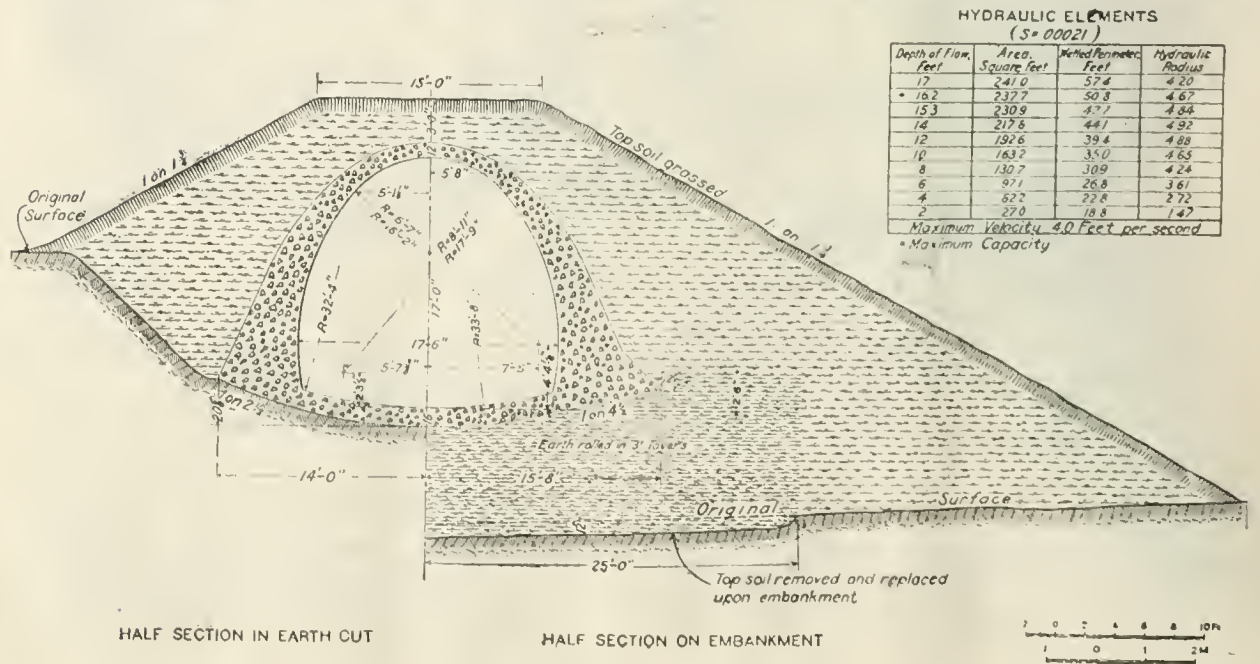


FIG. 17.—TYPICAL CUT-AND-COVER CONSTRUCTION IN EARTH TRENCH AND ON EMBANKMENT.

in weight showed but slight differences, whether the metals were alone or in contact, and gave no evidence of electrolytic action in the latter case. With the exception of lead, the corrosion of all the metals was slight, that of Monel metal being almost nil. The action of lead confirmed previous experience, and showed that this metal may suffer appreciably in alkaline as well as in acid mediums; the corrosive action was observed to be solvent in character, no protective coating being formed to arrest further change. Specimens of iron and steel, 12 in. by 24 in. by ¼ in. thick, from various manufacturers, were subjected to corrosive influences by exposure to the atmosphere and by immersion in Esopus creek. At the end of a year the specimens were cleaned of their accumulated rust with dilute sulphuric acid, while in galvanic contact with zinc, which effectually removed

GLOUCESTERSHIRE ROADS.

The annual report of the Highways and General Purposes Committee of the Gloucestershire County Council, which is signed by the chairman, Mr. F. W. B. Cripps, and the county surveyor, Mr. E. S. Sinnott, shows that the total expenditure on the county roads during the year ended March 31st last was £109,463, while the total cost of rural roads was £97,143—an average of £98 14s. 10d. per mile, inclusive of salaries, bridges, and footways. Superintendence cost 3.55 of the total outlay. The quantity of stone used amounted to 118,166 tons, made up as follows: Granite or basalt, 56,269 tons; tarmac, 4,244 tons; 2½-in. tarred macadam, 5,784 tons; carboniferous limestone, 40,024 tons; granite and mill grit tarred binding and patching.

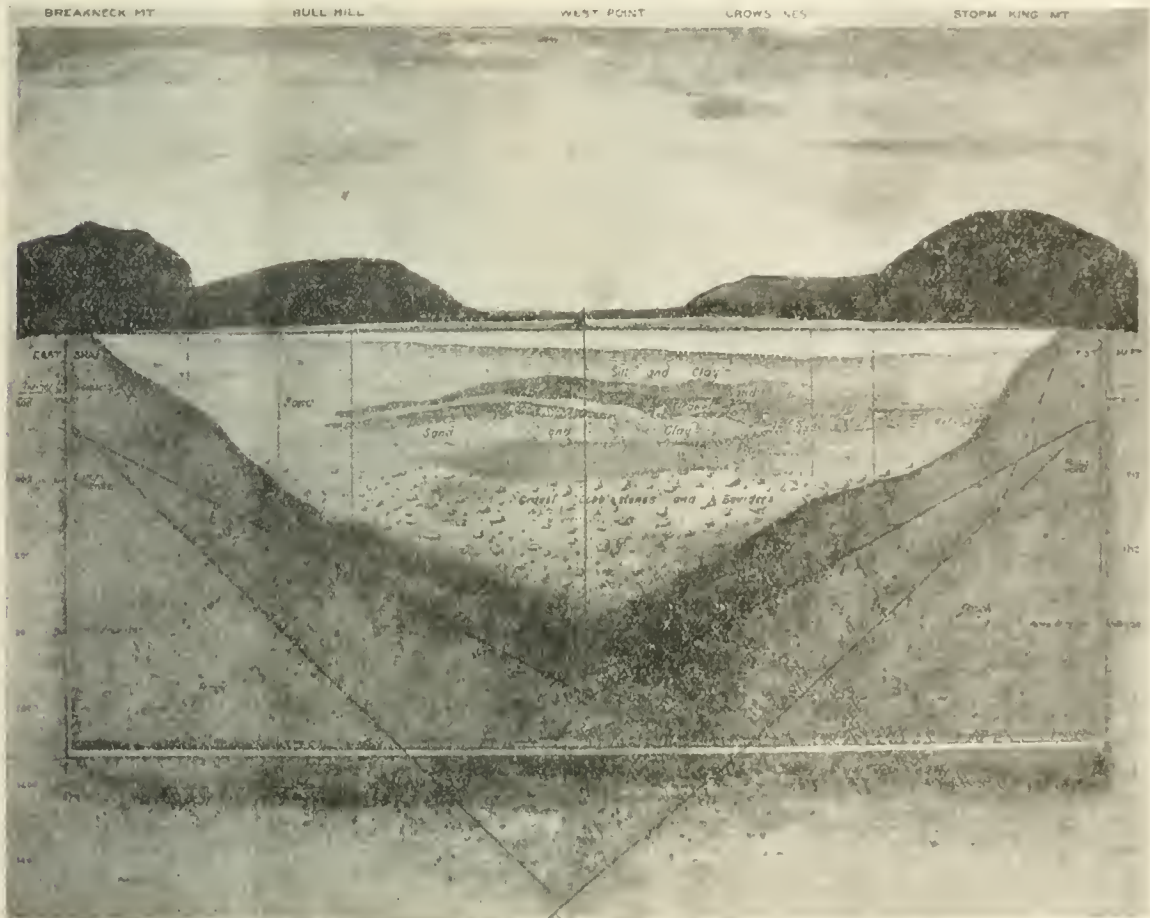


FIG. 18.—CROSS-SECTION OF HUDSON RIVER AT CATSKILL AQUEDUCT TUNNEL CROSSING, SHOWING DIAMOND DRILL EXPLORATION HOLES.

the rust without attacking the metal or scale, and were washed, dried and weighed. The relative deterioration of some of the metals, due to corrosion, are:—

MATERIALS.	(A)	Loss per square foot in grams.	
		(B)	(C)
Wrought iron	4	17.01	20.41
Especially pure, extra low carbon, open-hearth steel (a)	2	13.61	19.28
Especially pure, extra low carbon, open-hearth steel (b)	2	21.55	23.81
Open-hearth steel	4	17.01	18.14
Copper steel, containing ¼ per cent copper	2	6.80	11.74
Bessemer steel	1	20.41	26.08

(A) is number of specimens in average; (B) is for exposure on laboratory roof; (C) is for immersion in Esopus creek.

Other series of similar experiments are being made, the metals being stored in various soils and kept continually wet, but no determinations of value have as yet been made.

To measure the water drawn from the big reservoirs some very large Venturi meters have been built on the line of the aqueduct. These are probably the largest water meters ever built. There is one just below Ashokan reservoir, a second just above Kensico reservoir, and a third where the water is drawn from Kensico reservoir. Each of these meters is 410 ft. long, of reinforced concrete excepting for the bronze throat castings and the piezometer ring, which is also of cast bronze.

1,490 tons; oolitic limestone, 1,045 tons; slag, 3,548 tons; Naisheombe quartzite, 2,688 tons; land, 74 tons.

It is proposed to purchase three 10-ton steam rollers, to be used in connection with the consolidation of tarred material. It is found from experience that the putting down of tarred macadam or tarmac is best affected by two rollers working in pairs—i.e., 15-ton roller for consolidating the larger material, and the tighter roller for finishing the surface. It is also proposed to purchase a 6-h.p. traction engine and six steel-lined side-tipping trailers (6 tons capacity each).

The estimates show an advance of £29,198 over and above the expenditure of last year, which has been necessitated in consequence of the increase in traffic. The Road Board propose to contribute £20,000 out of an expenditure of £40,000 upon improved surfaces—i.e., those constructed with tarmac or tarred macadam, which are to be laid on the lengths due for resurfacing on the 354 miles of trunk routes. It is intended to lay the improved surface for an average width of 12 ft. in the centres of such roads, making up the sides with water-bound macadam, and it is estimated that 40 miles will be coated during the current year. The board will also contribute £1,500 towards tar-spraying.

“Pudlo.”—According to the report of the Inspector of Ancient Monuments, H.M. Office of Works, in restoring Weobley and Monmouth Castles, used Pudlo for making the structures waterproof.

Institution of Municipal and County Engineers.

THE DOVER MEETING.

There was a surprisingly small attendance at last Saturday's meeting of the Institution of Municipal and County Engineers at Dover, and the extreme brevity of the initial business proceedings at the town hall was another somewhat unexpected feature of the gathering. Following an address from the Mayor, and a short acknowledgment by the president, votes of thanks were immediately accorded to Messrs. W. C. Hawke, the borough engineer, P. C. Tempest, engineer to the South-Eastern and Chatham Railway, and A. T. Walmisley, the engineer to the Harbour Board, for their papers on the several undertakings with which they are concerned, and although Mr. Dryland, the district chairman, seemed anxious that something in the shape of a discussion should take place, the meeting was forthwith adjourned—barely half-an-hour after the start—for luncheon. The minutes of the previous meeting, if they happened to be available, were not read, and the new secretary to the institution, Mr. Dudley Robinson, who was among those present, found no opportunity of responding to a few words of welcome addressed to him by Mr. Cockrill. A good part of the next half hour was spent, more or less happily, by the members in posing in a group before a local photographer, who, having completed his preparations for a picture, was brought to a temporary standstill by an absence of cloud and a consequent excess of sunlight, which he explained, during the period of waiting, did not make for the best results in his art. This ordeal over, the party proceeded to the Grand Hotel for lunch, but the disinclination for speech making, shown so markedly at the morning meeting, was again evident here, the customary toast list being conspicuous by its absence. A collection for the Orphan Fund, however, realised the substantial sum of £7 9s. 6d., one contribution, from "A Friend of the Institution," being for five guineas. In spite of the inclemency of the weather, the subsequent visits, which included inspections of a ferro-concrete viaduct and workmen's dwellings in course of construction in the pier district, the new marine station on the Admiralty Pier, and the National Harbour Works, passed off pleasantly, and the members, on returning to the town hall, were the guests of the Mayor at tea. The attendance at the meeting included Messrs. S. P. Andrews (Faversham), W. Banks (Rochester), H. W. Barker (Walmer), R. Brown (Southall-Norwood), T. F. Bunting (Maidstone), T. A. Busbridge (Maidstone Rural), H. T. Chapman (Kent County), J. W. Cockrill (Great Yarmouth, president), A. Dryland (Surrey County, district chairman), T. C. Golder (Deal), F. Harris (Tonbridge Rural), W. C. Hawke (Dover), H. O. Jones (Folkestone), E. R. Lewis (Cranbrook), A. E. Nichols (Folkestone), J. L. Redfern (Gillingham), T. G. Robinson (Dover), W. Crowhurst Rubie (Birmingham) and J. W. Dudley Robinson (Westminster, secretary).

The MAYOR (Councillor E. W. T. Farley), in receiving the members, expressed the hope that, although the visit of the institution to the ancient port and borough of Dover was a short one, it might be one of profit and pleasure.

The PRESIDENT (Mr. J. W. Cockrill) said he was sure all appreciated the kind words of his Worship, and that the visit would prove instructive to them.

Mr. A. DRYLAND (Surrey County), district chairman, also voiced the indebtedness of the members to the corporation for the kind welcome which had been extended to them. They had, at the same time, to extend their thanks to Mr. Hawke, the borough engineer, for consenting to arrange for the meeting, and to Mr. Walmisley and Mr. Tempest for the facilities they had given for the inspection of the harbour and railway station works. Dover was a familiar place to him, for he spent some thirteen or fourteen years in that part of the country, and he would experience considerable pleasure in going round with the members that day.

On taking the chair, the PRESIDENT moved a vote of thanks to the readers of the three papers which had been prepared in connection with the meeting. Interest in their institution, he observed, was maintained very considerably by those who were kind enough to read papers before them. Proceeding, Mr. Cockrill observed that they had present with them that day their new secretary, Mr. Dudley Robinson.

He came to the institution as a young man. Mr. Cole had held the office of secretary for forty years, and if Mr. Robinson held the position for another forty years it was reasonable to hope that the institution would number between 3,000 and 4,000 members. He gave him a hearty welcome, and hoped that, under his guidance, the institution would go on and prosper.

Mr. REGINALD BROWN (Southall-Norwood), seconding the votes of thanks, remarked that in coming to an old town like Dover they expected to, and would, no doubt, see some works of unusual interest. The harbour works spoke for themselves, and Mr. Hawke's work was so well known that he thought his mere offer to throw them open to their inspection showed that he had an interest in the institution.

The votes of thanks were carried.

In a short acknowledgment of the compliment paid to him, Mr. WALMSLEY said he felt gratified at meeting that day a number of gentlemen whom he had met out of Dover on previous occasions. Mr. HAWKE, who also replied, excused the shortness of the paper which he had prepared on the ground that he preferred practice to theory. Answers given to questions asked on the job were, he added, of far more service to engineers than pages of descriptive matter. He was personally delighted to see them in Dover, and so far as he was concerned should use every endeavour to make the meeting successful in every way.

Mr. DRYLAND recalled that at the recent district meeting at Tunbridge Wells a certain amount of business was transacted and there might be a subject which they could deal with on that occasion. At the meeting he referred to the wish was expressed by some of the junior members that they should hold meetings of their own, and he was asked whether he would support them in arranging these. He expressed himself in favour of the idea, and a meeting of junior members was actually in course of arrangement. Papers would be prepared by junior members, and while all members of the institution could attend, it would be largely a meeting of the junior members themselves. It seemed to him most desirable that the junior members should be encouraged to take an active interest in the institution, and he thought the general body of members should give their assistance in the matter.

After lunch an inspection was made of the ferro-concrete viaduct and workmen's dwellings, which are in course of construction in the pier district, and which are fully described in the paper of Mr. W. C. Hawke, the borough engineer, reproduced on another page of this issue. Subsequently the members proceeded to the new marine station works. This station is being built for the railway company on land reclaimed by the Dover Harbour Board by constructing a sea wall on the eastern side of the Admiralty Pier from the shore to the Turret Fort, and filling the intervening space with chalk. In order to provide a solid foundation for the station buildings, nearly 1,200 reinforced-concrete piles (Consideré system) have been driven through the chalk filling to the sea bed, and the heads of the piles have been connected together with reinforced-concrete slabs and beams. A carriage shed, the sides of which will be constructed of reinforced concrete, is being erected contiguous to the station building, of sufficient size to take four of the company's longest trains at the same time. The roof of the station is of the braced-arch type. The main trusses are placed every 35 ft., and rest upon stanchions independent of the walls. The platform buildings and the side walls are to be built principally of brick, granite being used for dressings in the case of the side walls. The front of the station at the shore end will be faced entirely with granite. The station and works in connection therewith, including the foundations, have been designed by Mr. P. C. Tempest, the engineer to the company, and they are being carried out under the supervision of his new works assistant, Mr. F. C. Stainton, the resident engineer being Mr. W. Nightingale. Messrs. S. Pearson & Son, who were the contractors to the Dover Harbour Board for the reclamation works, constructed the piled foundations of the station for the railway company; the Butterley Company, of Derby, are the contractors for the steelwork generally; while Messrs. W. E.

Blake, Limited, of Fulham, are carrying out the works in connection with the front and side walls of the station and the platform buildings, and other general work.

DOVER HARBOUR WORKS.

Some interesting details with regard to the national harbour works were supplied in the paper prepared by Mr. A. T. Walmisley, M.INST.C.E., engineer to the Dover Harbour Board.

The construction of the shore end of the Admiralty Pier at Dover followed the Royal Commission of 1844. It was commenced in 1847, completed in 1871, and was designed to serve as a breakwater or western



MR. A. T. WALMSLEY, M.INST.C.E.

[Mr. Walmisley is a Fellow of King's College, London, and lecturer on Waterways, Harbours, and Docks at University College (University of London). He is a member of the Institution of Civil Engineers, and the auditor of that body for 1914-15; also an hon. associate of the Royal Institute of British Architects, and member of the Royal Institute of British Architects Reinforced Concrete Advisory Committee. He was appointed engineer to the Dover Harbour Board in 1888, and has been in private practice at 9 Victoria-street, Westminster, since 1877, being the senior partner of the firm of A. T. Walmisley & White. It may be recalled that Mr. Walmisley read a paper on the subject of groynes at the meeting of the Institution of Municipal and County Engineers held at Dover in 1897; and he is the author of "Iron Roofs" (Spon)—which has attained a second edition—and "Field Work and Instruments," and "Land Surveying and Levelling" (Whittaker & Co.). In the coronation year of 1911 he was Master of the Worshipful Company of Makers of Playing Cards.]

arm of a harbour of refuge. The embarkation and disembarking of railway passengers was arranged subsequent to its inception by the addition of timber landing stages on both sides of the pier. The stages on the west side are still existing.

The length of the Admiralty Pier was 2,100 ft. prior to its extension in 1899-1909 by the Government for the National Harbour, and with 2,000 ft. extended in a south-easterly direction is now 4,100 ft. long, or about $\frac{3}{4}$ mile in length.

Alongside the extension a deep water landing stage 780 ft. 3 in. in length by 20 ft. in width has been built in open pile work, being furnished with berths for Continental steamers and double decks to suit tidal levels for the service of the Calais and Ostend mail boats until the completion of the Marine Station already described. About 11 $\frac{1}{2}$ acres have now been reclaimed by the Dover Harbour Board upon the east side of the Admiralty Pier to obtain a site for the railway company's Marine Station, with sidings for Continental traffic in connection with the four berths provided by the Harbour Board for passenger steamers, one of the latter being constructed as an onset landing for the use of paddle mail boats at low water with a subway leading to the new station.

Spring tides rise 18 ft. 9 in., neap tides 15 ft., and range 11 ft. High water ordinary spring tide is 10.35 ft. above ordnance datum.

The retaining wall to the reclaimed area, designed by Mr. Walmisley, is a 50 per cent wall 2,260 ft. in length, formed of concrete blocks having its width at the base half the height, as portions had to stand

isolated until the filling, consisting of deposited chalk obtained from the cliff east of the harbour, was completed. The work up to coping level was executed by Messrs. S. Pearson & Son, Limited, Messrs. Baker & Hutzig being engaged as consulting engineers, and Mr. H. Sadler, M.INST.C.E., as resident engineer. Reinforced concrete piles on the Considere system support the foundations of the station and of the inset landing subway.

In the building of the wall there were three processes to be carried out from a temporary stage carrying goliath cranes capable of travelling longitudinally, and each furnished with a steam winch or crab with transverse movement. First the excavation of mud down to a chalk foundation by means of grab dredging, then the levelling of the chalk surface by aid of a diving bell, and finally the setting of the blocks at required level by a helmet diver were undertaken.

Portland cement was first used for concrete blocks of 3 to 7 tons in weight at the original pier in 1849. In the extension, blocks of 40 tons weight were employed, and the face blocks above low water level were dowed in position, timber fenders being provided at regular distances apart. A conduit 6 ft. in height by 4 ft. in width runs beneath rail level down the east side of the original pier between the entrance gates and the turret to convey electric cables and other pipes.

The Prince of Wales Pier was commenced in 1892 to the designs of Messrs. Coode, Son & Mathews, Sir John Jackson being the contractor, and marks the boundary of the area now available for the Harbour Board's outer harbour. The shoreward end for 1,260 ft. is formed by an iron viaduct having a clear headway of 15 ft. above high water ordinary spring tide, so as to allow the tide to run through in the supposition that no outside seaworks would then be constructed. The seaward end is formed of concrete blocks faced with granite, having a coping level 10 ft. above high water ordinary spring tides, and the total length of the pier is 2,910 ft.

Subsequent to its completion a landing stage was added in 1904 upon the Eastern side of the Prince of Wales Pier, with the provision of railway communication in connection with the mail lines at Dover Harbour Station. This was arranged by the Dover Harbour Board, and carried out by Messrs. S. Pearson, with a swing bridge across the Wellington Dock entrance, designed by Mr. A. T. Walmisley. The hydraulic power is actuated by an electric engine which raises an accumulator to generate a pressure of 750 lb. per square inch, and the machinery was inspected by the members present on their return from the Prince of Wales Pier.

THE HAMBURG MEETING.

Those members of the institution who intend to take part in the visit to Hamburg at Whitsuntide will leave London on Wednesday, May 27th (Liverpool-street Station), by the 8.30 p.m. service, *via* Harwich and the Hook of Holland, and reach their destination shortly before three o'clock on the following afternoon. At ten o'clock on Friday morning the party will proceed to the municipal waterworks at Rothenburgsort, Billhornerdeich, and in the afternoon will visit the sewers and hear a lecture on town planning. On the next day an inspection of the gas-works and public lighting system will be made, and visits paid to the town hall and the principal places of interest in Hamburg, the arrangements including a journey by steamer through the harbour. On Monday visits to the Altona flower exhibition and Blankenese will take place, while the following morning will be devoted to an excursion to Hagenbeck's Tierpark. Hamburg will be left on Wednesday, June 3rd.

The inclusive fare for the trip, it may be mentioned, is £11 19s. 6d.

SOUTHEND MEETING PROGRAMME.

The programme of the meeting of the institution to be held at Southend-on-Sea on Saturday, June 6th, was issued yesterday, and is as follows:—

11 a.m. Members will assemble at the Palace Hotel. Reception by his Worship the Mayor (Alderman Joseph Francis, J.P.).

11.35 a.m.—Leave hotel to inspect the following works in course of construction: (a) Pier extensions (electric cars to pier head, kindly provided by the Pier Committee); (b) Esplanade improvement and sea wall; (c) large swimming bath.

1.30 p.m.—Lunch at the Palace Hotel by kind invitation of the Mayor.

- 2.15 p.m.—Discussion on paper by Mr. E. J. Elford, M.INST.C.E., on "The Main Sewerage and Sewage Disposal Works, and other Recent Municipal Works, Southend-on-Sea."
- 2.45 p.m.—Leave hotel to inspect the following works: (d) Reinforced-concrete loading pier; (e) tramway boulevard; (f) sewage disposal works.
- 4.45 p.m.—Tea on the site of the sewage works at the invitation of Mr. E. J. Elford, followed, if desired, by further discussion on paper.

LYTHAM DISTRICT MEETING.

The arrangements for the North-Western District meeting of the institution to be held at Lytham on Saturday, June 13th, include the reading and discussion of a paper by Mr. A. J. Price, the engineer and surveyor, entitled "The Municipal Works of Lytham," and visits to the town's West End outfall sewage works (in course of construction), the East End sewage and destructor works and the slaughter-houses.

Efforts are being made to arrange for a two days' district meeting in Cork towards the end of July, and it is hoped that a district meeting will be held in Leicestershire in the near future. Provisional arrangements are also in hand for a meeting (probably an institution meeting) to be held at Cleethorpes in September.

SUSSEX ROADS.*

By A. McARTHUR,

Highways Surveyor to the Cuckfield Rural District Council.

In these parts, not so very long ago, a road maintained and repaired with broken sandstone was the vogue; flints came later, and the use of granite, when first introduced, was deemed a luxury. It is these earlier days of pit-stone and flints that give us the little bed or foundation that now appears in our roads, obtained only by process of accumulation, for except in the case of some of our main trunk roads and roads of recent construction there is a complete absence of initial foundation. This certainly is borne out by the conditions which were said to obtain in the earlier periods, and to a great extent aggravates the problem of maintenance as it exists to-day.

I might here say that I am not unmindful of the magnificent work achieved by Macadam and Telford, and, among exponents of a later school, Kinchin, of local fame. Let me, however, quote the following extract from Smiles, as I think it has some bearing on the question:—

"In the seventeenth century it is recorded that roads were in many cases but rude tracks across heath and common as furrowed with deep ruts as ploughed fields. In the winter to pass along one of these was like travelling in a ditch. The attempt made by adjoining occupiers to mend them were for the most part confined to throwing large stones in the bigger holes and filling them up. They were horse tracks in the summer and rivulets in the winter."

This rather sweeping, yet no doubt authentic, record applied generally; but, "in Sussex," it adds that "the roads had long preserved an infamous notoriety, and it was satirically alleged that the Sussex girls were so long-legged because of the tenacity of the mud in that county. The practice of pulling the foot out of it, by the ankle, tending to stretch the muscle and lengthen the bone." Further, according to local history, it is stated that children were drowned in the ruts, on one occasion this forming the subject of a coroner's inquest at Cuckfield; and among parochial possessions in the past there was the plough used to fill in the ruts when the spring, or early summer, rendered the ground sufficiently dry. These old-time implements probably rested by the roadside for the remainder of the year waiting for their period of usefulness, as does the aggressive-looking, ever-ready snow-plough of to-day. Be this as it may, I venture to express the view from personal observation that, in spite of the transformation of the mud track into the well-macadamised highway of to-day, our fair friends in Sussex still retain the physical characteristics referred to.

* Extract from paper on "Road Maintenance—Past and Present," read at a recent meeting of the Public Health and Local Government Officers' Association for Sussex.

COLCHESTER BOROUGH SURVEYORSHIP.

APPOINTMENT OF MR. HAROLD COLLINS.

As the result of the second competition for the position of borough engineer and surveyor of Colchester, Mr. Harold Collins, ASSOC. M.INST.C.E., M.I.M. AND CO.E., deputy city engineer, Norwich, has been successful.

Mr. Collins was articled to his father, the present city engineer of Norwich, afterwards being appointed assistant to the resident engineer of the Lancashire and Yorkshire Railway, when some very extensive works in and around Wakefield, including tunnelling and other heavy operations, were carried out. He was subsequently selected as assistant by Mr. H. T. Wake-



ham, M.INST.C.E., county engineer and surveyor of Middlesex, under whom he was engaged upon very important electric tramways and main road improvements.

Since his appointment by the Norwich Council in April, 1903, as deputy city engineer of that city, he has assisted the city engineer in all the numerous ramifications of special and routine works, and when his chief was disabled by accidents on two occasions, and by overwork on a third, Mr. Harold Collins carried on the whole work of the department with complete satisfaction to the authority. During the great flood of August, 1912, the city engineer was at sea taking his annual holiday, and the grave responsibility for meeting the demands on the department devolved upon his deputy, who thoroughly rose to the occasion, winning the commendations of Mr. John Burns, the President of the Local Government Board, who was an unrecognised observer of the work in progress to reduce the effects of the floods, and protect and help sufferers. Mr. Harold Collins received the thanks of the council, conveyed to him by the Lord Mayor, for his valuable services and exertions on that occasion.

The Colchester appointment carries with it a salary of £400, rising by annual increments of £20 to £500 per annum.

Bury Sanatorium Extension.—The Bury and District Joint Hospital Board have decided to proceed with a scheme for providing an additional 150 beds for adults and 50 beds for children, and for this purpose it is proposed, subject to the approval of the Local Government Board, to purchase the whole of an estate adjacent to the existing Aitken sanatorium at Holcombe.

London and Lancashire Fire Insurance Company.—In moving the adoption of the report and statement of accounts at the fifty-second annual meeting, Mr. John H. Clayton, the chairman, stated that the total reserves of the company now amounted to £3,286,043, or 125 per cent of their total premiums. Looking broadly and even analytically, at their accounts, he thought it would be the opinion of all that they were not only up to their standard, but a little better. They evidenced steady progress and substantial profit in every department.

Ferro-Concrete Viaduct and Pier District Workmen's Dwellings at Dover.*

By W. C. HAWKE, ASSOC. INST. C.E., Borough Surveyor, Dover.

The Viaduct, which is authorised by the Dover Corporation Acts of 1901 and 1912, is being constructed in accordance with designs prepared by the borough engineer under the Hennebique system of ferro-concrete, and to details supplied by Messrs. L. G. Mouchel & Partners, Limited, of Victoria-street, Westminster, S.W. It will, when completed, be about 700 ft. in length, running from the junction of Beach-street and

bottom, narrowing to 4 in. at road level, with counterforts every 9 ft. 6 in., and tied together by ferro-concrete tie beams every 19 ft., resting on ferro-concrete slabs of widths varying with the rise of the road from 5 ft. 3 in. to 8 ft. 3 in. From that point the roadway is carried on arches of varying spans which average about 31 ft. The road will cross the Dover and Deal Railway by a ferro-concrete bowstring girder bridge of 65 ft. clear span. The arches are formed of four main longitudinal beams, each carried by an 18-in. column, the external beams being finished as elliptical arches for the sake of appearance.

A system of grouting the gravel, which overlies the chalk to within 2 ft. or 3 ft. of the surface, with a thick Portland-cement grout to form a monolithic mass in situ, was eminently successful, and on the gravel thus prepared the ferro-concrete slabs and tie beams of the retaining walls were laid.

The foundations of the columns are taken down to the solid chalk at a level of about 22 ft. below ground level, at the point at which work is now proceeding. The level of the solid chalk coincides almost exactly with ordnance datum. A considerable quantity of water was met with, especially during spring tides, but this was overcome sufficiently during neap tides by a 4-in. electrically driven centrifugal pump to carry out the work of excavation. The high water level of spring tides is about 10.35 ordnance datum. It was considered unnecessary to carry the ferro-concrete slabs and columns themselves down to the chalk; therefore, it was decided to bring up Portland cement columns, 5 ft. by 5 ft. square, 6 to 1, through the water to above rest-water level, upon which the ferro-concrete slabs were laid with the 18-in. columns springing from them.

Ferro-concrete piles are to be driven for the abutments of the bridge over the Dover and Deal Railway on the south side, owing to the closeness of the abutment to the permanent way.

The Viaduct is carried over the sewage pumping station by a ferro-concrete bowstring girder bridge of 70-ft. clear span. The existing pumps are to be replaced by electrically controlled centrifugal pumps.

The existing roof will be removed, and the underside of the Viaduct will form the new roof. From the pumping station the Viaduct falls with a grade of 1 in 38.5 to the junction of Elizabeth and Limekiln streets, being slightly bell-mouthed at the junction.

A spur of about 270 ft. in length will run from the Viaduct to the junction of Limekiln-street, Bulwark-street and Bulwark-hill. This spur will be of exactly similar design to the Viaduct, but will be 40 ft. in width, carrying a 30-ft. road without tramways, and two 5-ft. footpaths.

Detached from the Viaduct itself, but included in the same scheme, is a new bridge over the S.E. & C.R. main line.

This bridge, which will be 68 ft. clear span, will be of similar design to the two other large-span bridges detailed above, and will replace the existing "Oil Mills Bridge" carrying Limekiln-street.

All the ferro-concrete work is composed of spiral bars and 3 to 1 Portland cement concrete. When completed, and before taking over, the Viaduct will be subjected to a test of 15 tons axle load at 6-ft. centres, and a superficial live load of 210 lb. per super. foot.

PIER DISTRICT WORKMEN'S DWELLINGS

Under the Dover Corporation Act, 1912, a scheme was submitted to and approved by the Local Govern-



Front Elevation.



Back Elevation.

DOVER WORKMEN'S DWELLINGS.

Clarence-place to the junction of Limekiln-street and Elizabeth-street, and will carry a 30-ft. road, with double line of tramway and two 7 ft. 6 in. footpaths, making a total width between parapets of 45 ft.

For the first 152 ft. from the Beach-street end the road runs between retaining walls, 5 in. thick at

* Paper presented at the meeting of the Institution of Municipal and County Engineers at Dover on Saturday last.

ment Board for the rehousing of the working classes. The scheme included the widening of Beach, Bulwark, Limekilo and Oxenden streets, in which there are twenty-four, fourteen, twenty-five and seventeen houses respectively to be erected.

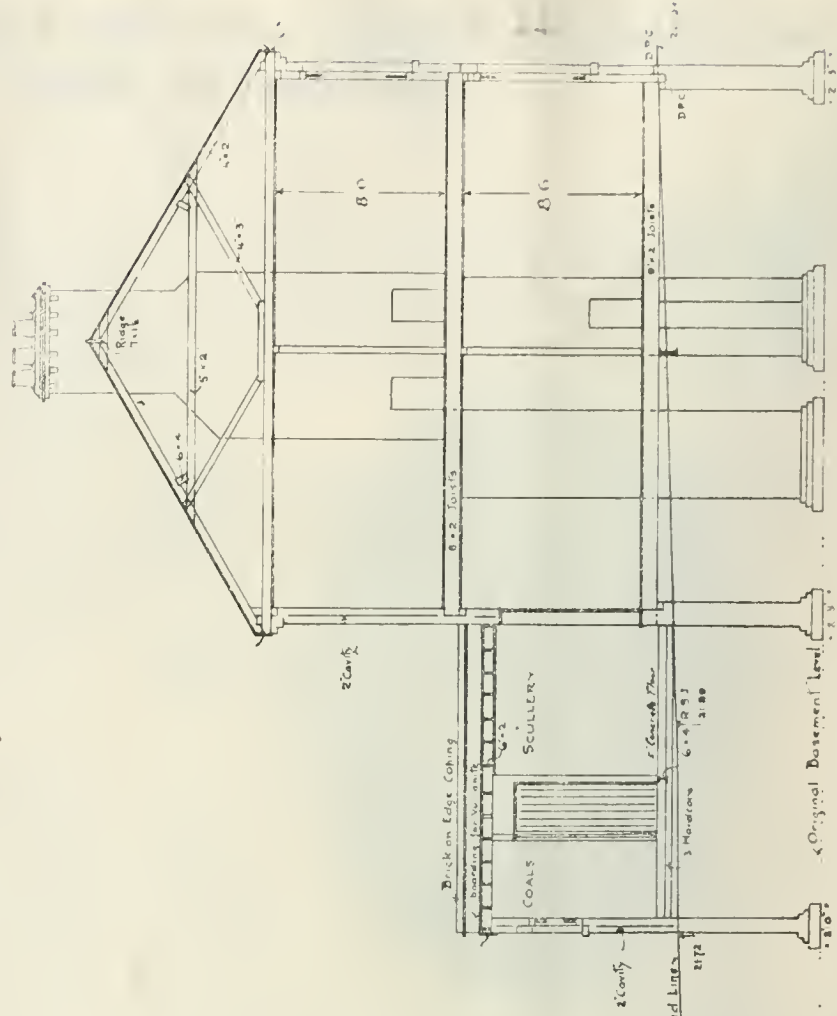
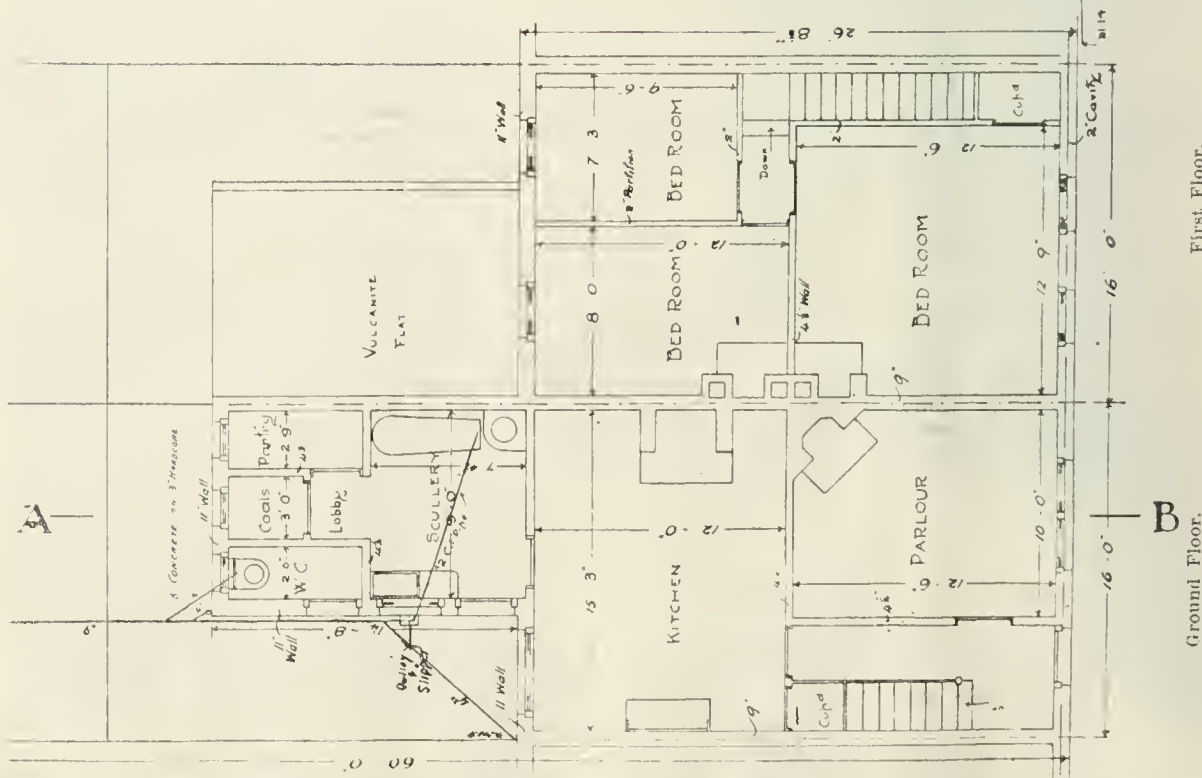
Two types of cottages were approved by the Local Government Board, one being a parlour cottage of six rooms, together with coals, larder, &c., and the other being a five-roomed cottage.

Up to the present contracts have been let for twelve of the six-roomed type, and four of these are now completed.

The contract price per cottage is £249. This sum may seem somewhat excessive at the first glance, but there are numerous difficulties in building these cottages which add to their expense. Nearly all the old houses which have been pulled down were basement houses, and it has been necessary to go down to 8 ft. for the foundations, since basement houses could not be allowed in such a waterlogged area; further, in some cases, where the ground surface is below high water ordinary spring tides, the existing road levels must be raised an average of at least 5 ft., and concrete-rafts will have to be constructed for foundations.

The cottages are brick built, with hollow walls having 2½-in. cavity, and have slated roofs, the ground floor and outbuildings having yellow stock facings, above which is a red-brick stringcourse at the first-floor level. The facing to the first floor is rough cast on Portland cement rendering.

The joinery is deal, painted three coats to approved tints.



Section A B.

DOVER WORKMEN'S DWELLINGS.

The Surveyor

And Municipal and County Engineer.

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and the internal walls are Portland cement rendered, and set in Sirapite.

The partitions on the first floor are "Acton" patent slab partitions, 2 in thick, finished with setting coat of Sirapite. The whole of the internal walls are distempered in approved tints with Hall's distemper.

The kitchen is fitted with a dresser, and the kitchen range has a Bailey's patent geyser boiler attached for supplying hot water to the bath and copper in the scullery.

The following are the sizes of the rooms:—

Ground floor—	
Parlour	10 ft. 0 in. by 12 ft. 6 in.
Kitchen	15 ft. 3 in. by 12 ft. 0 in.
Scullery	9 ft. 0 in. by 7 ft. 4 in.
Water-closet	6 ft. 3 in. by 2 ft. 6 in.
Pantry	6 ft. 3 in. by 2 ft. 9 in.
Coals	3 ft. 0 in. by 3 ft. 6 in.
First floor—	
Bedroom	12 ft. 9 in. by 12 ft. 6 in.
Bedroom	8 ft. 0 in. by 12 ft. 0 in.
Bedroom	7 ft. 3 in. by 9 ft. 6 in.

There are 15,290 cub ft. in a cottage, taken to the foundation level, giving a cost of 39d. per cubic foot.

If foundations were only 2 ft. below ground, the cubic contents would be 11,828 cub. ft., and the cost would have been £232, which is 47d. per cubic foot.

Motorists' £5,000,000 Road.—The *Daily Chronicle* states that proposals will come before Parliament next year for the construction of a new road for motor traffic between London and Brighton, at an estimated cost of about £5,000,000. The scheme is being put forward by the London, Brighton and South Coast Motor Road Syndicate, Limited. The proposed road will start from Robin Hood Gate, Richmond Park, which has been chosen as the most convenient point to the West End of London. The route, avoiding villages and towns as much as possible, skirts Sutton on the west and Horsham on the north-east. At Poyning's it will turn to the south-east into Brighton. Wherever the present main roads cross the new route over or under bridges will be built, so that the traffic on neither will be interfered with. The road itself will be 150 ft. wide, and it will be provided with three tracks—the first for fast motor traffic, the second for heavier vehicles, such as motor omnibuses and char-à-banc, and the third for motor cycles and cyclecars. Each track will be shut off from the other by a barrier, so that various speeds may be indulged in in safety. There will be facilities for leaving the tracks at certain points. There will be no speed limit.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act. ii., 2

ROAD TERMINOLOGY.

To the Editor of THE SURVEYOR.

SIR,—I am somewhat surprised to learn from Mr. Hutchinson's letter which appeared in your issue of the 8th inst. that he considers petroleum pitch can rightly be classified as bitumen.

Petroleum pitch is, of course, the residuum from the distillation of petroleum oil in the same way as coal-tar pitch is obtained from the distillation of tar, and there are many other such pitches of various kinds. Will Mr. Hutchinson therefore say if he considers coal-tar pitch and all other pitches should be classified as bitumen? If any one kind of pitch is entitled to the term bitumen, then the same must apply to all others. I cannot think, however, we have all these years been incorrectly describing and giving inferior titles to the materials referred to, but that is what Mr. Hutchinson's argument amounts to, and he also states that no harm will be done to either science, usage or commerce if petroleum pitch is classified as bitumen.

With regard to science—i.e., knowledge—Mr. D. A. Sutherland, F.I.C., F.C.S., one of the leading authorities on asphalt, bitumen, &c., says: "Bitumen is a natural product as opposed to bituminous products obtained as the result of destructive distillation, or by other artificial means. . . . The characteristics of native bitumen are not shared by artificial products, and the natural product, even at a higher price, is preferred to the artificial."

As to usage and commerce, does Mr. Hutchinson consider that manufacturers, merchants, and others, who for many years have only sold the genuine natural products as bitumen, would suffer no harm if any particular pitch or residuum is now sold under the title of bitumen? What is wrong, however, with the term petroleum pitch, a name which to my knowledge this material has been known under for more than forty years, and what is the object of robbing the term "bitumen" of its value and giving petroleum pitch a higher sounding title?

I shall be interested to hear Mr. Hutchinson's further views and explanations of these points.

I may say that I had no intention of using the publication of Mr. Hutchinson's letter as an opportunity to attack any particular committee, and it was Mr. Hutchinson himself who first referred to the Standardisation Committee.—Yours, &c.,

ENGINEER.

May 13, 1914.

We find that, owing to a printer's error, certain essential words were omitted from the final sentence of the third paragraph of Mr. John Hutchinson's letter on "Road Terminology" in last week's issue. The sentence in question should have read: "Bitumen is a generic term, which can be correctly applied to a number of substances which have certain physical properties in common."—Ed. SURVEYOR.

CALCUTTA IMPROVEMENT TRUST ENGINEERSHIP.

To the Editor of THE SURVEYOR.

SIR,—I believed fully that I had informed you, prior to your recent review of my report on Calcutta improvement, that I was no longer chief engineer to the trust, that the title was at present held by no one, and has been in abeyance from a date soon after I left Calcutta ill up to the present time.

I very much regret to find you did not receive the above information, the omission causing me to be mistakenly called chief engineer in your review, and I shall be indebted if you will give this letter full prominence in your next issue. It is only proper and fair to add that my late deputy engineer, Mr. James Maden, was, at the time of the *pro tem.* abolition of the post of chief engineer, created "trust engineer" with higher emolument, that he holds this post to-day, and is in full engineering charge of his department at Calcutta. Yours, &c.,

E. P. RICHARDS.

"Hawkhurst,"

Belle Vue-road,
Ware.

May 8, 1914.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. M. INST. C. E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

393. Surveying. In carrying out a large survey (by triangulation) describe in full detail how you would use the centre of a tower or shaft as a station on the ground without actually setting up the theodolite inside. Give proofs of any formulae involved. (T. W. P., *Berkhill-on-Sea.*)

395. Plumbing. A lead pipe has to convey both hot and cold water in horizontal and vertical directions. Show by a sketch how it should be fixed, and give reasons. (B. W., *Tadcaster.*)

396. Strength of Materials.—A horizontal uniform bar 18 in. long, is laid over two supports, each 4 in. from its ends. Find two points at which the bending moments are zero.

397. Testing Cement.—Explain in detail, giving sketches where necessary, how a sample of cement would be tested in practice. (B. W., *Tadcaster.*)

398. Road Construction.—Should the stones in a macadam road be all of one gauge, or are varying sizes preferable? Give reasons. (Junior.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

394. Building Inspection.—In carrying out the duties of a building inspector, state what are the common errors to be looked for when inspecting a deposited plan, and also the chief faults that are met with on the actual building. (T. W. P., *Berkhill-on-Sea.*)

Every local authority should possess a set of building by-laws, and when plans are deposited they should be looked over carefully to see if any contravention of the by-laws is on the plan, and if the by-laws are contravened the plan requires modification. The chief points to be looked for are usually:—

(1) That provision is made for sufficient open space.

(2) That sufficient and suitable closet and ashpit accommodation is provided, in accordance with by-laws.

(3) That sufficient drainage is provided, and that the drain does not pass under the building, except where unavoidable, and then the drain must be iron with caulked lead joints, and ventilated at both sides of the building.

(4) That the building does not encroach beyond the building line.

(5) That provision is made for sufficient light in every room.

(6) That the building is protected from dampness, by subsoil drainage, &c., where necessary.

In carrying out the inspection of the actual building the following points should be carefully noted:—

See that all materials are good. The bricks should be practically impervious, or the building will become damp. Drain pipes should also be impervious. Both these materials should be subjected to the absorption test.

The foundation should be taken to a sufficient depth to prevent uneven settlement (this depends on the nature of the ground).

All drains should be laid to a true gradient, and all connections made in manholes. They should be properly jointed, ventilated and trapped, and no waste pipe should discharge over a gully, but should be conducted thereto by open channel.

The damp-course should be carefully examined, as this is very important; it should be at least 6 in. above the adjoining ground, and below the first timbers.

Mortar should not be mixed with dirty water, as this causes the growth of vegetation in the wall.

All joints in brickwork should be made solid.

No unseasoned timber should be used.

All windows should be made to open, and where no chimney is provided in sleeping rooms, other means of ventilation should be provided.

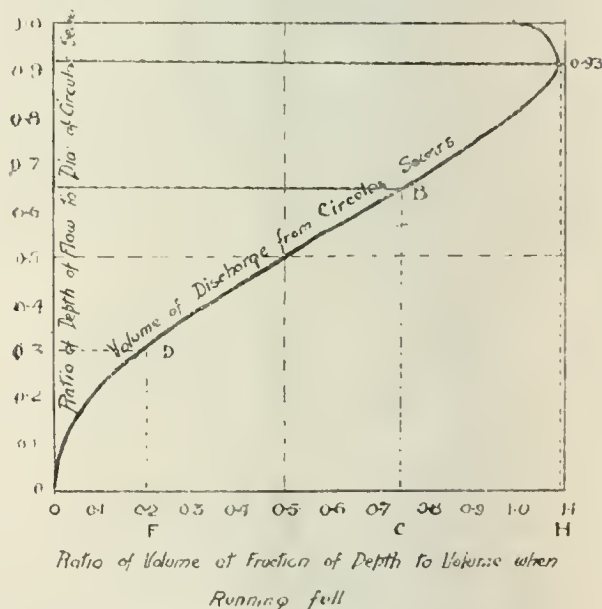
The whole site should be covered with concrete to exclude ground moisture.

The essentials of building are: Light, warmth, dryness, ventilation, and stability. (Sanitas)

NOTES.

We are indebted for the following to Mr. Oswald J. Wilkinson, ASSOC. M. INST. C. E., of Manchester:—

With further reference to the query No. 386 in your "Students' Section, I think it would be interesting to your younger readers to see how such a problem is easily solved in this office, in fixing the heights of the sills of this type of overflow weir, especially where



the height of a large number of sills has to be determined, as in the case of the revision of an existing scheme of sewers.

This discharge of a sewer of any regular cross-section varies as the depth of flow, provided that the other determining factors, such as gradient and material, remain constant. Hence, such a figure as that shown can be drawn for a circular section giving the ratio which the discharge at any given fraction of the full depth bears to the discharge when running full. It is, of course, well known that the maximum discharge occurs at a depth just short of the full value, but it is to be noted that the value of the fraction varies slightly with the formula used. Taking Kutter's formula, which is the one probably most commonly used by municipal engineers, the maximum discharge will be found to occur somewhere about 0.93 of the full depth, the reflex shape of the curve being due to the fact that above this depth the wetted perimeter increases at a greater rate than the sectional area of flow.

Let OE in the figure represent the depth of flow corresponding to the mean dry-weather flow when OG represents the discharge of the sewer running full. Then by drawing ED horizontally to cut the ratio curve at D, and drawing DF vertically to meet the base OH in F, OF will represent the fraction of the total discharge corresponding to OE.

Therefore OE will equal a certain fraction of OG,

and OF of OH—i.e., $OE = C_1 \times OG$, say, and $OF = C_2 \times OH$, and if OG and OH are taken as unity, then—

$$OE = C_1 \text{ and } OF = C_2.$$

Let it be desired that the overflow sill come in operation at m times the average dry-weather flow, then the fraction of the discharge when full, giving this discharge will be that represented by mC_2 .

Let this be represented by OC, then $OC = mC_2 \times OH$, or simply mC_2 .

Draw CB vertically and BA horizontally, and we obtain OA the fraction of the depth corresponding to the required level of sill, and OA will correspond to OE just as OC does to OF.

Let $OA = C_3 \times OG = C_3$, then, knowing C_2 from the diagram, we simply multiply it by the actual depth of the sewer in question and obtain the desired result.

The special point to be noted is that the actual discharge, the gradient, and the coefficient of friction need not enter into the problem after once calculating OE; but, on the other hand, this method is only applicable as long as OC and OA fall within the limits of the diagram.

If OC comes beyond OH, the sewer is surcharged, and the problem becomes an example of Bernouilli's theorem. Some research on this latter part of the problem has been undertaken by one of my assistants, and will probably be shortly available for publication.

WHAT IS A BUILDING?

This point was argued for some hours on Wednesday in an appeal of a Yorkshire landowner against the valuation of his farm, and the arbitrator reserved his decision. Mr. H. F. Dickens, K.C., contended that 11 miles of walls on this moorland farm were specially built for sheltering sheep, and were therefore "buildings" within the meaning of the Finance Act of 1909-10. He produced a dictionary in support, which gave an alternative definition of the term as "a fabric built for the shelter of animals." That covered his case completely, said Mr. Dickens. In one case he recollected that a railway embankment was held to be a building! Mr. Kingdom, on the other hand, insisted that walls were not "buildings," though he admitted they were "structures." Carriage builders "built" carriages, but were they "buildings" or "constructions"? He submitted that the normal meaning of the term was "a structure of the nature of a house built where it is to stand"—a definition he quoted from another dictionary.

The Drainage of Eye.—At their meeting on Wednesday the Eye Town Council had before them a report of Mr. E. J. Silcock, M.INST.C.E., on the drainage of the borough. Mr. Silcock suggested two new drains to take all the sewage, and that this should be purified before being allowed to pass into the river. He estimated that the cost would be £5,652, or a modified scheme with all new sewers would cost £6,382.

Beauty in Sewage Works.—A contributor to the *Erith Observer* writes: "Sewage disposal works cannot always be recommended as health or pleasure resorts, but those belonging to Erith are, in some respects, far more attractive than several I have visited. With the exception of a very slight aroma occasionally to be detected in the air, the surroundings remind one of those associated with well-kept reservoir grounds, and at the present time are looking particularly smart with the banks of spring flowers in full bloom. I believe there is one official who really believes that the sewage disposal works is the most healthy spot in the district, and points to the robustness of his staff in confirmation of that assertion. Whether that is so or not, the fact is evident that the low death-rate in the district is, to a great extent, due to the way in which the sanitary department is managed generally. As a proof of the excellence of the arrangements for the disposal of the effluent, it may be stated that, although the Port of London Authority officials make frequent unexpected visits to the works, and take away samples of the water which has passed the last treatment, so far no complaint has been received as to the condition of the liquid, which has the appearance of being pure water. I have even seen men interested in local government work test samples in the same way as tea is tested, and they have declared that it is quite tasteless. I am content to take their word for it."

ROYAL SANITARY INSTITUTE.

THE ANNUAL DINNER.

Members, associates, and guests assembled in goodly numbers at the annual dinner of the Royal Sanitary Institute, which took place at the Langham Hotel on Wednesday night. The chair was occupied by the Earl of Plymouth, president, and the company included Sir Henry Tanner, C.B. (chairman of the council), Sir Rickman J. Godlee (president of the Royal College of Surgeons), Mr. David Davies, M.P., Sir Aston Webb, C.B. (vice-president), Dr. A. News-holme, C.B. (medical officer, Local Government Board), Principal E. H. Griffiths (University of South Wales and Monmouthshire), Mr. H. Percy Boulnois (deputy chairman of the council), Major-General F. W. B. Landon, C.B. (director of transport and movement, War Office), Prof. A. Bostock Hill, Mr. Percy B. Tubbs (president of the Society of Architects), Surgeon-General Sir Lionel D. Spencer, K.C.B., M.R.C.S., Sir Shirley F. Murphy (vice-president), Sir Thomas Barlow (president of the Royal College of Physicians), Councillor R. W. Granville-Smith (Mayor of Westminster), Very Rev. W. R. Inge (Dean of St. Paul's), Dr. A. Wynter Blyth (registrar and vice-president), Mr. Baldwin Latham (vice-president), Dr. S. Rideal, Dr. Louis C. Parkes (chairman of the museum, library, and Education Committee), Mr. Henry Rolfe, Mr. John S. Brodie (borough engineer of Blackpool), Mr. Edwin Ralphs (hon. secretary Hong Kong Board of Examiners), Colonel J. Lane Nottter (treasurer), Mr. H. D. Searles-Wood (chairman of Congress, Referee, and Editing Committee), Mr. J. Osborne Smith (chairman of examiners), and Mr. E. White Wallis (secretary and director).

The toast of "The Houses of Parliament" having been proposed by the MAYOR OF WESTMINSTER,

Mr. DAVID DAVIES, M.P., in reply, said he was pleased to find that Parliament was taking a keener interest in the subjects which the institute was formed to promote. There had been a movement in favour of sanitation in all directions of late years, and public opinion was being translated, slowly, into Acts of Parliament. There had been passed the Public Health Grants Acts, the Housing Acts, and a host of minor Acts, good, bad, and indifferent, all dealing with the improvement of public health and kindred subjects. That showed that Parliament was beginning to interest itself in these matters, and he ventured to think that an institute like this could be of great assistance in moulding and advising upon measures which came before Parliament. Certainly there never had been a time when Parliament needed more the advice of scientific minds.

The EARL OF PLYMOUTH, in proposing "The Royal Sanitary Institute," said the days were long past since it was the idea that scientific investigation should be concerned exclusively with the cure of diseases, however important that was. It was now recognised generally that ultimately far more benefit would be derived by the population of the country by a strict inquiry into the prevention of diseases. It was very difficult to get what were now called minor measures passed through Parliament without the assistance of the Government, so he was afraid that there was still a rather heavy list of measures of considerable importance to public health which had been brought before the Houses of Parliament, but which had been withdrawn or dropped. He felt that the Royal Sanitary Institute was drawing public attention of a most valuable kind towards those measures which affected the welfare of the whole country, and which had not been lost sight of; and though they might not be able to point to measures that had been passed, they could be absolutely confident that the work of the institute was of the very greatest assistance, and that year by year the question of hygiene and sanitary improvement, which would affect the future of the country very largely, would be more and more brought into public notice, and the nation would insist that sufficient time should be given to their consideration. They were glad to recognise that in the Budget recently introduced a certain amount of money had been set apart to enable the local authorities to deal with greater freedom with the questions in which the members of the institute were interested. The institute had now branches in every one of the Dominions of the British Empire; it was getting increasing support from all the Dominions, and lately in British Columbia they had a considerable accession in the establishment of a new branch. They were making

satisfactory progress with the arrangements for Health Week at Blackpool, and in this connection they were pleased to welcome as guests that night the medical officer and the borough engineer of that town. The general financial state of the institute was now, he believed, satisfactory, and the total number of members and associates had increased during the year from 4,257 to 4,434. That showed that there was a constant increase taking place in the work of the institute, and that quiet, but valuable, work was surely drawing the appreciation of a wider public year by year.

Sir HENRY TANNER, chairman of the council, in reply, remarked that the institute was a pioneer, and had during its forty years of existence introduced, brought into operation, or promoted many of the agencies which had extended a knowledge of sanitary science. Lectures, qualifying examinations for sanitary inspectors and other servants of local bodies, the congress, exhibitions, and the museum for demonstrating purposes had all been brought into being by the institute. Their certificates were current in all the Colonies and in this country, and were accepted by local authorities, and the council welcomed the help and co-operation of all the bodies which had been more recently established. They had now got headquarters suitable for the staff and the functions they had to carry out, and the museum was beginning to be well arranged. The membership had never gone back from the time the institute started, and the finances showed a small margin of income over expenditure. The council were always pleased to render assistance in making Parliamentary Bills workable. These were considered by the Parliamentary Committee, and afterwards by the council, and either petitioned for or against as was considered fitting. They continued to promote Health Week because they thought it should not be dropped, and it had tended to great benefit in the towns in which it was held, as well as the country generally. Their membership comprised the triple professions of architecture, engineering, and medicine, and they found that what might be termed this three-legged basis acted for stability. The institute, in fact, exercised a very potent influence in the promotion of public health, and if they did that, and did it thoroughly, they considered they were carrying out the objects they had in view.

Mr. H. PERCY BOULNOIS submitted "The Visitors," and said that public dinners were of various kinds. The object of the political dinner was to secure votes and patronage, and at the philanthropic dinner the guests were asked to put their hands in their pockets for subscriptions. The object of this dinner was really to advertise the Royal Sanitary Institute. They wished to impress their activities upon their guests and the public, and he might remind them that their activities, in addition to the congress, included the Parkes Museum. Mr. Wells had stated the museum dealt with "interiorities." There was more to see than these, however, and it was a grievous pity the public did not take more advantage of it. The institute kept an eye upon legislation, and the suggestion that in this respect it should act as a sort of clearing-house was well worthy of being carried out. The membership comprised laymen, churchmen, a great many women, and people of all descriptions, and their operations were more widespread than those of a purely scientific institution. Mr. Boulnois commended Health Week to the consideration of the guests, and remarked that Sir Thomas Barlow (whose name he associated with the toast) was taking the keenest interest in the movement. He also coupled the name of Principal Griffiths with the toast.

Sir THOMAS BARLOW, in a brief response, observed that medical men had a weakness for a concrete basis for their work, and they recognised that in the Parkes Museum the Royal Sanitary Institute had established their work on a sound footing. He was very pleased with the quiet, steady, and fundamentally sound policy they pursued.

Principal GRIFFITHS, in his reply, emphasised the value of teaching hygiene in elementary schools, and added that it was due to the work of the Royal Sanitary Institute that such instruction was beginning to bear fruit.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bournemouth T.C. (May 8th. Mr. H. Shelford Bidwell).—£60,000 for the erection of a pavilion on the Belle Vue site near the pier.—The borough engineer, Mr. F. W. Lacey, who prepared the scheme, stated that the variations in the plans from the original scheme had been made to meet the Local Government Board's requirements. There was an upper and a lower ground floor. On the upper ground floor was the great hall, the lounge, tea and refreshment rooms. The promenade could be enclosed in winter. It overlooked both the sea and the gardens, the views extending over three-parts of a circle. The outer structure would be of brick, covered with cement.

Castle Ward (Northumberland) R.D.C. (May 5th. Mr. H. O. Stanford).—£550, contribution to a joint scheme of sewerage and sewage disposal for Ponteland, Darras Hall, and Little Callerton.—It was stated that the total estimated cost of the scheme was £1,750.

Earby U.D.C. (May 7th. Mr. W. O. E. Meade-King).—£1,310 for the provision of a depot, £140 for widening Victoria-road, £110 for a public urinal in Victoria-road, and £110 for a public urinal at Kelbrook.—The clerk, Mr. J. C. Waddington, explained that the land required for these various purposes belonged to the council. The surveyor, Mr. J. E. Aldersley, gave details of the proposed works. The depot included stabling, cart sheds, and a storehouse for tools and cement. A portion of the yard was to be set apart for the purpose of a fire station. The widening of Victoria-road included the widening of Seal bridge to 36 ft. The proposed urinals would be lined with glazed bricks, and be of up-to-date construction.

Foleshill R.D.C. (May 8th. Mr. F. H. Tulloch).—£1,067 for street work at Bedworth and Foleshill.—Mr. A. P. Oswin, clerk, gave particulars of the proposed expenditure, and there was no opposition to the scheme.

Mansfield T.C. (May 6th. Mr. F. H. Tulloch).—£1,200 for a contribution towards the cost of the construction of a new road from Ratcliffe-gate and Littleworth; £5,700 for street improvements in Albert-street, Belvedere-street, Newgate-lane, Nottingham-road, and Ratcliffe-gate; and £1,600 for works of sewerage.—With respect to the proposed new road from Ratcliffe-gate, the town clerk, Mr. J. H. White, stated that the Mansfield Railway Company proposed to make a private approach road, 28 ft. wide, to their new station. The borough surveyor (Mr. T. P. Collinge), believing it would be a great advantage to have a through public road of full width, brought the matter before the Highways Committee, who entered into negotiations with the company, and ultimately it was arranged to pay £1,200 towards the cost of the road, which was to be made to the satisfaction of the borough surveyor and taken over as a public road. Evidence was also given with respect to the proposed street improvements, and the sewage disposal project.

Rotherham R.D.C. (May 6th. Mr. R. H. Bicknell).—£967 for sewerage works.—It was stated that the proposed work had become necessary owing to the development of the land on the south-west of Swallow Nest, and to the north of the Beighton colliery. The inspector suggested that the work proposed in connection with the Beighton-lane sewer should stand over to await further development, and that a length of sewer should be laid in the Sheffield-road only. He would be prepared to advise the Local Government Board to sanction a loan on that understanding.

Sleaford R.D.C. (May 7th. Mr. R. H. Bicknell).—£1,110 for a supply of water to South Kyme Fens.—Mr. C. Clarke, chairman of the parish council, protested against the cost of laying the mains being borne by the parish, but admitted that the Fen district was greatly in need of pure water. Mr. A. Challand, a large ratepayer in the Fen, stated that there was a great necessity for drinking water in the Fens, many people having to obtain their supplies from shallow wells or dykes. The inspector called the attention of the Sleaford Rural Council to a great need for hydrants opposite large farmsteads in that district. He said it was most annoying in cases of fires to know there was an ample supply of

water in the mains yet not available owing to the absence of hydrants. Mr. W. B. Marsden, the engineer, replied that this matter was under consideration. The inspector suggested that as the ends of the proposed mains would reach within 200 yds. of those now being laid in Heckington Fens, it would be advisable to connect the two.

Sutton-in-Ashfield U.D.C. (May 6th. Mr. A. G. Drury).—£20,000 for sewage disposal works, and £2,895 for private street improvements.—Mr. H. P. Raikes (Messrs. Willeox & Raikes, Birmingham) stated that the new scheme provided for the extension of the present sewage disposal works by additional tanks, also a large area of bacterial beds for the purification of the sewage, and for taking the effluent into the reservoir, but the pollution would be previously removed. The present works, however efficiently managed, were not sufficiently large to deal with the needs of the town. The new works would be large enough for a population of 30,000. Particulars having been furnished by the surveyor, Mr. W. Burn, and Dr. Handford, the inspector visited the present outfall works. The proposal to make up twelve new streets under the Private Street Works Act was unopposed.

APPLICATIONS FOR LOANS.

Bournemouth T.C.—£3,500 for the purchase of land for police barracks, and £650 for sewerage works.

Chester R.D.C.—£6,400 for sewerage works.

Coalville U.D.C.—£1,450 for street widening.

Dartford U.D.C.—£1,400 for a chapel at Watling Street cemetery.

Halesowen U.D.C.—£257 for sewerage works.

Harrogate T.C.—£500, excess expenditure in connection with the Roundhill reservoir, and £6,200 for the provision of a larger stage at the Kursaal.

Herts C.C.—£420 for alterations to the constabulary buildings at Hatfield.

Lewes T.C.—£2,800 for a council school.

Market Drayton R.D.C.—£175 for drainage works.

Merthyr T.C.—£260 for a bandstand.

Middleton T.C.—£7,160 for extensions to the electricity works, and £1,185 for sewerage works.

Northants C.C.—£4,250 for the extension of the Towcester grammar school, and £7,226 for extensions to sessions court and police quarters.

Pontefract T.C.—£1,150 for a street improvement.

Runcorn U.D.C.—£977 for road improvement.

Southampton T.C.—£2,500 for a branch library.

West Ashford R.D.C.—£3,300 for a water supply scheme.

West Ham T.C.—£10,275 for the purchase of land for a recreation ground.

LOANS SANCTIONED.

Bridlington T.C.—£1,300 for road widening.

Brighton T.C.—£1,500 for electricity works extension (for a period of twenty years).

Buckfastleigh U.D.C.—£2,701 for the erection of thirteen houses, and £450 for the purchase of the site.

Chingford U.D.C.—£800 for road improvement.

Dartford U.D.C.—£364 for an electrical system of fire alarms, and £5,550 for paving works.

Dewsbury T.C.—£2,650 for the purchase of land for sewage disposal purposes.

Hampstead B.C.—£1,500 for extension of an open space.

Harrogate T.C.—£8,000 (to be repaid in fifty years) for the erection of a school.

Hemel Hempstead R.D.C.—£650 for a sewerage scheme.

Keswick U.D.C.—£600 for a common lodging-house.

Leyburn R.D.C.—£220 for water supply works.

March U.D.C.—£2,900 for a housing scheme.

Penybont R.D.C.—£1,520 for water supply works.

Swansea T.C.—£11,000 for roads and sewers.

Tavistock U.D.C.—£750 for water mains.

Tunbridge Wells T.C.—£2,700 for the purposes of the cemetery.

Wakefield T.C.—£17,813 for sewerage works.

Woolwich B.C.—£10,000 for the electricity undertaking.

FORTHCOMING INQUIRIES.

	MAY.	£
18.— Heckmondwike. For the provision of a disinfecting station (Dr. F. Seymour)...		150
19.— Ashby-de-la-Zouch. For the provision of a hospital (Dr. W. W. E. Fletcher)		13,600
19.— Blackpool. For street improvement (Mr. F. H. Tulloch)		6,816
19.— Chelmsford. For the provision of pumping plant and the erection of a cottage (Mr. A. W. Brightmore)		4,300
19.— Dorking. For the purchase of a depot (Mr. Edgar Dudley)		800
19.— East Cowes. For water supply and sewerage (Mr. P. M. Crosthwaite)		1,925
19.— Litherland. For the provision of a public convenience and street works (Mr. W. O. E. Meade-King)		160
19.— Northallerton. For the construction of a bridge (Mr. M. K. North)		—
19.— Plymstock. For sewage disposal works (Mr. F. O. Stanford)		3,510
19.— Wigton. For street improvement (Mr. R. H. Bicknell)		550
20.— Bolton. For street improvement (Mr. W. O. E. Meade-King)		23,361
20.— Brighton. For the purposes of a depot and recreation ground (Mr. Edgar Dudley)		1,025
20.— Chelmsford. For the purposes of water supply (Mr. A. W. Brightmore)		2,000
20.— Cramlington. For the provision of a depot (Mr. R. H. Bicknell)		750
20.— Middlesbrough. For street improvement (Mr. M. K. North)		3,422
20.— Plymouth. For works of sewerage (Mr. F. O. Stanford)		700
20.— Todmorden. For the purchase of a motor fire engine (Mr. F. H. Tulloch)		1,650
20.— Ventnor. For alterations to public conveniences (Mr. P. M. Crosthwaite)...		160
20.— Wallsend. For works of sewerage (Mr. R. H. Bicknell)		2,434
21.— Bootle. For the purposes of street improvement and electricity (Mr. T. C. Ekin)		23,763
21.— Crompton. For the purposes of a park and dust destructor (Mr. F. H. Tulloch)		5,512
21.— Hornsea. For street improvement (Mr. M. K. North)		1,700
21.— Manchester. For the erection of baths and washhouses (Mr. W. O. E. Meade-King)		16,870
21.— Rochford. For the provision of workmen's dwellings (Mr. H. S. Stewart)		750
21.— Torquay. For the purposes of bridge widening (Mr. F. O. Stanford)		565
22.— Brackley. For the provision of workmen's dwellings (Mr. H. S. Stewart)...		2,200
22.— Connah's Quay. For the provision of offices and public conveniences (Mr. W. O. E. Meade-King)		6,170

TOWN PLANNING.

19.— Newport. (Mr. George L. Pepler)	—
28.— Nelson. (Mr. George L. Pepler)...	—

Manchester Corporation Bill.—The Manchester Corporation Bill was passed by the House of Lords Committee on Monday and ordered for third reading. If the Bill meets with no further opposition the corporation will have obtained powers covering a variety of municipal activities. Among these are: An electricity generating station at Davyhulme, to cost £1,200,000; street works and improvements, including the widening of Cross-street; extension of time for the construction of tramways and power to provide and run omnibuses.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Bradford £57,000, East Riding £10,935, Newcastle-on-Tyne £300,000; housing and town planning—Aberdare, Blackrock, Normanton; roads and materials—East Sussex, West Riding £20,400; sewerage and sewage disposal—Burnham; water, gas and electricity—Bolton, Gwyrfa. Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Bournemouth T.C.—The borough engineer, Mr. F. W. Lacey, has received instructions to complete the negotiations for the purchase of the freehold property adjoining the law courts, at £3,500, for the purpose of police barracks.

Bradford T.C.—It is proposed to effect alterations at the Sunbridge-road destructor, at an estimated cost of £3,000. The Tramways Committee also recommend extensions at the workshops at Thornbury depot, which are estimated to cost £54,000.

Durham C.C.—The tender of Mr. G. Mauchlen, of Newcastle-on-Tyne, at £450, has been accepted for the widening of Browney Burn bridge.

East Riding C.C.—Plans are being prepared for an isolation hospital at Driffield, the cost of which is estimated at £10,935.

Edmonton U.D.C.—Alterations are to be carried out at No. 1 fire station, at an estimated cost of £220.

Ely U.D.C.—The council have accepted the offer of Mr. W. Cutlack to provide an isolation hospital to contain twelve beds.

Herts C.C.—New education offices are to be erected at Hertford, at an estimated cost of £3,634.

Kendal T.C.—The tender of Messrs. J. Steel & Co., at £1,858, has been accepted for the general concrete work at the extensions to the sewage disposal works.

Lindsey (Lincs) C.C.—It has been decided to build a school at Crosby for 500 scholars.

Newcastle-upon-Tyne T.C.—Designs are being invited for a new town hall in Eldon-square. The scheme, which means the clearing away of the buildings on the north side of the square right through to Prudhoe-street, furnishes a space of 6,795 sq. yds. on which to erect a town hall, facing an ornamental plot recently laid out. The plan also admits of side streets, 50 ft. in width, from Eldon-square to Prudhoe-street. A town hall, to accommodate about 3,500 persons, and the municipal offices are arranged for, and the estimated total cost is said to be about £300,000.

Perth T.C.—The burgh surveyor has been authorised to obtain tenders for shelters on the North Inch.

Sligo C.C.—A proposal has been adopted for the purchase of Cloonamahan House, situate $1\frac{1}{2}$ miles from Collooney, co. Sligo, at a sum of £1,400, £800 to be expended on repairs and alterations to render it thoroughly suitable for the treatment of tuberculosis patients.

Warwickshire C.C.—Extensions are to be carried out at the Nuneaton high school for girls, at an estimated cost of £6,000.

Wolverhampton T.C.—The council on Monday agreed to the erection of ten firemen's houses, at an estimated cost of £3,000.

HOUSING AND TOWN PLANNING.

Aberdare U.D.C.—In view of the continued dearth of housing accommodation and the urgent duty of the council to close insanitary dwellings, the council on Monday decided to erect 200 houses, to be distributed among the various wards of the district.

Blackrock (Co. Dublin) U.D.C.—Plans have been adopted for the erection of thirty-one houses in Brookfield, with baths and washhouses, and twenty-four in Booterstown. The surveyor, Mr. Powell, estimates the cost of the scheme at £26,734.

Brixham U.D.C.—The Housing Committee are considering plans for the erection of twelve workmen's

houses, estimated to cost £210 each, which have been prepared by the surveyor, Mr. J. Silley.

Chard R.D.C.—The council have instructed their architect to complete his plans for the erection of four working-class dwellings at Combe St. Nicholas, and to invite tenders for their erection.

Gwyrfa R.D.C.—The council had submitted to them on Saturday a draft scheme by their surveyor, Mr. J. Thomas, for the erection of thirty-six workmen's dwellings in the villages of Ebenezer and Clwybont. The sites recommended comprise $2\frac{1}{2}$ acres, and are expected to cost not more than £90, including legal expenses. The total capital charges are estimated at £6,760, and the nett rents £368 a year, leaving a small balance to be paid out of the rates. It was resolved, in the first instance, to apply formally to the Local Government Board for the necessary loan, it being understood that the final selection of sites would come up at a future meeting.

Normanton U.D.C.—Provisional approval has been given to tenders for building seventy-eight houses in Dalefield, at an estimated cost of £17,000.

Renfrew T.C.—The plans of housing schemes on the north side of High-street and Porterfield are under consideration, and a decision has been reached to erect public baths on a site adjoining the police courthouse.

Taunton T.C.—In the course of the last meeting it was reported by the Health Committee that, having had under consideration the question of the provision of a further number of workmen's dwellings, they considered it desirable that the necessary steps should now be taken for the erection of an additional block of houses in String-lane, in continuance of the scheme prepared by the borough surveyor, Mr. D. Edwards. The council was therefore recommended to authorise the committee to advertise for tenders for the erection of a further batch of twelve houses similar to the existing houses previously erected by the council. After discussion, however, the recommendation was referred back to the committee on the ground that such dwellings were required in the West and North Wards.

Truro R.D.C.—It has been decided to build workmen's dwellings at St. Just and Gerrans in the south of the district, and at Kea and Feock in the north.

REFUSE COLLECTION AND DISPOSAL.

St. Andrews T.C.—The council have decided to erect a patent lightning dust manipulator, as manufactured by the Patent Lightning Crusher Company, Limited, of 14A Rosebery-avenue, London, E.C., for the conversion of their house refuse into manure.

Widnes T.C.—The Health Committee recommend the provision of a refuse destructor and tar-macadam plant, at a cost of £6,000. The cost of maintenance was estimated at £720 a year, but against this had to be set off the value of 2,000 tons of macadam, sale of mortar, scrap iron and glass.

ROADS AND MATERIALS.

Aberystwyth T.C.—It is proposed to effect an improvement at the main entrance to the town, and as a preliminary land and buildings have been purchased at a cost of £500.

Banff C.C.—It has been agreed to apply for a grant from the Road Board for the road from the Don to Grantown-on-Spey—the grant to be postponed until the present demands for the upper and lower district are dealt with.

Bournemouth T.C.—The tender of Messrs. William Griffiths & Co., at £3,835, has been accepted for laying wood paving in Charminster-road and Wimborne-road, and the borough engineer, Mr. F. W. Lacey, has received instructions to proceed with the work at once.

Brighton T.C.—The borough surveyor, Mr. H. Tillstone, has received instructions to report upon suggested improvements to the western esplanade by the laying out of greenswards with flower beds and screen seats, extending from the western boundary to the West Pier, and also a proposition that the bandstand should be removed.—It has been agreed to purchase for £7,900 property in Western-road for

street improvement, and property in Marlborough-street, at £1,470, for a similar purpose.

Cardiff T.C.—Acting upon a report by the city engineer, Mr. W. Harpur, the council have decided to pave Kingsway and Park-place with creosoted wood on concrete foundations 8 in. thick.—The council on Monday agreed to pay £1,000 for the purchase of 154 sq. yds. of land for the widening of East Canal wharf.

East Sussex C.C.—The county surveyor, Mr. F. J. Wood, has been authorised to purchase four convertible steam rollers and traction engines, at a cost not exceeding £4,566, and the council have accepted the Road Board's offer to advance on loan the purchase money repayable by five equal annual instalments.

Lancashire C.C.—There was a new departure in the recommendation of the Main Roads and Bridges Committee, presented last week, to treat certain main roads under direct control in the Hundred of Lonsdale, Amounderness, Blackburn, Leyland, and West Derby with calcium chloride in front of abutting property, where, owing to gradients, it was considered inadvisable to tar-spray. But the committee, it was stated, were not in love with the calcium chloride treatment. With respect to the Preston, Chorley, and Bolton main road, the Road Board, it was announced, was prepared to grant £9,772 towards the reconstruction with granite setts of this road at Adlington, for which a loan had been authorised of £45,000. It was stated that the committee had decided to establish a tar-macadam factory at Carnforth, and that the committee had no intention to go into the market to sell any of the macadam which they proposed to make. The factory was simply for the economical supply of a great part, at any rate, of the committee's own requirements.

Lewes T.C.—A horse-drawn automatic pressure tar-spraying machine is to be purchased for £89.

Totnes T.C.—The Road Board have sanctioned a grant of £1,000 towards the cost of widening High-street, and it is hoped also to obtain a substantial contribution from the county council.

West Riding C.C. The Highways Committee propose to expend £20,400 upon tar-paving, an addition of £10,000 upon the estimate for this work which was approved in January. The committee are also seeking to induce the Road Board to increase their grant beyond the limit they had laid down one-third of the expenditure.

Worcester T.C.—The Streets Committee have received authority to proceed with the improvement of St. Martin's Gate, at an estimated cost of £1,200.

SEWERAGE AND SEWAGE DISPOSAL.

Bournemouth T.C.—The tender of Messrs. Tom Wilkinson & Co., at £6,663, has been accepted for the extension of the 9-in., 18-in., and 36-in. outfalls at Alum Chine. It has been decided to construct the Parkwood-road relief sewer, at an estimated cost of £650.

Burnham (Essex) U.D.C.—The question of sewage disposal is under consideration, the surveyor, Mr. J. Cook, accompanied by councillors, being engaged in visiting various sewage works with a view to deciding the best system to adopt.

Cannock U.D.C.—The surveyor, Mr. R. Blanchard, has received instructions to obtain tenders for sewer extension in several streets.

Ottery St. Mary U.D.C.—The council have approved the plans of the surveyor, Mr. H. Finister, for the proposed grit chamber and pumping engine at the sewage works, it being stated that the new equipment would effect a saving of £130 a year.

WATER, GAS, AND ELECTRICITY.

Birmingham T.C. Owing to increased cost of fuel and other circumstances, the Birmingham gas undertaking will yield £12,000 less in relief of the rates this year than last, the sum available from current profits being £65,584. The expenditure has advanced by £100,000, but this is partly accounted for by an increased demand.

Bolton T.C.—The Waterworks Committee have requested the waterworks engineer to prepare a report on the desirability of proceeding with the construction of additional works in the near future.

Bradford T.C. The council are recommended by the Gas Committee to instal Woodhall-Duckham

vertical retorts at the Birkshall gasworks, at an estimated cost of £68,700.

Chelmsford T.C.—The tender of Messrs. F. Smith & Son, Grimsby, at £722, has been accepted for sinking a 14-in. borehole at Admiral's Park.

Coalville U.D.C.—It is proposed to carry out a gas main extension, at an estimated cost of £170.

Conway R.D.C.—The Local Government Board have been asked to approve a water supply scheme for Penrhynside.

Gwyrfai R.D.C. Messrs. Berrington, Son & Watney, Wolverhampton, have prepared a report dealing with the water supply, and offering details of two alternative schemes. One was a proposal to obtain the supply from Marchlyn Bach, a lake with an area of 9½ acres, the storage capacity of which might, at some future time, be increased by about 6,000,000 gallons at a comparatively small cost. They thought it possible to obtain an ample and pure supply of water from this source, without prejudicially affecting riparian owners, for about £3,250, and should it become necessary to construct a dam to meet any objection on the part of the owners, they estimated that it could be provided for an additional £800 or £1,000. The alternative scheme consisted of utilising several springs which rise in the face of the mountain some distance below the lake, and the cost of this they estimated at £3,800.

Hampstead B.C. Additional plant costing £7,600 is to be installed at the electric lighting station.

Loughborough R.D.C.—Mr. F. W. Hodson, engineer, has submitted alternative schemes for a supply of water to Hathers.

Walsall T.C.—Details of the new borough electricity scheme are given in a report of the Walsall Electricity Committee issued on Saturday. This states that it is proposed to erect a power station with a nominal capacity of 9,000 kilowatts in three units of 3,000 kilowatts each, the first to be installed by June, 1915, the second by August, 1916, and the third when required, having regard to the development of the undertaking. The cost of the new power station, when developed to its total ultimate capacity, is estimated by the consulting engineer (Mr. E. M. Lacey) at approximately £80,000, exclusive of £850, the cost of the land, but the expenditure necessary during the next three years to complete the first two units would be £59,000. In addition to the actual cost of the new power station, a system of high tension mains would be required, the approximate total cost of which is estimated at £15,000. The committee have decided to recommend the approval of the plans and estimates submitted to them, and of the borrowing at the present time of £71,850, which will equip the works up to a capacity of 6,000 kilowatts.

MISCELLANEOUS.

Brighton T.C.—Serious inroads of the sea threaten the cliffs and defensive works to the east of the town. The engineers point out that the protective agencies employed cannot be expected to fulfil their purpose until sufficient quantities of sand and shingle have accumulated, and as the process is abnormally slow, it is recommended that beach should be obtained where dredging operations are being carried out, and deposited on the foreshore, as was done successfully at Hove some years ago.

Bristol T.C. Tenders of Messrs. Dennis Brothers, Guildford, at £2,310, have been accepted for the supply of two motor fire engines and a motor van.

East Sussex C.C.—A sum not exceeding £100 is to be expended upon obtaining from Messrs. Coode, Matthews, FitzMaurice & Wilson a report upon the sea defences between Brighton and Newhaven. The salary of the chief assistant to the county surveyor is to be increased from £190 a year to £250 on and from July 11th.

Exmouth U.D.C.—The tender of Messrs. Merryweather, at £1,060, has been accepted for a petrol motor fire engine.

Yarmouth T.C. The tender of Messrs. Aveling & Porter, Rochester, has been accepted for a steam wagon and tractor plant at £499 10s.

Keighley's New Reservoir. At a recent meeting of the Keighley Town Council, the tender of Messrs. Morrison & Mason, Glasgow, at £159,027, was accepted for the construction of the new Lower Laithe reservoir, with filter-beds.

PERSONAL.

Mr. McDougal, burgh surveyor and inspector of Arbroath, has had his salary raised from £150 to £180 a year.

Mr. G. A. Millard, surveyor to the Axminster Rural District Council, has been voted an increased salary of £50 to enable him to provide and maintain a motor cycle.

Mr. J. Stanley Sawdon, ASSOC.M.INST.C.E., assistant borough surveyor of Margate, has been presented with a marble clock and Wedgwood hot-water jug by the borough officials and staff on the occasion of his marriage.

Mr. Fred. J. Dixon was, by a regrettable slip, described as borough engineer of Ashton-under-Lyne in our issue of May 1st. This office is, of course, held by Mr. J. T. Earnshaw, ASSOC.M.INST.C.E., while Mr. Dixon is water engineer.

Mr. Joseph Hall, M.INST.C.E., who for nine years prior to 1890 was surveyor to the Torquay Local Board, and subsequently for twelve years borough surveyor of Cheltenham, died, we regret to state, at Bombay on the 7th inst. He left Cheltenham to take up the post of executive engineer in the city of Bombay, and was honorary secretary of the Indian District of the Institution of Municipal and County Engineers. Mr. Hall was about sixty-three years of age. He leaves a widow and four children.

Mr. N. McK. Barron, water engineer to the Lincoln City Council, having resigned, the council have decided to appoint Mr. Charles Horobin interim engineer at a salary at the rate of £220 a year, and that a consultant engineer, experienced in distribution work, be engaged to report to the council each quarter during the period Mr. Horobin holds office as such engineer. It has been further decided to advertise for applications for the appointment of a temporary assistant engineer for a period of twelve months at a salary of £125.

Mr. J. Cracroft Haller, M.R.SAN.I., of Carlton, Notts, has been provisionally appointed chief assistant engineer and surveyor to the Notts County Council, in order to relieve Mr. E. Purnell Hooley, M.INST.C.E.,



of some of the many onerous duties attached to the office of engineer and surveyor for such a large and growing industrial district. Mr. Haller, since May 5, 1904, has held the position of engineer and surveyor to the Carlton (Notts) Urban District Council, and has superintended and carried out a number of important works rendered necessary by the increase of population from 13,000 to 17,500. The outlay on special works alone during the ten years amounted to over £40,000, and included the erection of a free library and fire station, and the construction of thirty-four new streets, and 9 miles of sewers. Three recreation grounds have also been opened, and the cemetery extended; while 1,600 houses have been erected since 1904. Mr. Haller was articled to his father, Mr. J. C. Haller, ASSOC.M.INST.C.E., at Dew-

bury, and prior to taking up his duties at Carlton was engineer and surveyor at Guiseley, Yorks, for 3½ years. He will take up his position under the Notts County Council on June 1st.—The salary of Mr. Lamb, Mr. Hooley's chief general assistant, has been increased by £50, to £300 per annum.

In the person of Mr. Robert Johnston there has recently passed away one who must have been well known to many of our readers, inasmuch as he was the first to suggest to road engineers the use of basalt stone as a suitable material for road work. That was about fifteen years ago, and Mr. Johnston's supply was at first obtained from the Rhine districts. As, however, he was himself of Ulster extraction, it is not surprising that a few years later he was found devoting his energies to the commercial development of a source of supply much nearer home, and in Ulster itself. It was about five years ago that he founded the Giant's Causeway Columnar Basalt Company, Limited, whose quarries are situated in County Antrim, with an office at Portrush, and whose registered office is in Manchester. We are informed that he afterwards parted with his interest in that company, and that at the time of his death he was interested in an asphalt business in Cork, having the concession for Ireland from one of the Trinidad Lake asphalt companies. Mr. Johnston died at his home in Portrush on the 6th instant, and was buried on Saturday last at Bromborough, Cheshire. He was seventy-one years of age.

Road Maintenance in Axminster Rural District.—The surveyor to the Axminster Rural District Council, Mr. G. A. Millard, presented recently a comparative statement of the cost of main and district road maintenance under contract and direct labour, showing a balance of about £100 in one year in favour of the former system. The chairman (the Rev. A. W. Parke) expressed the opinion that the statement was very satisfactory. Although the direct-labour system had cost a little more than the contract system, he thought that the expense had been warranted in view of the improved condition of the roads. Mr. Perham: They are more than £100 better.

FOR OTHER ADVERTISEMENTS

See End of Paper.

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

RECONSTRUCTION OF LANGFORD BRIDGE, MALDON.

Tenders are invited from Contractors licensed to execute Ferro-concrete Work on the Hennebique system for the Erection of a New Bridge over the river Blackwater, in the parish of Langford, near Maldon.

Drawings may be seen, and Specifications obtained, on and after Saturday, May 16th, 1914, upon application to the County Surveyor of Essex at Chelmsford.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, sealed and endorsed "Langford Bridge, Maldon," to be delivered to this Office not later than the first post on Monday, June 1st, 1914.

PERCY J. SHELDON, M.INST.C.E.,
County Surveyor.

Chelmsford.

May 14, 1914.

(1,617)

BOROUGH OF MALDON.

Tenders are invited for the Supply and Delivery of Broken Granite and Flints.

Also for Steam Rolling for the year ending March 31, 1915.

Forms of Tender and all particulars may be obtained on application to the Borough Engineer, Mr. T. R. Swales, M.INST.C.E.I., Municipal Offices.

Tenders, endorsed "Tenders for Materials," or "Tender for Steam Rolling," are to be delivered to the undersigned on or before Thursday, June 4, 1914.

The Town Council does not bind itself to accept the lowest or any Tender.

F. H. BRIGHT,
Town Clerk.

Municipal Offices,
Maldon.

May 11, 1914.

(1,616)

Institution of Municipal Engineers.

EASTERN AND NORTH-EASTERN DISTRICT MEETING.

An interesting time was spent in Finedon and Kettering (Northants) by members of the Eastern and North-Eastern Districts of the Institution of Municipal Engineers on Thursday of last week. Those present included the following: Messrs. Chas. Mayfield, district chairman, W. T. Unwin (March), G. F. Bearn (Finedon), G. E. Mathews (Spalding), W. R. Bailey (Holbeach), Selden Hipwell (Chatteris), T. F. Parker (Desborough), J. Bailey (Spalding), G. A. Penwill (Peterborough), Walton Maughan (Northamptonshire), N. E. Dixon (Oundle), E. Madin (Irthlingborough), A. W. Broker (North Witchford), J. S. Parrott (Downham), W. Hadley Darby (Warwickshire), W. A. Clegg (Dorking), members; J. W. Walshaw (Peterborough), J. C. Sturgess (Hardingstone), K. H. J. Parker (Kettering), F. R. Chapman (Bedford), Thomas Northern (Uppingham), George Dolphin (Gretton), A. E. Wiseman (Berkshire), J. F. Jobson (Warwickshire), J. Thomson (Warwickshire), R. E. Spencer (Warwickshire), H. J. Softley (St. Ives), Arthur Harris (Rothwell), W. Forvague (March), W. G. Wilmott (Rushden), L. Blacklock (Bedford), T. Cockrill (Biggleswade), H. E. Broughton (London), visitors; G. Belson Chilvers, hon. district secretary, and B. Wyand, secretary of the institution.

Letters of apology for non-attendance came from a number of prominent surveyors to county, borough, urban district and rural district authorities.

The guests first assembled at the Excelsior Company's works at Finedon sidings. Mr. W. B. Mortimer, managing director of the company, acted as guide. He was careful to emphasise the fact that Excelsior stone was entirely composed of finely crushed and washed granite chippings and best Portland cement. These ingredients are measured out into gauging boxes, and then conveyed by means of elevators to the mixing mill. During the process of mixing water is sprayed on to the requisite proportion, after which the material is taken by spouts to the flag batteries or moulds in which paving slabs are made. The composition is thoroughly puddled with a view to getting rid of all air bubbles, pressure then being applied in order further to consolidate it. The flag moulds used by this company—they are patented—are arranged on such a principle as to allow of the slabs being cast in an edgewise position instead of face upwards, thus rendering it possible for fifty to be cast at once in one battery. In the room where this process was going on no fewer than 500 can be simultaneously made; whereas, placed face upwards, a tenth of that number would fully occupy the same floor space. The flags are allowed to remain in the moulds for three days to set, and an additional three days in the shed before being removed to the yard, and a stay of twelve months in the latter before being sent away. This explained the large stocks that were to be seen in the yard.

The members were very favourably impressed by the main advantage claimed for the edgewise method—namely, that the only part touched by hand is the top edge—thus obviating risk of disturbance after chemical action has taken place, and readers will perceive in this a very important factor, having regard to wearing qualities.

Kerbs are also made by processes similar to those described in the case of flags; likewise the combined kerb-channelling, one of the Excelsior Company's specialities now coming into particularly high favour with many authorities. With regard to the latter, it may be of interest to mention that at the time of the visit to the Finedon sidings a truck was being loaded for Carmarthen in distant Wales. The company make eleven different sections of kerbing, besides the "kerb-channelling," so that the requirements of practically any district can be supplied from stock.

Next on the programme was the machinery at work in the pattern shop, making moulds for copings, cornices, mullions, and various other architectural devices.

The company have started on a contract order for some 2,000 yds. of station platform copings, destined to be incorporated in stations on the Great Northern Railway Company's new line from Enfield to Stevenage. Large quantities of these were seen, as also junction box tunnel-slabs, specially manufactured for the General Post Office as covers for inspection cham-

bers for underground telephone and telegraph wires. The present order—for the latter—is for 10,000, and last year the Government was supplied with about 20,000, while the company naturally set some store by the fact that they are one of the only two firms whose stones are accepted by the General Post Office.

County, urban and rural surveyors are good customers of the reinforced concrete department, which can supply watercourse culverting, sewerage mains, &c. Here were to be seen circular cisterns to be used for water storage, cesspools, and so on; and it was pointed out that these were absolutely watertight, and, unlike brickwork and galvanised iron, would gain rather than lose in reliability from contact with water. The sizes are from 18 in. to 5 ft. in diameter.

As giving some idea of the demand for Excelsior stone, the members were told that the company supply more than a hundred urban and rural authorities, besides eleven county councils, with their kerbs and paving slabs. The output of slabs was given approximately at 50,000 sq. yds. per annum, with about 40,000 yds. run of kerb. About one hundred men are employed on the works.

Leaving the works, the visitors had an enjoyable journey—on a specially chartered motor omnibus—to Kettering, where, at the Royal Hotel, they were entertained to lunch. Afterwards a brief speechmaking was indulged in.

Mr. HORACE BOOT (president of the institution) expressed—in the course of a letter read by the district secretary—his great regret at not being present, and best wishes for a good time.

Mr. C. F. MAYFIELD (district chairman) made a few introductory remarks, saying he himself had been using Excelsior stone with best results.

Mr. MORTIMER highly appreciated the honour done to his company that day by the presence and the manifest interest of so large a gathering of their distinguished profession.

Mr. N. E. DIXON (surveyor to the Oundle Rural District Council) moved a vote of thanks to Mr. Mortimer for his hospitality.

This was seconded by Mr. J. W. Walshaw (city surveyor, Peterborough), who observed that if their host continued to manufacture such slabs as they had seen that day there was a great future before him.

The CHAIRMAN said he was especially glad to see some young members present that day. They would find the institution most helpful, and he would particularly draw their attention to its splendid library. He now proposed that best thanks be accorded Mr. Walton Maughan (Northamptonshire County Council) for having prepared a paper on "Steam and Motor Traction and Motor 'Bus Traffic.'" As time was pressing, they would not have the pleasure of hearing the paper read now, but would doubtless profit from its perusal when published in due course.

The vote was heartily passed.

Thanked for indefatigable labours as district hon. secretary, and at the same time warmly complimented upon his professional ability, Mr. G. BELSON CHILVERS (surveyor and water engineer to the Oundle Urban District Council) said, in reply, that he hoped the time was not far distant when every eligible official would have joined their institution.

Boarding their 'bus again, the company were taken to see Kingsley-avenue, a fine new road paved and "kerb-channelled" with Excelsior stone, the Co-op. factory, and the police station, in the construction of both of which much of the same stone had been used.

On the way out from Kettering attention was called to Barton Bridge and its effective baluster work, and when Finedon town was reached Mr. G. F. Bearn (the urban district council surveyor) showed the party many interesting features, and how he had made use of some thousands of yards of Excelsior kerbing.

In "Ye Olde Tingdene" ("The Bell") Mr. Bearn pointed out the oldest licensed house in England, and although some of the visitors did not appear to be altogether pleased with everything that had been achieved in the way of "restoration," this did not materially lessen their enjoyment of the capital tea provided in this ancient hostelry.

When the meal was over, the CHAIRMAN (Mr. Mayfield) proposed a vote of thanks to Mr. Bearn for

having taken the trouble to make their few hours in Finedon so pleasant and helpful.

While on his feet for the purpose of seconding, Mr. UNWIN (ex-president) also paid a high tribute to Mr. Mayfield, who, he observed, was proving an ideal chairman of the Eastern and North-Eastern Districts, while in Mr. Chilvers they had a secretary second to none.

The vote was heartily endorsed by everybody, Mr. BEARN briefly responding.

On the suggestion of Mr. CHILVERS, the general secretary (Mr. Wyand) was similarly complimented, and in responding he remarked upon the wonderful strides the institution had made in that district since Mr. Chilvers undertook the secretaryship. The future had good things in store for them, including a gathering at Humstanton in July or August, and really they must have a meeting of that district at least every two months.

Before leaving Finedon, the visitors had the pleasure of witnessing a very smart turn-out on the part of the local fire brigade.

ENGINEERING JOTTINGS.

IV. PREVENTION OF WASTE BY STANDARDISATION.

By HERBERT G. COALES, ASSOC. M. INST. C. E., F. S. I.

Possibly the heading may conjure up interminable streets all exactly the same width with the same class of footpath, one kind of tree, and so on; also ghastly row upon row of brick and slated dwellings, all painted green and ornamented with brass door knockers. But if such an abominable state of things could only be obviated by a wasteful expenditure, then let there be waste! Such a monotonous standard of output would be altogether outside the general interest; indeed, it would be against the civic health, for would not the consequent depression of spirits weigh almost as heavily as that from other recognised unpleasant conditions?

What is waste? Would the expenditure by the State of £50,000 for a picture of an old master be waste? Not in the sense in which the word waste is here used, because it would be a matter of opinion. The picture, perhaps, could not be bought at all except on such terms, and it might well be argued that, under the circumstances, it ought to be acquired.

Examples of waste which could scarcely be denied would be the making of a road 2 ft. thick, the putting of 11-in. by 3-in. joists for a cottage floor having only an 11-ft. bearing, or the running of expensive machinery without the proper lubrication of the bearings. Equally there would be waste if the road were made only 6 in. thick, or the joists 3 in. by 2 in., for in both cases the work would have to be reconstructed, and, of course, a deluge of oil over the machinery would be an obvious waste. As we know, there is a happy mean in all things; but if one looks about and listens, are there not evidences of waste all around? This is where standardisation would come in; such matters ought to be governed by a standard of acquired knowledge.

Fortunately, standardisation has been set up, for instance, with such materials as steel, iron, and Portland cement; but why should one town always use 6-in. pipes for house drains when another employs 4-in. pipes which are cheaper and much better suited to their work? If the additional cost per house were only £1 (the difference between a 6-in. and a 4-in. drain), then in a town of 3,000 houses the loss would be £3,000, and for a less efficient service too. Why, for this sum the town might establish public baths free of debt!

If one has motored through several counties in the road-tarring season, one has noticed every man doing what was good in his own eyes. Probably all were first sweeping the dust off the road, but, after the application of the tar, with what was the surface being sprinkled?—with nothing, with sand, with pit gravel, with $\frac{1}{2}$ -in. granite chippings without dust, with $\frac{1}{4}$ -in. granite chippings with dust, or half-a-dozen other substances. Surely there is a "best" gritting material. It cannot, therefore, be economical and sensible to use any other. Either we want the tar into the road, or a film on the road, and we should grit accordingly. Where is the standard? Of course, if the traffic can be kept off the wet tar for a time, until it has sunk into the surface and hardened, it will not be necessary to grit the road at all.

Standardisation should not be set up to extinguish

legitimate experimenting; but every experimenter should be invited to contribute his results to the common stock. However much an engineer might be a benefactor to his own town as the result of a successful experiment, the benefit would be lost to the general community unless the knowledge of it were passed on. Often, no doubt, a standard would not be set up as the result of only one man's success, but through the efforts of many.

It would be of the greatest possible convenience, and in the interests of economy, if one could say: "That's law, and I need not further investigate it." Let us have a table of law for municipal engineers, as binding as the commandments on the Jews. Where judgment on a matter of standard is in suspense, it must not be tabled; but when the absolute rock-bottom truth has been reached, and a standard can be laid down, let it be scheduled. It is not considered necessary every time to calculate the stresses for a tall factory chimney; we take the rules, say, of the London County Council just in the same way as we specify the recognised weights of lead water piping, or accept the tables for safe loads on rolled-steel joists. We may say they are each standardised. What is wanted is an extension of the list.

Every day people are doing, in ignorance, what has been proved elsewhere a failure. New settling tanks and non-filtering "filters" are being provided as a means of sewage disposal for villages. Indifferent concrete flagging, mixed to a home-made recipe, is being laid. Tons of disinfectants are being put down sewers to the discomfiture of the friendly microbe.

At this time of day it is a little exasperating that such a thing as sewer ventilation is treated as an open question. If town A thinks it is necessary to spend thousands of pounds in ventilating its sewers, how is it that town B does not? Town C puts in disconnecting traps, which town D omits, and at E they are optional. Some of these towns must be wasting money. It is therefore apparent that, if standardisation could be agreed upon for ventilation, it would be for the prevention of waste. If it is not always possible at present to inscribe the "Thou shalt" on the table, it may, nevertheless, be quite reasonable to put "Thou shalt not." Thou shalt not use scrapings in the construction of a dustless road! Thou shalt not lay granite setts on the earth without concrete! Thou shalt not pour lukewarm tar on a loose granite road coat to make tar-macadam! Thou shalt not use common bricks containing lime—at least for damp situations! But these things are continually being done.

Prevention is better than cure, and much cheaper. Standardisation should be treated with respect, for it would prevent the making of expensive mistakes, and lead to the saving of a good deal of time and worry. One properly repaired and surfaced road, costing £500 a mile, would outlast two other repairs, costing £400 a time, executed upon inexperienced lines.

Some people dislike standardisation as the curtailment of their liberty in execution; but it would be the means of preventing many a piece of freak construction.

Direct Labour at Taunton.—At the last meeting of Taunton Town Council, the borough surveyor, Mr. D. Edwards, reported that a saving of £180 had been effected in the work of scavenging by direct labour over the amount required by the old system of contract, and the workmen engaged had received 1s. per week increased wages and a half-holiday per week, so that the gross saving effected approached £275 per annum.

Road Maintenance in Tipperary.—In the matter of road management the Tipperary (North Riding) County Council (the *Freeman's Journal* states) has an exemplary record. Ten years ago steam rolling was introduced, two rollers being purchased. During the decade about 220 miles of roads have been steam rolled, and for this work loans amounting to £50,467 have been obtained, while a grant of £2,456 was given by the Road Board, bringing the total expenditure up to £52,922. This works out at about £246 per mile, an average of 15s. per perch. The average width dealt with was 16 ft., and the metalling was $\frac{5}{8}$ in. deep in the loose, consolidating to about 4 in. After the wear and tear of ten years, it has been found necessary to re-roll only about 5 miles of road. The machinery by which this splendid result has been attained is of an extensive character, and includes four steam rollers, six traction engines, five light tractors, five stonebreakers, and six end-tipping wagons.

ECCLES MAIN DRAINAGE.

BOROUGH SURVEYOR'S SCHEME OF RECONSTRUCTION.

The main sewers that were constructed forty years ago in Eccles and district have been found to be altogether inadequate for the requirements of the borough at the present time. Since 1900 the corporation have converted into water-closets over 5,000 privy middens, and with the addition of over 40 acres of paved front streets and back passages since that time serious trouble has arisen during times of heavy rainfall, so that the existing trunk sewers could not deal efficiently with the accumulated water pouring into them. Four years ago the borough engineer and surveyor, Mr. Thomas S. Picton, was instructed by the Highways and Sewers Committee to go fully into the matter and make a report to the committee. For many months the working of the old sewers was under careful observation by the surveyor; gaugings and measurements of the velocity and depth of the sewage were taken daily, the state of the sewers after heavy rainfall and thunderstorms being also noted.

On October 12, 1911, Mr. Picton placed before the Highways and Sewers Committee a comprehensive scheme dealing with the alteration and enlarging of the outfall sewers, the storm-water overflow sewer across the sewage farm, also the provision of new storm-water overflows, &c., in other parts of the borough, at a total estimated cost of over £56,000. As the contemplated expenditure for the carrying out of these proposals amounted to such a large sum of money the committee decided to submit the scheme as to its practicability to an expert engineer, and Mr. John T. Wood, M.INST.C.E., Liverpool, was consulted with regard to it.

On May 24, 1912, Mr. Wood's report, which dealt very fully with Mr. Picton's proposals, and on the whole agreed with what was proposed to be undertaken to remedy the difficulties of the flooding of basements, &c., was received by the committee. This report, and the scheme generally, came before the town council for discussion, and eventually it was decided to apply to the Local Government Board for borrowing powers to enable the works to be carried out in accordance with the scheme of the borough engineer. The inquiry was held on November 27, 1913, by Mr. R. G. Hetherington, M.INST.C.E., inspector of the board. Mr. Hetherington's report to the Local Government Board suggested one or two amendments to the scheme, which were agreed to by the town council. The amendments increased the estimated cost to £60,984. Sanction to proceed with the scheme was received on April 8th last.

The schemes are briefly described as follows: From the pump well at the sewage farm it is proposed to construct a 6-ft. by 5-ft. outfall sewer for a distance of about 30 yds., at a gradient of 1 in 600. The depth to the bottom of the foundations is 19 ft. A storm-water overflow manhole immediately adjoining the catchpit will be connected to this outfall sewer, and in it will be fixed a stone cill, at such a level that the sewage will have to be diluted at least twelve times the dry-weather flow before the storm overflow comes into operation.

The catchpit will be about 42 ft. long and 31 ft. wide, and about 21 ft. deep below ground level. Two 9-ft. by 6-ft. egg-shaped channels will be constructed. Provision is made for two sets of screening and raking apparatus, and two sets of detritus elevators, and two small steam engines of 6 h.p. to work the screens and elevators, with the necessary machinery. Also four large penstocks will be fixed, two at each end of the catchpit, so that if one set of screens or elevators gets out of order, or when cleaning becomes necessary, two of the penstocks can be closed down and the machinery, &c., can have proper attention.

The brick walls of the catchpit supporting the roof will be 18 in. thick at the base, resting on 12 in. of reinforced concrete. The walls of the catchpit 6 ft. below the ground level will be of concrete, 6 ft. thick at the base to 2 ft. thick at the top. Astley and Tyldesley selected common bricks are to be used.

This building will be properly roofed over, using Messrs. Bell's asbestos slates, and Heywood's patent glazing will be fixed on both sides of the roof. The catchpit will be lighted by electricity. At the inlet end of the catchpit there is to be built a junction manhole to receive the 7-ft. 6-in. by 5-ft. egg-shaped sewer, also the 5-ft. 9-in. by 3-ft. 10-in. egg-shaped sewer.

The bricks to be used in these new sewers are

radiated engineering "Winil" from the Winney Hill Plastic Brick Company, Limited, Accrington, and the "Duro" from the Humecoat Plastic Brick and Terra Cotta Company, Limited, Accrington. The Astley and Tyldesley Company's common bricks are being used to back up the square engineering bricks in the manholes.

The existing 4-ft. circular storm-water sewer is to be made larger—namely, to a 7-ft. 6-in. circular storm-water sewer surrounded with 9 in. of Portland cement concrete, 6 to 1, laid at a gradient of 1 in 1,600. At a distance of 842 lin. yds. the construction will be in open cutting at an average depth of 13 ft. 4 in., and 285 lin. yds. in tunnel at an average depth of 23 ft. When this work is nearing completion, the 7-ft. 6-in. by 5-ft. egg-shaped sewer and the 5-ft. 9-in. by 3-ft. 10-in. egg-shaped sewer will be commenced. These sewers are to take the place of the existing 3-ft. 3-in. circular sewers, a size which is now altogether too small for storm water. At present it is only proposed to construct the 5-ft. 9-in. by 3-ft. 10-in. sewer (receiving the sewage from Barton-lane) for a distance of 166 lin. yds., and the 7-ft. 6-in. by 5-ft. (receiving the sewage from Liverpool-road) for a distance of 152 lin. yds. in open cutting, and 355 lin. yds. in tunnel, laid at a gradient of 1 in 1,000, and at an average depth of 17 ft. 6 in. to the bottom of the foundations.

At the junction of New-lane and Liverpool-road the existing 3-ft. 3-in. circular brick sewer along Liverpool-road will be removed, and a 4-ft. by 2-ft. 8-in. egg-shaped sewer constructed in its place for a distance of 415 lin. yds. in tunnel at a gradient of 1 in 300, and at an average depth of 22 ft. to the bottom of the foundations.

It is also proposed to construct a brick storm-water overflow sewer, 5 ft. by 2 ft. 3 in. from Worsley-road, at the junction of Parrin-lane, through private lands, discharging the storm water into Worsley Brook. The length of this sewer is 326 lin. yds. laid at a gradient of 1 in 1,421, at an average depth of 7 ft. to the bottom of the foundations.

For some years past a part of the sewage of Eccles had to be taken into the sewers of the county borough of Salford. It is now proposed to divert this sewage into the Eccles system, using 18-in. pipes protected with 6 in. of cement concrete. This sewer will nearly all be constructed in tunnel, in very hard sandstone rock, and a portion of it will have to be driven under the London and North-Western Railway main line. The length of this sewer will be 201 lin. yds. in open cutting, at an average depth of 12 ft. to the bottom of the foundations, laid at a gradient of 1 in 155, and 619 lin. yds. in tunnel. The average depth of working shafts will be 26 ft.

The whole of the sewers under the above-mentioned schemes will be surrounded with at least 6 in. of Portland cement concrete 6 to 1.

In preparing the schemes provision has been allowed for the quantity of storm water and sewage that may be required to be dealt with fifty years hence, taking the estimated population then at 64,000 persons, and the rainfall has been calculated at $\frac{1}{2}$ in. of rain falling per hour per acre.

Mr. Picton desires to place on record the very able assistance given by his chief assistant, Mr. C. Vernon Hill. He tenders his thanks also to his assistant, Mr. Alfred J. Price, Assoc.M.INST.C.E., for that part of the work which has come under his special care, and to other assistants in the department who have all worked hard in bringing these schemes to such a successful issue so far.

The Surveyors' Institution.—On the 7th instant an important conference between representatives of the universities, the public schools, and the council of the institution was held with the object of ascertaining whether any steps might usefully be taken in order that the usefulness of the institution scholarships might be extended to a wider circle of competitors. Four scholarships, of a value of from £50 to £80 per annum, tenable at Oxford, Cambridge, and the other universities in Great Britain, are offered yearly, and it had been suggested that the conditions attaching to them were such as unnecessarily to restrict competition for them. The conference lasted an hour and a-half, and many valuable suggestions were made, and will be embodied in a report to the council. In the evening the chairman entertained the members of the conference to dinner at the Whitehall Club, Sir Thomas Elliott, K.C.B., Sir Ellis Cunliffe, Mr. Cecil Walsh, K.C., being among those invited to meet them.

ROAD MAINTENANCE IN COUNTY DOWN.

A COMPARISON OF EXPENDITURE.

The Down County Council have referred to the Proposals Committee a report by the county surveyor in which the latter stated: "It is becoming more clear every day that this county is not spending nearly sufficient on the roads, and that the limits of expenditure of the rural districts must be extended. For a number of years the expenditure was sufficient to effect some improvement, particularly in the main roads, but it is now evident that, with the increase in mechanically propelled traffic, the roads are deteriorating, and that if there is not an immediate and substantial increase of expenditure on their maintenance they will get out of hand altogether. Published returns show that County Antrim, with a smaller valuation, population and road mileage, has a much larger road expenditure. In the last ten years, for which the returns are available, Antrim spent on its roads £194,217 more than Down, or an average of more than £10,000 a year. A sum of £10,000 would suffice to supply and steam roll about 36,000 cub. yds. of stones in addition to the present annual quantity in this county of about 100,000 cub. yds. The total permanent statutory limit of expenditure on roads is in Down £64,561, and in Antrim £74,930. The valuation of Down is £847,387, and of Antrim £747,128; population of Down 204,303, of Antrim 193,864."

THE QUESTION OF WHOLE-TIME ASSISTANT SURVEYORS.

Mr. King, on behalf of the Proposals Committee, submitted, at the Down County Council meeting last week, a report by the surveyor on the petition of the assistant surveyors for an addition to their salaries on the grounds of the increased cost of living, and the multiplication of their duties owing to the development of steam rolling, road expenditure having risen, since the Local Government Act was passed, from £44,911 to £62,317, exclusive of special works, the introduction of direct labour, and the preparation of details for the administration of funds from the Road Board.

The surveyor stated that he agreed with the opinion of the committee that it would be much more satisfactory if assistant surveyors were whole-time officers. If the number of assistant surveyors were reduced from twelve to eight, each assistant would have charge, on the average, of 307 miles of road instead of 205 miles as at present, and the salary of each ought obviously to be higher for the larger districts. With eight whole-time assistants he reckoned that each road could be inspected on an average about once in three weeks. He was not quite satisfied that this would be a sufficient number of assistants in view of the volume of road work in progress, which had much increased within the past few years. It might be expected that the amount and cost of such work would, in the future, be added to enormously. If the present number of assistants were retained, the scheme for whole-time assistants could be introduced at once—at any rate, in such cases as the assistant surveyors were willing to fall in with the arrangement, regard being had to the provisions of the Local Government Act as to existing officers, and as to the term of appointment in each case. If the number of assistant surveyors were reduced, say, to eight, the difficulty of introducing the system would be greatly increased. He did not see how it could be done except gradually as vacancies occurred.

Association of Consulting Engineers.—The annual general meeting of the association will be held at Caxton Hall, Westminster, on Monday, May 25th, at 4.30 p.m., when the report of the committee and the accounts for the past year will be presented.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times*.

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

THE PROPOSED GREAT WEST ROAD.

DECISION OF THE PARLIAMENTARY COMMITTEE.

The House of Commons Committee which inquired into the proposal of the Middlesex County Council to construct a new main trunk road 5 miles in length and 80 ft. in width from Gunnersbury-lane, Chiswick, to Hounslow, joining the old main Bath road, on the 7th inst. found the preamble of the Bill proved, but considered that the Bill required alteration on the following points: In the first place, the Committee desired some modification in connection with the valuation under the Lands Clauses Act of the land required for the road, so that the valuer or arbitrator should be able to make some allowance for loss arising from transfer and investment of capital; and, secondly, that as regards betterment there should be some consideration in respect of increment duty. The Committee were also of opinion that a provision should be inserted in the Bill by which the omnibus companies and the District Railway Company, if they desired to run buses over the road, should be required to contribute towards its maintenance at the rate of 3d. per vehicle-mile. In the opinion of the Committee a width of 14 ft. on each side of the road was quite sufficient to meet the present requirements of the Post Office, the Water Board, and the gas company, and to afford the accommodation necessary for all those bodies.

In the House of Commons on Friday last, Lord Charles Beresford asked the Secretary of State for the Home Department if he would inform the House in what manner companies running motor omnibuses in London and the suburbs contributed towards the upkeep of the roads; what was the total sum contributed by these companies last year, and whether, looking to the amount of damage done to road surfaces by these vehicles, he would consider the desirability of taking steps, by legislation or otherwise, to secure that these companies should pay their fair share of the cost of upkeep of the roads.

In reply, Mr. Herbert Samuel said the companies running motor omnibuses, so far as they were in occupation of rateable premises, contributed as ratepayers to the upkeep of roads, and further contributions in respect of Motor Spirit and Carriage Licence Duty were made to the cost of roads under the Finance (1909-10) Act, 1910, and the Revenue Act, 1911, but the total sum so contributed could not be distinguished. As regarded the last part of the question, the recommendations of the Local Taxation Committee on the subject were under consideration.

At Tuesday's meeting of the London County Council, referring to the proposed contribution of motor omnibuses towards the upkeep of the new western approach road, observed that on the basis of 105,000,000 miles run in 1913 by the cars of the London General Omnibus Company, a corresponding contribution to the rates would exceed £164,000 a year. The contributions made to public funds by the London County Council's tramway undertakings amounted to £200 per car, or 11d. per car-mile. It was estimated that local councils were saving £128,000 annually owing to the tramway undertakings maintaining part of the public highways, this estimate having no regard to the additional expense which would be incurred if the passengers now carried by trams were carried by motor omnibuses.

Intercepting Traps.—Mr. W. Farrington, surveyor to the Woodford Urban District Council, Council Offices, Woodford Green, desires information respecting intercepting traps in house drainage, and would like to hear from surveyors of districts where the traps are not used.

Child Welfare and Housing.—The Child Welfare Housing and Town Planning Exhibition, to be held at the Imperial Institute under the auspices of the Victoria League next week, will be an important contribution to the public knowledge of these subjects. Many of the Colonial Governments will show plans and models of work that is being done overseas, and there will be a full representation of modern housing conditions in the United Kingdom. The Marquis of Salisbury will declare the exhibition open on Monday, and on subsequent days speeches will be delivered by Mrs. Humphry Ward, the Earl of Lytton, and Mr. Waldorf Astor, M.P.

DUBLIN HOUSING.**TWO SCHEMES APPROVED.**

Two schemes for clearing slum areas and building small dwellings for the working class were passed by Dublin Corporation on Monday. One, dealing with the Ormond market area, involves an outlay of £45,803, of which £10,000 will have to go towards the acquisition of the property; the Crabbe-lane scheme involves the expenditure of about £39,350. The dwellings will have two rooms each, and the rent will be 4s. 6d. a week.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A., Borough Surveyor, Great Yarmouth.

SALISBURY MEETING.

A meeting of the institution is to be held in the Southern District at Salisbury to-morrow (Saturday).

PROGRAMME.

11.30 a.m.—Reception in the council chamber by the Right Worshipful the Mayor of Salisbury, Mr. Councillor J. Macklin, J.P.

Papers by Mr. W. J. Goodwin, Assoc.M. INST.C.E., city engineer, "Some Notes on the Municipal Works of Salisbury"; and Mr. J. H. Blizard, Assoc.M.INST.C.E., on "The Bemerton and Wilton Pumping Station for Sewage Disposal."

Discussion.

1.15 p.m.—Lunch in the banqueting room at the invitation of the Right Worshipful the Mayor.

2.15 p.m.—Leave council house in motor char-à-banc to visit the following works—viz., Salisbury sewage disposal works and refuse destructor.

3.15 p.m.—Leave for Salisbury waterworks, chief pumping station.

3.45 p.m.—Leave for Bemerton pumping station.

4.15 p.m.—Return to council chamber, where tea will be provided, at the invitation of Mr. Alderman C. J. Woodrow, J.P., chairman of the Salisbury Sanitary Committee. (Cost of conveyance, 2s. each.)

By the kind consent of the chief officer of the fire brigade, the fire station will be open all day for inspection.

DISTRICT MEETING.

Members of the Southern District are asked to assemble in the council chamber at 11.10 a.m., to elect the Executive Committee and to consider any other district business.

F. R. PHIPPS, Assoc.M.INST.C.E.,
Hon. District Secretary.

Town Hall,
Basingstoke.

EASTERN DISTRICT.

An Eastern District Meeting is to be held at Ipswich to-morrow (Saturday).

PROGRAMME.

12 noon.—Meet at town hall. Business meeting: Read minutes; elect sub-district secretary for counties of Norfolk, Suffolk and Cambridge.

Afterwards, Mr. John R. Mead will describe the proposed accommodation which is about to be provided for the Ipswich medical officer of health, which includes the school clinic and tuberculosis dispensary. After this, he will open a discussion on road making, road maintenance, and the use of dust palliatives.

1.15 p.m.—Luncheon. (Tickets, 2s. each.)

2.15 p.m.—Visit Ipswich sanatorium, recently completed.

3.30 p.m.—Visit new vertical retort-house at gasworks.

4.30 p.m.—Visit St. Helens School, recently completed at a cost of £13,000; accommodation provided for 1,000 children.

5.30 p.m.—Tea. (Tickets, 1s. each.)

J. A. WEBB, H. T. WAKELAM, M.I.C.E.,
Hon. District Secretary. District Chairman.

WEST MIDLAND DISTRICT.

A meeting of the West Midland District is to be held at Birmingham on May 23rd.

PROGRAMME.

Assemble at Victoria-square entrance to the Council House.

2.15 p.m.—Leave Council House.

2.30 p.m.—Arrive Aston Church-road Bridge (two-span girder bridge, with trough flooring, spanning river Rea and canal).

2.40 p.m.—Leave Aston Church-road, travel *via* Alum Rock-road (60-ft. road laid out with grass margins and trees).

3.10 p.m.—Arrive Kings-road Bridge (single-span brick arch bridge over canal, with retaining walls to street).

3.20 p.m.—Leave Kings-road.

3.35 p.m.—Arrive Stratford-road Bridge (two-span brick arch over river Cole, with stone superstructure; note raising of levels of Stratford-road and new double line of tramway).

3.50 p.m.—Leave Stratford-road.

3.55 p.m.—Arrive Foremans-road Bridge (two-span brick arch over river Cole, with made-up approaches).

4.10 p.m.—Leave Foremans-road.

4.30 p.m.—Arrive Council House, where members will be entertained to tea by Mr. H. E. Stilgoe, city engineer.

District Business:—

Elect district chairman for the year 1914-15.

5 p.m.—Discussion on paper entitled, "Recent Highway Bridges in Birmingham," by Mr. A. S. Parsons, Assoc.M.INST.C.E. (Birmingham).

F. C. COOK, A. T. DAVIS, M.INST.C.E.,
Hon. District Secretary. District Chairman,
Nuneaton. Shrewsbury.

SCOTTISH DISTRICT.

The annual Scottish meeting of the institution will be held in Dunfermline on June 5th and 6th.

The following papers will be read—viz.:—

"A Town Planning Scheme: Its Effects on Housing and Architecture," by Mr. Raymond Unwin.

"Edinburgh and Its Early Examples of Town Planning," by Mr. A. Horsburgh Campbell.

"Town Planning from a Lawyer's Point of View," by Mr. John L. Jack.

"The Advantages of Steam Tractor Haulage over Team Labour for Road Material," by Mr. W. L. Gibson.

On the first day the members are to be entertained to luncheon by the corporation of the city of Dunfermline. On the second day, by the courtesy of the Admiralty and Messrs. Easton, Gibb & Co., the members are to be permitted to visit the works at Rosyth.

SOUTHEND MEETING.

A meeting of the institution will be held in the Eastern District at Southend on Saturday, June 6th.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on Saturday, June 13th.

ANNUAL GENERAL MEETING AND TOWN PLANNING, HOUSING AND ROAD CONFERENCES.

The forty-first annual general meeting of the institution will be held at the Town Hall, Cheltenham, on Wednesday, Thursday, Friday and Saturday, June 24th, 25th, 26th and 27th. Conferences will take place with delegates from the various corporations and local authorities of the United Kingdom and representatives of the different bodies interested in the subjects of town planning, housing and roads. An important exhibition of plans, maps and models of town planning and housing schemes has been arranged, and it is believed that the collection will be one of great educational and practical value. The exhibition will be open during the four days of the meeting. Ladies are invited to attend the meeting, visits and annual dinner, and the permission of the president may in their case be assumed, but due notice must be given on the reply form.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

J. W. DUDLEY ROBINSON, B.SC.(LOND.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

COUNCIL MEETING.

The next meeting of the council will be held in London on Wednesday, May 27th.

NORTHERN DISTRICT.

Meetings will be held in Cumberland in June, at Alnwick on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Hull to-morrow (Saturday).

PROGRAMME.

- 11.15 a.m.—Meet near bookstall, Paragon (N.E.R.) Station.
 11.30 a.m.—Proceed to the Hull Corporation electrical power station, Osborne-street.
 12.30 p.m.—Lunch at Imperial Hotel, Paragon-street. Approximate charge, 2s. each.
 1.30 p.m.—Proceed to Guildhall, Alfred Gilder-street, for internal and external inspection.
 2 p.m.—Proceed by tramcar to Garden City, where Mr. P. Runton, architect (or his chief assistant), will meet the members.
 3.15 p.m.—Inspect new municipal boating lake (five minutes' walk from Garden City).
 3.45 p.m.—Proceed by tramcar over two routes to Hull Corporation East District sewage pumping station.
 4.30 p.m.—Inspect Hull Corporation tramcar shed, opposite to sewage pumping station.
 1P TIME—One hour's trip by launch on river Hull.
 6.15 p.m.—Tea.

Darlington.

JOHN ROBINSON.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

NORTH-WESTERN DISTRICT.

A visit will be paid to the Oldham sewage disposal works to-morrow (Saturday).

PROGRAMME.

- 3 p.m.—Meet at Middleton Junction Station.
 3.15 p.m.—Arrive at Oldham sewage works, where members will be received by Dr. J. B. Wilkinson, medical officer of health, Oldham, and Dr. Grossmann, patentee of the grease extracting plant which has been described by him in a paper read before the institution.
 5.15 p.m.—Tea.

R. J. McKENN,

Hon. District Secretary

Heywood.

WESTERN DISTRICT.

A Western District meeting will be held at Tisbury on Saturday, June 13th, when the municipal works of the town will be inspected and a paper, "Wiltshire Roads, Past and Present," will be read by Mr. E. Plummer Davies (member).

EASTERN AND NORTH-EASTERN DISTRICTS.

A joint Eastern and North-Eastern District meeting will be held at Hunstanton in July.

GENERAL MEETING.

A visit will be paid to the works of the General Electric Company, Limited, Witton, Birmingham, on Thursday, May 21st.

Members will meet at the offices of the company at Witton at 1.45 p.m., proceeding at 2 p.m., on the kind invitation of the company, on an inspection of the engineering works, small motor, switchboard and switchgear departments, foundry, test-house, and conduit works. The works are among the first and best equipped in the country, and the visit will be one of extreme interest, and should command a large attendance.

B. WYAND,

39 Victoria-street, S.W.

Secretary.

CONCRETE INSTITUTE.

The fifth annual general meeting of the institute will take place on Thursday, May 28th, at 4.30 p.m., and the fourth annual dinner will take place on the evening of the same day at 8 p.m., at the Connaught Rooms, Great Queen-street, W.C., Prof. Henry Adams presiding.

H. KEMPTON DYSON,

Secretary.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.**METROPOLITAN DISTRICT.**

A visit will be paid to the Surbiton Urban District Council's new sewage disposal and refuse destructor works, Lower Marsh-lane, Surbiton, on Saturday, May 23rd.

Objects of Interest: Modern sewage purification plant, comprising pumping machinery, sludge-pressing plant, precipitation and humus tanks, storm-water diverting apparatus, primary and secondary filters, and a two-cell destructor plant in duplicate with Babcock and Wilcox boilers.

PROGRAMME.

- 2 p.m.—Meet at the works, when a description will be given by the engineer and surveyor, Mr. H. T. Mather, who, afterwards, with the works manager, Mr. C. A. Snook (member), will conduct the party over the works.
 3.15 p.m.—Demonstration of the dissolved oxygen test by Dr. Rideal (past-president).
 5 p.m.—Tea at the Red Lion Hotel, Tolworth, by kind invitation of the chairman of the council, Councillor Stephen Kavanagh, J.P.

J. FIELDHOUSE,

Hon. District Secretary.

INSTITUTION OF WATER ENGINEERS.**SUMMER MEETING AT STOCKPORT.**

The annual summer meeting of the Institution of Water Engineers will be held this year on June 11th, 12th and 13th at Stockport (headquarters at Midland Hotel, Manchester). Candidates for election at the council meeting to be held on June 11th should see that their proposal forms (duly filled in and signed) are received by the secretary, Mr. Percy Griffith, 20 Victoria-street, Westminster, S.W., not later than June 1st.

Wood Paving in Yarmouth.—One hundred thousand Jarrah blocks have been purchased by the Yarmouth Corporation from Millar's Timber and Trading Company, at £7 7s., £8 9s., and £9 11s. per thousand.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

COUNTY SURVEYOR'S ASSISTANT.—May 15th.—West Sussex County Council. £130—£150 per annum.—Mr. H. W. Bowen, county surveyor, North-street, Horsham.

SANITARY AND CLEANSING INSPECTOR.—May 18th.—Perth Town Council. £200 per annum.—Mr. J. Bogg, town clerk.

TEMPORARY WATERWORKS ASSISTANT ENGINEER.—May 18th.—Corporation of Lincoln. £125 per annum.—Mr. W. Bagshaw, town clerk, Guildhall.

CLERK OF WORKS.—May 18th.—Corporation of Cardiff. £3 10s. per week.—Mr. J. L. Wheatley, town clerk.

SURVEYOR.—May 18th.—Kingswood (near Bristol) Urban District Council. £150—£180 per annum.—Mr. Percy Baldwin, clerk.

CITY SURVEYOR AND SANITARY ENGINEER.—May 18th.—Corporation of Lichfield. £200 per annum.—Mr. Herbert Russell, town clerk.

SURVEYOR'S GENERAL ASSISTANT.—May 18th.—Whitley and Monkseaton Urban District Council. £101 per annum.—Mr. Augustus Whitcomb, clerk, 60 Saville-street, North Shields.

CLERK OF WORKS.—May 19th.—East Sussex County Council. £3 10s. per week.—Mr. P. J. Wood, county surveyor, County Hall, Lewes.

SURVEYOR.—May 20th.—Carlton Urban District Council. £150 per annum.—Mr. E. W. Turpin, clerk, 23 King-street, Nottingham.

HIGHWAY SURVEYOR.—May 20th.—Keighley Rural District Council. 30s. per week.—Mr. W. Birstow, Bridge House, Steeton, Keighley.

WATERWORKS ENGINEER-MANAGER.—May 21st.—Epsom Urban District Council. £200—£250, with house and motor-car allowance.—Mr. E. G. Wilson, clerk, Church-street, Epsom.

JUNIOR ASSISTANTS.—May 22nd.—Borough Surveyor's Department, Corporation of Chesterfield. £78 per annum.—Mr. Vincent Smith, borough surveyor.

TEMPORARY ASSISTANT.—May 23rd.—Bentley-with-Arksey Urban District Council. £2 10s. per week.—Mr. George Pye, clerk, 17 Priory-place, Doncaster.

CLERK.—May 23rd.—Committee for the Care of the Mentally Defective, Somerset. £130 per annum.—Mr. G. I. Simey, clerk to the county council, Sidney House, Boulevard, Weston-super-Mare.

SURVEYOR AND INSPECTOR OF NUISANCES.—May 23rd.—Bollington Urban District Council. £140 per annum.—Mr. Samuel Knight, clerk.

COUNTY SURVEYOR AND ARCHITECT.—May 25th.—Durham County Council. £800—£1,000 per annum.—Mr. Harold Jevons, clerk, Shire Hall, Durham.

SURVEYOR'S ASSISTANT.—May 29th.—Cannock Urban District Council. £2 2s. per week.—Mr. C. A. Loxton, clerk.

SEWAGE FARM MANAGER.—June 1st. Balby-with-Hexham Urban District Council.—Mr. George Gledhill, surveyor, Council Offices, Low-road, Balby, near Doncaster.

BRIDGE AND MAIN ROAD SURVEYOR.—June 1st.—County Council of Devon. £400 a year, with £200 a year for expenses.—Mr. F. Bailey, clerk, Castle of Exeter.

RESIDENT ENGINEER.—June 1st.—Chard Town Council. 3½ guineas per week. Mr. J. A. Forward, town clerk.

COUNTY SURVEYOR.—June 4th.—Hertford County Council. £800 a year.—Mr. Charles E. Longmore, clerk, Clerk of the Peace Office, Hertford.

ENGINEER AND SURVEYOR.—June 8th.—Cheadle and Gatley Urban District Council. £250 per annum. Mr. Arthur Briggs, clerk, Council Offices, Cheadle, Cheshire.

INSPECTOR OF ROADS.—June 9th. Corporation of Aberdeen. £200 per annum. Mr. W. Dyaek, burgh surveyor, Townhouse.

SURVEYOR.—June 15th.—Board of Trustees for the Improvement of Calcutta. 600—800 rupees per month (rupee valued at 1s. 4d.). Chairman, Calcutta Improvement Trust.

DRAUGHTSMAN.—Government of East Africa. £160—£250.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ENGINEERING DRAUGHTSMAN.—Government of Nigeria. £400—£500.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ENGINEERS.—Public Works Department, Government of Federated Malay States. £300—£450 per annum, with duty allowance of £75. Messrs. Gregory, Eyles & Waring, 12 Dean's-yard, Westminster, S.W.

ELECTRICITY SUPERINTENDENT.—Durban Corporation, Natal. £300—£360.—Messrs. Webster, Steel & Co., 5 East India-avenue, Leadenhall-street, London, E.C.

BUILDING ENGINEERS.—Government of Nigeria. £500.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

ASSISTANT ENGINEERS.—Public Works, Government of East Africa. £300—£400.—Crown Agents for the Colonies, Whitehall-gardens, London, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

BALLYCASTLE.—May 19th. Plans for a water supply for the Ballycastle Rural District Council.—Mr. H. McGill, clerk.

CWMAMMAN.—May 25th. Plans for a scheme of sewerage, for the Cwmamman Urban District Council.—Mr. W. M. Knoble, clerk, Commercial Buildings, Glanamman.

SUNDERLAND.—June 23rd.—Designs for a secondary school for 600 scholars, for the Corporation of Sunderland. Premiums, £100, £50, and £25.—Mr. J. W. Moneur, borough engineer and surveyor, Town Hall.

MIDDLETON.—July 16th.—Designs for a town hall, the cost of which must not exceed £18,000. Premiums £100, £50, and £25.—Town Clerk.

LONDON.—September 7th.—Designs for elementary schools, for the London County Council.—Education Officer, Education Offices, Victoria-embankment, W.C.

BELPER.—Designs and estimates for the erection of a bridge over the River Derwent, for the Belper Rural District Council.—Mr. Robert C. Cordon, surveyor, Duffield, near Derby.

CHESTER.—Designs for working-class dwellings, for the Corporation of Chester. Premiums, £50, £25, and £10. Mr. Patrick Abercrombie, M.A., Liverpool University School of Civic Design, has been appointed assessor.—Mr. J. H. Dickson, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

CHESTERFIELD.—May 18th.—For the construction of a reinforced-concrete service reservoir, for the rural district council.—Mr. G. Frith, Council Offices.

BRIGHTON.—May 18th.—For the erection of a department for infants at Coombe-road school, for the Education Committee.—Messrs. T. Simpson & Son, 15 Ship-street, Brighton.

SHEFFIELD.—May 18th.—For the erection of a school, for the Education Committee. City Architect.

SALFORD.—May 18th.—For the erection of a sub-station, for the corporation.—Messrs. C. S. Allott & Sons, 46 Brown-street, Manchester.

LEDBURY.—May 18th.—For the construction of a reinforced concrete open-air swimming bath, with dressing-boxes and corrugated iron fencing, for the urban district council.—Mr. R. G. Gurney, surveyor.

SOUTHAMPTON.—May 18th.—For the erection of four cottages, for the corporation.—Waterworks Engineer, 33 and 35 French-street.

LEEDS.—May 19th.—For the diversion and covering of Earsley beck, and the erection of a stone boundary wall, for the corporation.—Mr. W. T. Lancashire, city engineer.

DURHAM.—May 19th.—For the erection of a school, for the county council.—Mr. A. J. Dawson, clerk to the Education Committee, Shire Hall, Durham.

BOOTLE.—May 20th.—For the erection of an electricity sub-station, for the corporation.—Mr. B. J. Wollenden, borough engineer.

WEST RIDING.—May 20th.—For alterations to a school, for the county council. Mr. B. Thornton, divisional clerk, Education Offices, Skipton.

NEWCASTLE-UPON-TYNE.—May 20th.—For the extension of the laundry and mortuary, for the Sanitary Committee.—City and Property Surveyor.

HOVE.—May 20th.—For the construction of an underground lavatory, for the corporation.—Mr. H. H. Scott, borough surveyor.

OLDHAM.—May 20th.—For the supply and fixing of equipment for a public wash-house, for the corporation.—Borough Surveyor.

DORCHESTER.—May 21st.—For the erection of a shelter, for the corporation.—Borough Surveyor.

WEST RIDING.—May 22nd.—For the erection of a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

DUBLIN.—May 23rd.—For alterations and additions to public baths and washhouses, for the corporation.—Mr. M. J. Buckley, borough surveyor, Castle-street.

ESSEX.—May 23rd—June 16th.—For the erection of a school, for the Education Committee. Mr. J. Gleave, Education Offices, County High School, Braintree.

WHITEHAVEN.—May 23rd.—For the supply of cast-iron spigot and socket pipes, bends, junctions,

and valves, cutting trenches, and laying pipes for a water supply, for the rural district council.—Mr. George Boyd, 33 Queen-street, Whitehaven.

ABERDARE.—May 25th.—For the erection of a refuse destructor, for the urban district council.—Mr. D. L. Griffiths, clerk.

DUBLIN.—May 25th.—For the erection of 113 cottages, blocks of flats, and eight-roomed houses, for the corporation.—City Architect, City Hall.

DEVON.—May 25th.—For the erection of a police station, for the Standing Joint Committee.—Mr. E. H. Harbottle, County Chambers, Exeter.

BIRMINGHAM.—May 25th.—For constructional works at generating station, for the corporation.—Electric Supply Department, 14 Dale-end.

HANTS.—May 25th.—For the erection of a teacher's house, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

BLACKBURN.—May 25th.—For the erection of public halls, for the corporation.—Town Clerk.

CUCKFIELD.—May 26th.—For the erection of six cottages and other buildings, for the urban district council.—Mr. C. H. Waugh, clerk, Boltro-road, Haywards Heath.

WEST SUSSEX.—May 26th.—For alterations and additions to the Midhurst Grammar School, for the Joint Education Committee.—Mr. Haydn P. Roberts, county education architect, Thurloe House, High-street, Worthing.

WEST SUSSEX.—May 26th.—For alterations and improvements to the Shoreham council school, for the Joint Education Committee.—Mr. Haydn P. Roberts, county education architect, Thurloe House, High-street, Worthing.

WEST HAM.—May 26th.—For painting, cleansing, and repairing public buildings in the borough, and certain other institutions, for the corporation.—Mr. J. G. Morley, borough engineer.

HAMMERSMITH.—May 27th.—For the construction of a urinal, for the borough council.—Mr. H. Mair, borough surveyor.

QUEENSTOWN.—May 29th.—For the construction of a water supply, for the urban district council.—Mr. P. H. McCarthy, 39 Westmoreland-street, Dublin.

STAFFORD.—May 30th.—For alterations to the borough hall, for the corporation.—Mr. W. Plant, borough engineer and surveyor.

CAVAN.—May 30th.—For laying cast-iron pipes and valves, and the construction of filter beds at water-works, for the urban district council.—Messrs. Swiney & Croasdaile, Avenue Chambers, Belfast.

CHARD.—June 1st.—For the construction of covered reservoir, well, tunnel, and the laying of 7-in., 5-in., 4-in., 3-in. and 2-in. cast-iron water mains, valves, hydrants and other castings, for the corporation.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

Iron and Steel.

CHORLEY.—May 19th.—For the supply of cast-iron pipes and steel tubes, for the corporation.—Mr. J. W. Allin, gas engineer.

MANCHESTER.—May 19th.—For the supply of steel girder tramway rails, for the Tramways Committee.—Mr. J. M. McElroy, general manager, corporation tramways, 55 Piccadilly.

BRITON FERRY.—May 19th.—For the supply of 2,337 lin. yds. of cast-iron plates 7 in. in diameter, 1,317 lin. yds. 6 in. in diameter, and 15 lin. yds. 3 in. in diameter, for the urban district council.—Mr. Alex. Clarke, engineer and surveyor.

BRITON FERRY.—May 19th.—For laying, jointing and completing cast-iron pipes, for the urban district council.—Mr. H. Alex. Clarke, engineer and surveyor.

GRAYS.—May 20th.—For the supply of 1,000 yds. of 3-in. diameter cast-iron pipes, for the rural district council.—Mr. C. F. W. Marsh, engineer, Grays, Essex.

BURY.—May 20th.—For the supply of floor girders, stanchions, and staircase and chequered plates at the generating station, for the corporation.—Town Clerk.

MARKET HARBOROUGH.—May 22nd.—For the erection of a brick and puddle gasholder tank, for the urban district council.—Mr. A. T. Harris, engineer, Gas Offices.

GLOUCESTER.—May 25th.—For the installation of pumping machinery, for the corporation.—Messrs. Fox, Moore, Bateman & Fox, 5 Victoria-street, Westminster, S.W.

CARDIFF.—May 28th.—For the supply of steel and cast-iron work and small feed tank, for the corporation.—Mr. A. Ellis, electric engineer and manager.

CHARD.—June 1st.—For the supply of, approximately, 450 tons of 7-in., 5-in., 4-in., 3-in. and 2½-in. cast-iron pipes, junctions, bends, tapers, and other castings; also for the supply of 7-in., 5-in., 4-in. and 3-in. sluice valves, fire hydrants, air valves, and surface boxes, for the corporation.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

FLEET (Hants).—June 4th.—For the supply and delivery of 2,700 yds. of 12-in. diameter cast-iron pipes, 1,900 yds. of 10-in., 2,950 yds. of 9-in., 1,060 yds. of 8-in., 2,400 yds. of 7-in., 900 yds. of 6-in., and pipes of smaller diameters, also bends, taper junctions, and other specials, for the urban district council.—Mr. T. J. Moss-Flower, 28 Victoria-street, Westminster, and Carlton Chambers, Bristol.

MADRAS.—June 17th.—For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer, and Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

Roads.

EASTBOURNE.—May 18th.—For the execution of private street works, for the corporation.—Mr. A. Ernest Prescott, borough surveyor.

BLACKBURN.—May 18th.—For the execution of street works, for the Highways Committee.—Mr. W. Stubbs, borough engineer.

ROMFORD.—May 18th.—For works of street improvement, for the urban district council.—Mr. H. T. Ridge, acting surveyor.

PLYMOUTH.—May 18th.—For making up certain streets, for the corporation.—Mr. James Paton, borough engineer.

HOLYWOOD (Ireland).—May 18th.—For the supply of road metal and screenings, for the urban district council.—The Surveyor.

KENSINGTON.—May 18th.—For laying creosoted deal blocks in certain streets, for the borough council.—Borough Engineer and Surveyor.

BOGNOR.—May 18th.—For the supply of granite chippings, for the urban district council.—Mr. O. A. Bridges, surveyor.

BELCHAMP.—May 19th.—For the supply of broken slag, for the rural district council.—Mr. S. Allpress, surveyor.

GLASGOW.—May 19th.—For the construction of certain streets, for the corporation.—Office of Public Works, City Chambers.

HOVE.—May 20th.—For providing and laying wood paving, for the corporation.—Mr. H. H. Scott, borough surveyor.

KENT.—May 20th.—For the supply of about 11,000 yards of Guernsey, Norwegian, Pennant, Scottish or other kerb, for the county council.—County Surveyor, St. Peter-street, Maidstone.

RAWTENSTALL.—May 20th.—For paving and sewerage certain streets, for the corporation.—Mr. James Johnson, borough surveyor.

DEWSBURY.—May 20th.—For widening a road, for the corporation.—Borough Surveyor.

LUTON.—May 21st.—For the execution of private street works, for the corporation.

KILDARE.—May 23rd.—For the supply of a 10-ton compound steam roller, sleeping, water carts, and a force pump, for the county council.—Mr. Thomas Langan, secretary, Courthouse, Naas.

DORKING.—May 23rd.—For the supply of 1,000 tons of tarred slag, for the urban district council.—Mr. W. A. Clegg, surveyor.

LANCASTER.—May 23rd.—For the execution of a highway improvement, for the rural district council.—Mr. W. Dixon, surveyor.

SCUNTHORPE.—May 25th.—For the supply of any quantity up to 500 tons of broken granite of approved quality, for the urban district council.—Mr. Herbert Heap, engineer and surveyor.

EXETER.—May 25th.—For paving a portion of Sidwell-street with creosoted wood blocks, for the corporation.—Mr. Thos. Moulding, city engineer and surveyor.

ROWLEY REGIS.—May 25th.—For work of road improvement, for the urban district council.—The Surveyor.

SHEPPEY.—May 26th.—For the supply of blue ragstone, for the rural district council.—Mr. John Copland, clerk, Sheerness.

TOTTENHAM.—May 26th.—For making up Boundary-road (remainder) and Clifton-gardens, for the urban district council.—Mr. W. H. Prescott, surveyor.

WEST HAM.—May 26th.—For making up part of Saville-road, part of Leonard-street, Eclipse-road, part of Cumberland-road, part of Chadwin-road, and part of Varley-road, for the corporation.—Borough Engineer.

STOWMARKET.—May 27th.—For the supply of 350 tons of best broken granite, for the urban district council.—Mr. P. C. G. Hayward, clerk.

WALTHAMSTOW.—May 27th.—For the supply of Trinidad asphalt macadam and Trinidad Lake bitumen, for the urban district council.—Mr. E. Morley, surveyor.

BRENTFORD.—May 30th.—For the supply of 300 yds. of blue Guernsey or other approved granite, for the urban district council.—Mr. J. W. Croxford, surveyor.

MONMOUTHSHIRE.—May 30th.—For the supply of materials or haulage, for the county council.—Mr. W. Tanner, county surveyor, County Council Offices, Newport (Mon.).

BOULTON.—May 30th.—For the supply of 700 tons of slag rejections, for the urban district council.—Mr. W. J. Holbrook, clerk.

BARNSTAPLE.—June 5th.—For the purchase of a 12-ton steam roller with scarifier.—Mr. E. Y. Saunders, borough surveyor.

TANGIER.—June 8th.—For the construction of about 10 miles of road, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

EPSOM.—June 16th.—For making up Leigh-road, School-road and Spencer-road, for the rural district council.—Mr. T. E. Ware, surveyor of highways, Waterloo-road, Epsom.

LEWES.—June 19th.—For road rolling and the supply of 600 tons of 2-in. broken granite and 600 tons of broken surface-picked flints, for the corporation.—Borough Surveyor.

LARNE.—June 25th.—For the construction of a new street, for the urban district council.—Mr. W. G. Younge, clerk.

LONDON.—No date.—For the execution of paving works, for the Street Committee.—Town Clerk, Public Health Department, Guildhall.

Sanitary.

RHYMNEY.—May 18th.—For the construction of outfall sewer, storage tank, discharge pipe, and storm overflow pipe, for the Sewerage Board.—Mr. J. S. Alford, 9 Victoria-street, Westminster, S.W.; Messrs. Willcox & Raikes, 63 Temple-row, Birmingham; and Mr. T. J. Thomas, 36 High-street, Bargoed.

GELLIGAER.—May 19th.—For surface-water drainage, for the urban district council.—Mr. F. Read, engineer and surveyor.

BRADFORD.—May 19th.—For emptying middens and ashpits, for the corporation.—Mr. F. Stevens, town clerk.

PETERBOROUGH.—May 22nd.—For the construction of Eye drainage works, with manholes, flushing chamber, and ventilating pipe, for the rural district council.—Mr. G. A. Penwill, 33 Queen-street, Peterborough.

ECCLES.—May 23rd.—For the construction of outfall sewer, storm overflow manhole, junction manhole, screening and raking apparatus, detritus elevators, machinery, engines, pen-stocks, and circular storm-overflow sewer, for the corporation.—Mr. Thomas S. Pictou, borough engineer.

DURSLEY.—May 23rd.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. G. P. Milnes, 7 Rowcroft, Stroud.

LEEK.—May 25th.—For laying and jointing about 2,840 yds. of 9-in. and 6-in. stoneware pipe sewers, and constructing manholes, flushing chambers, engine house, pump well, liquefying tanks, bacteria beds, sludge beds, approach road, and other works, for the rural district council.—Messrs. Willcox & Raikes, 63 Temple-row, Birmingham.

DEUDRAETH.—May 25th.—For laying glazed stoneware and cast-iron socket-pipe sewers, and constructing manholes and other works, for the rural district council.—Mr. L. Lloyd Jones, Lloyd's Bank Chambers, Carnarvon.

WAKEFIELD.—May 25th.—For the construction of a main outfall sewer, comprising 4,000 yds., or thereabouts, of pipe sewers, pumping station, and subsidiary branch sewers, comprising 5,800 yds., or thereabouts, of pipe sewers, for the corporation.—Mr. A. C. Allibone, town clerk.

WARBLINGTON.—May 25th.—For laying laterals or branch drains from the public sewers, and the connection of existing drains, with all necessary inspection chambers and other works, for the urban district council.—Mr. Arthur J. Martin, engineer, 7 Victoria-street, Westminster, S.W.

CWMAMMAN.—May 25th.—For the preparation of a sanitary scheme, for the urban district council.—Mr. W. Martin Knoble, clerk, Commercial Buildings, Glamorgan.

CHESTER.—May 25th.—For sewer construction, for the rural district council.—Mr. C. J. F. Owen, 10 Batchelors-lane, Dee Banks, Chester.

BASFORD.—May 25th.—For providing and laying stoneware pipe sewers with Hassall's joints and manholes, for the rural district council.—Mr. S. Maylan, engineer and surveyor.

BLYTH AND CUCKNEY.—May 26th.—For scavenging work, for the rural district council.—Mr. A. E. Hewitt, inspector.

KIVETON PARK.—May 26th.—For the construction of sewers, for the rural district council.—Mr. F. Hewitt, engineer and surveyor.

FARNBOROUGH.—May 26th.—For the construction of sewers and storm-water drains, and making good a road, for the urban district council.—Mr. John E. Hargreaves, surveyor.

CHEPPING WYCOMBE.—May 28th.—For the supply and erection of steam engines, air compressors, air lifts, ejectors, and all necessary appurtenances in the extension of the sewage outfall works at Wycombe Marsh, for the corporation.—Mr. T. J. Rushbrooke, borough engineer and surveyor.

DEWSBURY.—May 30th.—For the construction of sewage disposal works, for the corporation.—Mr. Henry Dearden, borough engineer.

Stores.

BRIERLEY HILL.—May 18th.—For the supply of Rowley ragstone setts, chippings, broken furnace slag, blue kerbs, paving bricks, hard burned and common bricks, scavenging brushes, shovels, picks, gully grates, stoneware pipes, sanitary articles, and disinfectants.—Mr. William Waldron, clerk.

WALSALL.—May 18th.—For the supply of requisites for the gas department.—Town Clerk.

MANCHESTER.—May 19th—26th.—For the supply of requisites, for the Electricity Committee.—Mr. F. E. Hughes, secretary Electricity Committee.

FRIERN BARNET.—May 28th.—For the supply of steam coal, engine slack, coke, hardcore, hoggon, gravel, broken Leicester granite, cartage, and general horse hire, for the urban district council.—Mr. E. J. Reynolds, engineer and surveyor.

LUTON.—May 30th.—For the supply of broken granite for the year ending June 30, 1915, for the corporation.—Borough Engineer.

PAIGXTON.—June 5th.—For the supply of coal, coke, granite, lamp columns, gully gratings, oil, firewood, and other articles, for the urban district council.—The Surveyor.

Miscellaneous.

TYLDESLEY-WITH-SHAKERLEY.—May 25th.—For the supply of gas fuel, cast-iron pipes and special (gas and water) lead pipes, wrought-iron tubes and fittings, and gas meter, for the urban district council.—Mr. Hedley Hoy, gas engineer.

WARWICK.—June 1st.—For the supply of electric motors, centrifugal pumps, switchgear, automatic control apparatus, pipes, and valves, at the Loughbridge pumping station, for the corporation.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

MADRAS.—June 1st.—For the supply of two petrol-driven motor fire engines, for the corporation.—Mr. James R. Coats, engineer.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

ABERDEEN.—For the erection of a car shed, for the corporation.—Mr. W. Dyack, burgh surveyor:—
Mason Work.—J. Shirras & Son, Aberdeen, £1,238.
Carpenter Work.—G. Lyall, junr., Aberdeen, £1,369.
Track Work.—E. Allen & Co., Sheffield, £1,063.
Plumber Work.—A. McRobb, Aberdeen, £230.
Slater Work.—C. Maitland & Son, Aberdeen, £153.
Asphalting.—Roger & Baxter, Aberdeen, £38.

ALDERSHOT.—For laying a 9-in. stoneware sewer, with two manholes, for the urban district council.—Mr. Fred C. Uren, surveyor:—

CEMETERY-ROAD SEWER EXTENSION.
McCarthy E. Fitt, Reading £137
E. Free & Sons, Maidenhead 85
W. Norris, Farnham* 70

ALDERSHOT.—For main drainage reconstruction, extension of sewage and destructor works, and subsidiary sewers, for the urban district council.—Mr. Fred C. Uren, surveyor:—

	Contracts.		
	1.	2.	3.
McCarthy E. Fitt, Reading	£14,224	£1,986	£1,248
Ford & Co., Willesden Junction	8,135	—	—
E. Free & Sons, Maidenhead	7,333	—	995
Binns & Co., Croydon	6,848	—	1,010
Hardy & Co., Woking	6,600*	—	905
W. Norris, Farnham	—	—	793*
Crosby & Co., Farnham	—	1,150*	—

BRECON.—For paving works in certain streets, for the corporation.—Mr. Hugh L. Griffiths, borough engineer and surveyor:—

BRECON BOROUGH PAVEMENTS IMPROVEMENT.
W. Meredith, Newbridge-on-Wye £885
W. G. Plunkett, Brecon 710
J. R. Morgan, Brecon 709
B. Jenkins, Brecon 685
Lewis Meredith, Brecon 658

BRIDGWATER.—For the supply of 124 tons of 3-in. cast-iron pipes and other castings, for the rural district council.—Mr. W. A. Collins, engineer:—

Clay Cross Iron Company, Chesterfield	£847
J. Oakes & Co., London	844
Staveley Coal and Iron Company, Chesterfield	841
Cochrane & Co., Woodside	835
Jordans, Limited, Newport	838
Stanton Ironworks, Nottingham	835
Sheepbridge Coal and Iron Company, Chesterfield*	819
Iscia Foundry Company, Newport (Mon.)	787
A. G. Cloake, London	700

BUCKS.—For enlargement of county secondary school at

Wolverton, for the Education Committee:—
—Hawkin £1,885
—Green 1,856
Henson & Son 1,855
Hickman & Sons 1,835
Webster & Cannon 1,798
E. Archer & Sons, Limited, Northampton* 1,685

CHESTER-LE-STREET.—For making up certain streets, for the urban district council.—Mr. W. Ridley, surveyor:—

J. Douglass, Newcastle-on-Tyne	£2,692
W. Kennedy, Jarrow-on-Tyne	2,390
J. Wears & Sons, Pelton Fell, S.O., Co. Durham	2,372
E. R. Davison, Blyden-on-Tyne	2,205
E. Edgar, Gosforth	2,172
J. Thompson & Son, Chester-le-Street*	2,009

CHINGFORD.—For making up certain portions of 11all-lane, for the urban district council.—Mr. J. T. Griffin, surveyor:—

W. & C. French, Buckhurst Hill	£898
W. & C. Hampton, Palmer's Green, N.	865
G. Porter, Clapton	809

DURHAM.—For the execution of the Ludworth sewerage and sewage disposal scheme, for the rural district council:—

—Carrick	£2,385
R. Oliver, Gilesgate Moor*	1,789

FELIXSTOWE AND WALTON.—For alterations and extensions at the electric lighting station, for the urban district council.—Mr. H. Clegg, surveyor:—

—Andrews	£395
H. J. Lintell, Felixstowe*	369

LARNE.—For the construction of a new road and repairing bridges and fences, for the rural district council:—
New Road.—W. Hirst, Larne, £2,000.
Footpath.—W. Hirst, Larne, £110.

ST. NEOTS.—Recommended for the supply of broken granite, basalt, slag tar-macadam, and slag dust, for the urban district council.—Mr. J. Edey, surveyor:—

Jees Hartshill Granite Company, Atherstone.—50 tons 1-in., 50 tons 1½-in., 100 tons 1½-in. granite.
Groby Granite Company, Groby.—300 tons of 2-in. to 2½-in.
J. Smart & Son, London.—300 tons slag tar-macadam, and 100 tons slag dust.

TORPOINT.—For making up certain roads, for the urban district council.—Mr. R. H. Beaumont, surveyor:—

T. Dovey, Plymouth.—North-road, £757; Vicarage-road, £204; Liscaun-road, £111; Salamanca-road, £109; Barossa-road, £98.

WOLVERHAMPTON.—Accepted for extensions to buildings at Commercial-road station, for the town council:—
T. & S. Ham, Wolverhampton, £2,595.

WOLVERHAMPTON.—Accepted for the supply of steelwork and bunkers for boiler-house extension at electric generating station, for the corporation:—
W. Hayward & Sons, Wolverhampton, £1,012.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MAY.

- 16.—Institution of Municipal and County Engineers: Meetings at Salisbury and Ipswich.
- 18.—Royal Institute of British Architects: Mr. T. Raffles Davison on "Beautiful London, with Special Reference to the Aims of the London Society," 8 p.m.
- 20.—Institute of Sanitary Engineers: Visit to Metropolitan Water Board's Reservoirs at Chingford.
- 23.—Association of Managers of Sewage Disposal Works: Visit to Surbiton Sewage Works.
- 23.—Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham; Mr. A. S. Parsons on "Bridge Construction."
- 24.—Institution of Civil Engineers (Students' Meeting): Mr. A. A. Hudson, K.C., on "Engineering Contracts," 8 p.m.
- 25.—Association of Consulting Engineers: Annual General Meeting, Caxton Hall, Westminster, 4.30 p.m.
- 27.—Institute of Sanitary Engineers: Visit to Eton Rural District Council's sewage outfall works at Gerrard's Cross. Train from Marylebone, 2 p.m.
- 28.—Concrete Institute: Annual General Meeting, 4.30 p.m.; Annual Dinner, Connaught Rooms, 8 p.m.

JUNE.

- 5-6.—Institution of Municipal and County Engineers: Meeting in Dunfermline.
- 6.—Institution of Municipal and County Engineers: Meeting at Southend.
- 11-13.—Institution of Water Engineers: Summer Meeting at Stockport.
- 13.—Institution of Municipal Engineers: Western District Meeting at Tisbury. Mr. E. Plummer Davies on "Wiltshire Roads, Past and Present."
- 17.—Royal Institute of British Architects: Annual Dinner, Hotel Cecil.
- 24.—Institute of Sanitary Engineers: Visit to Luton sewage farm. Train from St. Pancras, 2.50 p.m.
- 24-27.—Institution of Municipal and County Engineers: Annual Meeting and Town Planning, Housing and Road Conference at Cheltenham.

JULY.

- 4-11.—Royal Sanitary Institute: Annual Congress and Exhibition at Blackpool.
- 6-10.—Institution of Mechanical Engineers: Summer Meeting in Paris.

SEPTEMBER.

- 26.—Institution of Municipal and County Engineers: Meeting at Scarborough.

EX-PUPILS AND JUNIOR ASSISTANTS.

A.R.S.I.—3 years' college course, and 2 years' Articles, seeks appointment, Junior Assistant Sanitary Engineer. Thorough practical experience in all branches of Sanitation; neat draughtsman and good mathematician. Numerous certificates; references exchanged. Willing to undergo any test in Sanitation. Age 23. Salary required £50.—Box 1421, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,614)

APPOINTMENTS WANTED.

PREPAID Advertisements under this heading are inserted at the rate of ONE PENNY per word, with a minimum charge of 2s. THREE consecutive insertions given for the price of TWO.

GENTLEMANLY YOUTH (17), son of an A.M.I.C.E., wishes to enter Civil Engineer or Council Surveyor's Office in London or suburbs. Can trace, sun-print and colour up. Small salary desired.—Box 1,420, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,615)

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

EAST SUSSEX COUNTY COUNCIL.

RECONSTRUCTION OF MONK BRETTON BRIDGE, RYE.

Wanted, a thoroughly competent Clerk of Works. Preference will be given to one experienced in Reinforced Concrete Construction.

Salary £3 10s. per week.

Applications, accompanied by three references, to reach the undersigned on or before Tuesday, May 19th, 1914.

F. J. WOOD, ASSOC. M. INST. C. E.,
County Surveyor.

County Surveyor's Department,
County Hall, Lewes.

(1,584)

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

MAY 22, 1914.

No. 1,166.

Minutes of Proceedings.

The Proposed Motor Speedway to Brighton.

It is well known to most of our readers that a scheme has for some time been in course of preparation for the making of a motor road between London and Brighton, and it is now announced that Parliamentary powers for the construction of this road will be sought next winter, the cost of the enterprise being estimated at £5,000,000 sterling. It may be assumed that the syndicate which is responsible for the scheme will publish, before the winter session, such particulars of the route and nature of the proposed road as will enable the public to form, with the help of technical and financial criticism, a clear idea of the objects and scope of the scheme, and of the extent to which it will depend upon attracting custom, in the form of private and trade vehicles, or, on the other hand, in the form of individual passengers or goods, conveyed by vehicles provided and run by the syndicate itself. The project is one which stands by itself: for, if we assume that as much as £1,000,000 sterling may be spent on accessory works and equipment, the cost of the road would be about £80,000 a mile, and it cannot, or need not therefore be considered in the light of the views which one may hold regarding the usefulness and economic importance of a system of motor roads intended to supplement and relieve the general network of highways. As far as present needs are concerned, a road 25 ft. wide would amply suffice to relieve the existing roads to Brighton of such a proportion of their motor traffic as would have to be withdrawn from them in order that they might have the character of ordinary main roads with a fair share of motor traffic. As regards commercial vehicles, it is to be remembered that many, and perhaps most, of them could not conveniently use a through route, serving only a few of the important towns between London and the coast. Up to some limit of divergence special facilities for clear runs and high speeds would attract commercial and private traffic, but, as regards the former, the financial disadvantage of having to pay for the use of the road would render the limit of economical divergence a somewhat narrow one. On Saturdays, Sundays, and on a few important days at certain holiday seasons, the private motor-car and motor-cycle traffic between Brighton and London is very great, but at other times the total traffic at any point on a main road between Brighton and London consists largely of vehicles which enter or leave the road at some distance from Brighton or London, many of them being

vehicles belonging to residents in the wealthy Surrey suburbs and residential towns, who use these main roads simply as the most convenient local main roads, and often as parts of routes which are on the whole easterly or westerly. To pay 3 per cent on a capital of £5,000,000, the syndicate will have to make £150,000 a year, or nearly £3,000 a mile. To meet this they will have, it is understood, their tolls and, it may be assumed, passengers' fares and charges for transporting goods. In all three cases they have to compete with transport by the railways and by the ordinary roads. The transport of passengers and goods is not so profitable a business on ordinary roads as to leave a large margin for the cost of upkeep, and this cost, the wear and tear of the road, has to be deducted from receipts on all three classes of traffic before anything can be allotted to the payment of interest on capital.

If we put the cost of maintenance at, as a preliminary estimate, £600 a mile, we find that it would take 400 penny-per-mile tolls per day to pay for this alone, and another 2,000 penny-a-mile tolls to pay the 3 per cent interest on the capital, without allowing for management expenses. It is necessary, of course, to consider the possibility that petrol "in bond" might be allowed free of the tax on this road, but there is not much in that—a few pence on the whole run. The saving in the cost of running commercial vehicles would be considerable, owing to the relatively few checks to straightforward running, but it cannot be contended that this would suffice to attract vehicles other than those for which the route would provide the shortest, or nearly the shortest, way—and leave a substantial profit to the syndicate, after deducting the vehicles' share of the cost of maintenance. The great width of the road—150 ft.—would make it somewhat costly to maintain, in proportion to the area of the surface, but, from the present point of view, this consideration has not the full force that it would have in a general comparison, as the extra cost may partly be met out of capital expenditure, in the provision of a very large number of cross culverts, and drainage by elements of width instead of across the whole surface. The data now available do not allow of an engineering criticism of the scheme being made, but, on the bare facts at present furnished, it certainly seems that the significance of engineering features in relation to capital cost, the costs of maintenance, and the nature and volume of the traffic have not been adequately and competently considered.

Institution of Municipal and County Engineers. To anyone acquainted with the history of Salisbury, the beauty of the surrounding country, and the efficiency of the municipal administration, the idea of holding a meeting of the Institution of Municipal and County Engineers there must have appeared wholly attractive. Cathedral cities are popularly supposed to possess certain attributes—not all of them desirable ones—but while the visitor to Salisbury finds himself in an atmosphere of holy calm, he soon discovers that those responsible for the public affairs of the city are by no means asleep. Saturday last was the first occasion on which a meeting of the institution had been held in Salisbury, but this fact did not affect the cordiality with which the members were welcomed by the mayor. After the preliminary proceedings, two papers were read. Mr. W. J. Goodwin, ASSOC.M.INST.C.E., the city engineer and surveyor, dealt with the municipal works of Salisbury, and Mr. John H. Blizard, ASSOC.M.INST.C.E., described the Bemerton and Wilton sewage disposal scheme. The former paper completely reviewed the engineering achievements of the corporation and the work of Mr. Goodwin's own department, but the principal matters dealt with were naturally the water supply and sewage disposal. The whole of the water supply is derived from deep wells in the chalk, and the water is not only of unlimited quantity and exceptional purity, but it is also supplied at the phenomenally low price of 6d. per pound of rateable value. When the city boundary was extended in 1904 three small water undertakings which were at that time giving a supply in portions of the added area were acquired by the corporation. Alterations were soon found to be necessary, and their execution and the subsequent maintenance of the whole of the works in a high state of efficiency reflect the greatest credit upon Mr. Goodwin. The extension of the city boundary also necessitated additions to the sewage disposal works, which were carried out under the supervision of Sir Alexander Binnie & Sons. Mr. Goodwin's paper was a complete justification of his concluding remark that although old cathedral cities are usually considered to move slowly and to be more or less behind the times, Salisbury is so much up to date in municipal matters that the councils, past and present, are to be congratulated upon the progressive spirit they have displayed. The reading of the papers was followed by an interesting discussion and the entertainment of the members at luncheon by the mayor. A round of visits in the afternoon brought a highly successful meeting to a close.

A successful meeting of the Eastern District of the Institution was held on the same day at Ipswich, when Mr. John R. Mead, who was elected sub-district secretary for the counties of Norfolk, Suffolk and Cambridge, gave an interesting description of some works recently executed under his supervision. Perhaps the most interesting part of his address was that which was devoted to a description of the new building which is being erected at a cost (including land) of £7,700 for the accommodation of the medical officer of health, the school clinic and tuberculosis dispensary. As Mr. Mead pointed out, recent statutes have so added to the duties and responsibilities of these officials, that special accommodation has become necessary, and special buildings are being erected in many towns. The building at Ipswich is divided into four separate departments—namely, the medical officer's administration department, the sanitary inspector's department and laboratories, the tuberculosis department, and an infants' department. A separate entrance from the open air is provided for the tuberculosis patients. Mr. Mead also

described the municipal tenement dwellings which are about to be erected, and which are intended particularly for persons who are unable to pay an economic rent; also a proposed extension of the sanatorium to provide accommodation for ninety patients at an estimated cost of £4,500. Finally, he dealt with some aspects of road making and maintenance. The address produced a useful discussion.

* * *

New York Water Supply.

That a careful and systematic search for leakage or waste of water in the city of New York would probably have saved an enormous outlay of money, required in order to supply 150 gallons per head to the population, is a matter which must come prominently before engineers in this country. It is difficult to imagine why, if we in London require about 30 gallons a day, the inhabitants of New York should need five times the amount. Where trouble has been taken in other American cities an enormous amount of leakage or waste has been detected. For instance, by the prevention of undue waste the quantity of water pumped daily in West Philadelphia was reduced as reported from 45,000,000-48,000,000 gallons to 32,000,000-35,000,000 gallons in one year, and many similar instances might be quoted. On the other hand, the American engineers seem to expect enormous waste and leakage, and to have deliberately provided for it, for it is urged that the greater pressure will carry water to the upper floors of high buildings, formerly supplied by means of separate pumps, and it is expected that with an unrestricted supply more water will be used at these places.

The discussion following the paper read at the joint meeting of the Society of Engineers and the Institution of Municipal Engineers, being the first meeting in this country at which the water supply works of New York have been discussed, shows the difficulty which English water engineers in this country have in accepting the fact that a supply of 150 gallons per head is really necessary. While the discussion did not deal with matters of detail, enough was said to suggest that when the whole matter receives fuller consideration and discussion there will be many points upon which opinions will be divided. Mr. Sandeman drew attention to the fact that the factor of safety allowed for the Olive Bridge dam was greater than that allowed for the Croton dam, and commended the change. He also expressed an opinion unfavourable to concrete core walls used instead of puddle trenches. The construction of a large concrete conduit as a foundation of earth rolled in 3-in. layers was also regarded as risky.

The subject and the meeting are of very great importance. The meeting is of special interest as showing a distinct effort on the part of two engineering societies, entirely different in character and constitution, to co-operate in a friendly manner for the discussion of a matter of common interest. Such co-operation is to be commended as being likely to lead to better meetings and to lessen the number of meetings held by the many different societies in London: for it generally happens that two or three papers on the same subject are read in one session before different societies, each meeting being poorly attended, when by a combination of forces at one meeting much time and money might be saved. The increase in the number of meetings of various societies and institutions is becoming a tax upon the time of the ordinary member too great to be borne, and the smaller number of persons present at such meetings is very noticeable. It is therefore to be hoped that the practice of holding joint meetings will be more generally adopted when

papers of interest to two or more societies are to be read.

* * *

**Proportioning
Concrete.**

There is probably no material of construction more widely used than cement concrete, and having regard to the essential part which it plays in the economy of almost every engineering work of any magnitude, too much trouble cannot be taken in investigating its strength and properties. Attention has frequently been directed to the necessity for using only the most suitable ingredients, and for securing thoroughly efficient mixing if good results are to be obtained. From the point of view of economy it is almost equally necessary to see that the several ingredients are present in their proper proportions. As to what these proportions should be no exact rule can be laid down, but the investigations of Mr. John A. Davenport, ASSOC.M.INST.C.E., and Mr. S. W. Perrott, M.INST.C.E., the results of which were incorporated in a paper entitled, "Sand and Coarse Material and Proportioning Concrete," read by those gentlemen at the last meeting of the Concrete Institute, should prove of great assistance in this direction. The general object to be achieved in mixing concrete is to attain the maximum of strength with the minimum of cost; or, in other words, so to grade the materials that the sand will just fill the voids in the coarse aggregate, and the cement will just fill the voids in the resulting mixture and coat each particle with a thin jointing layer. Of course, greater strengths can be obtained by the use of an excess of cement, but any increase of strength secured in this way is out of proportion to the increase in the cost, and so is only justified in special circumstances. The object of the experiments conducted by the authors of the paper referred to was to test the effect of the proportioning of materials upon the strength and other properties of the resulting concrete. The investigation as originally planned was to have included tests as to compressive strength, modulus of rupture, specific gravity, water resistance, and fire resistance, but circumstances compelled the postponement of the last three, which it is to be hoped may form the subject of a subsequent paper. In concluding their paper, the authors state that they do not feel justified in attempting to generalise from the results of their experiments, as they consider that these results do no more than open up the subject of proportioning and grading in relation to cost. We fully agree that the figures already given by them show that the subject is well worthy of special research, and engineers will await the results of their further work with great interest.

* * *

**Second-hand
Road Stone.**

For some time past the urban district council of Leatherhead has been able to obtain at a reasonable price considerable quantities of second-hand road stone, suitable for making up the roads of the district. The surveyor, Mr. S. R. Drake, went into the matter very closely some years ago, and came to the conclusion that the council were saving money by using this material, and the roads on which it was used three years ago are now in a satisfactory state. To some persons it may seem, at first sight, that it would be desirable to use for the roads of a district such as Leatherhead only the best stone of a particular class. Supposing, however, that the second-hand stone of one class has precisely the qualities of the best stone in another class, but costs less, it would obviously be economy to use the second-hand stone. In actual fact, partly worn granite, though it may be somewhat rounded and reduced to a small average size, may be of such a nature that, with moderate expenditure on steam rolling,

it will provide very fair road crusts suitable for roads with considerable traffic or, generally, more lasting crusts than can be made at the same cost with other materials. It is precisely in a district such as that of Leatherhead that one would expect to find the use of second-hand granite an economical advantage, especially if the material has been removed from roads where wood paving was in progress, before the stone was approaching the end of its ordinary life. In the neighbourhood of London, second-hand granite is probably cheaper than it is anywhere else in proportion to the cost of new stuff, and possibly it is as cheap as it is anywhere in proportion to the cost of the best stone of those not reckoned in the first class—in this case probably Kentish rag. The smaller and tougher material can be rolled to a good shape more cheaply than can the larger stone, and if incipient decay of the stone has rendered it somewhat less strong than the new material the resulting tendency to rapid binding may be of some advantage on roads with light traffic.

* * *

**Private Street
Works Loans.**

On Monday in the House of Commons Mr. Keir Hardie asked the President of the Local Government Board whether, in view of the continued diminution in the number of dwellings available for the working classes in urban areas, and in order to encourage local authorities to meet the demands for such dwellings, he could see his way to grant an extension of the time allowed for the repayment of loans taken up by local authorities to meet the cost of making and paving private streets from seven years to twenty years. The question is one which undoubtedly raises an important point. The President of the Local Government Board in his reply did not admit the hypothesis upon which it was based, but at the same time his attitude was distinctly sympathetic. At the present time the usual period allowed for the repayment of loans by local authorities in respect of street works executed by them in connection with housing schemes is twenty years. Mr. Samuel pointed out that where the cost of making up the streets has to be repaid by the frontagers a period of seven years has hitherto been usually allowed. But he promised that in future, if in any case it could be shown that a longer period was desirable on account of the financial position of the frontagers, or for other reasons, and that the local authority was willing to allow the frontagers a longer period, the board would be prepared to consider an extension of the time for repayment of the loan. There would appear to be little objection to this, inasmuch as local authorities have power under section 257 of the Public Health Act, 1875, to declare that the period for repayment by frontagers shall extend to thirty years.

* * *

**Proposed
Exchequer Grants
for Road
Maintenance.**

By an unfortunate slip, in the first column of the opening page of our issue of last week, we referred to the sum which the Chancellor of the Exchequer proposes to allot to the maintenance of roads as being nearly £4,500,000. As most of our readers will have realised, this should have been "nearly £2,500,000," the exact sum mentioned in the Budget speech being £2,480,000. The sense of the passage is not affected, as this sum is a very substantial proportion of the cost of main road maintenance: the main roads maintained by or at the cost of county councils, in urban and rural areas, costing at the present time not much more than £3,000,000, allowing for increases on the figures in the last local taxation returns.

Some Notes on the Municipal Works of Salisbury.*

By W. J. GOODWIN, ASSOC. M. INST. C. E., City Engineer and Surveyor.

As this is the first occasion on which a meeting of the institution has been held in Salisbury, the author proposes briefly to outline generally the municipal works of the city rather than to deal in detail with any particular feature. As a matter of comparative practice, the information may be found interesting and, possibly, in some respects useful.

HISTORY AND STATISTICS.

It is not usually known outside the city that the official name is not "Salisbury," but "New Sarum." Old Sarum lies to the north, less than $\frac{1}{4}$ mile outside the present city boundary. It was once an important and flourishing Wessex stronghold dating back to the remote days of the Celt and Belgae, the earliest inhabitants of Britain of whom we have any authentic record. The site is now being excavated by the Society of Antiquaries.

The present city dates from 1220, when the foundation stones of the famous cathedral were laid. The cathedral is too well known throughout the world to require any description here. A Royal Charter was granted in 1228 by King Henry III., whereby the city and borough of New Sarum (then known as Saresbury) was constituted a city for ever.

In the very early days, surrounded as it was by the large plain with immense flocks of sheep, the city became an important centre of the export wool trade. A large proportion of the inhabitants were weavers, fullers, and others engaged in the making of cloth. This industry, however, died away with the introduction of machinery, when it was more economically carried on further north in the region of the coalfields. The splendid merchants' residences, erected several centuries ago, are a feature of the city. They were originally surrounded by immense gardens and orchards, but most of the ground was afterwards sold for building purposes, and now present the curious sight of a fine old house next a number of cottages.

The boundary has only once been extended since the Municipal Act of 1835, and this was in 1904. The area of the city prior to its extension was 600 acres, and the population, according to the census of 1901, was 17,117, the rateable value being £79,424. The present area is 1,710 acres, the population at the last census was 21,217, and the rateable value is £115,962. The average death-rate for the past five years was 10.8.

WATER SUPPLY.

The whole of the water supply is derived from deep wells in the chalk. It is of unlimited quantity, and of exceptional purity. The old city area is supplied from the corporation waterworks (which are under the author's control), and the greater part of the area added in 1904; but a small portion of the added area, shown hatched in Fig. 1, is still supplied by a private company under Parliamentary powers. The quality of the water is the same, the only difference between the two supplies being that three times as much is charged by the private company, and the residents in that area consider that they have a distinct grievance.

The original plant of the corporation was laid down in 1855, and consisted of a well, 82 ft. deep by 8 ft. in diameter, with about 50 ft. of heading and 50 ft. of 9-in. borehole, two compound condensing beam engines, two Cornish boilers, 20 ft. by 6 ft diameter, and the pumps, which were gear-driven. A brick-in-cement covered-in reservoir, shown in Fig. 4, was constructed about $\frac{1}{4}$ mile from the pumping station holding 295,000 gallons, with 12-in. rising and distributing mains. The estimated cost of these works was £12,000.

The whole of this plant is still in use except that a new set of cylinders has been fixed to one engine; the original pumps were replaced in 1905 by a pair of single-acting pumps 2 ft. 9 in. stroke by 14 in. diameter delivering 750 gallons per minute; a surface condenser took the place of the original jet condenser, and one boiler has been renewed so as to provide a duplicate for the new pumping plant (described in the next paragraph), which is worked at higher pressure. These engines work with a steam pressure of 40 lb. per square inch.

In 1894 the entire pumping plant was duplicated at a cost of £5,200 by the provision of a new engine-room, &c.: an additional well of the same depth and diameter as the old one, with about 60 ft. of 15-in. borehole, and a tunnel was driven at the bottom to connect the two wells. A Lancashire boiler was provided, and a compound surface-condensing beam engine erected, with bucket and plunger pump in the well worked by the continuation of the low-pressure piston rod. The low-pressure cylinder is 23-in. diameter by 48-in. stroke, and the high-pressure cylinder 16-in. diameter by 32-in. stroke. The flywheel is 14 ft. in diameter, and weighs 5 tons. The engine works at 100 lb. per square inch pressure, and is 75 indicated horse power.

The double-acting pump of the bucket and plunger type is 18 $\frac{1}{2}$ -in. diameter by 48-in. stroke, the plunger 13-in. diameter. A cast-iron air vessel in the well on the rising main is 12-ft. by 3-ft. diameter, and another, outside the pumping station, is 10-ft. by 3-ft. 3-in. diameter. The capacity of the pump is 70,000 gallons per hour, although it is usually run so as to deliver 1,000 gallons per minute. The whole of the plant, therefore, consists of two wells, three engines and three boilers. The larger pump, just described, is the one ordinarily used, those in the old engine-room being reserved as a stand-by plant. The pump is usually worked for twelve to fourteen hours a day, the afternoon run being arranged so that pumping is stopped about midnight with a full reservoir. The total lift, taking the mean-water level in the well, is 141 ft. The level of the water in the reservoir is electrically indicated at the pumping station.

A 5-ton travelling crane spans the engine-house, commanding every part of the machinery.

Fig. 3 shows that extraordinary pumping, on account of drought, has practically no effect upon the level of the water in the well. During the months of April to September inclusive, in 1911, there were two periods of "absolute drought," and the total rainfall for these months was 6.27 in., according to the corporation rain gauge, whereas the average for the past half-century has been 13.8 in.; yet it will be noticed that after the long days of pumping, the depth of water in the wells was little reduced below the normal, and that during the short period of rest at night, about four hours, the water rose to its usual level. The connecting broken lines for November and December are where the stand-by plant was in use while the large pumps, &c., were being overhauled ready for the summer run. As the rate of pumping is less, the water level does not fall so far, and, for the sake of comparison, the actual recorded level is omitted.

When the city boundary was extended in 1904, in addition to the private company previously referred to, there were three small water undertakings which were at once bought by the council. The mains of one were immediately connected to the city supply and the wells of the other two were used for a few years, but both are now discarded, the whole of the corporation supply being derived from the wells at the chief pumping station. The old reservoirs, however, are still in use, as they supply higher levels than can be reached from the main service reservoir.

The Haruham high level reservoir is on the south side of the river Avon (see Fig. 1), and is supplied from the old pumping station belonging to this undertaking, the water being taken direct to the pump from the city mains and forced to the reservoir, which is 128 ft. above the engine-room floor. Power is derived from a gas engine, with an oil engine as a stand-by. A horizontal three-throw ram pump is now being built by Messrs. Tangyes, Limited, capable of lifting 10,000 gallons an hour against 300 ft. head, and will be fixed in time for the summer demand. This has been necessitated by the growth of that part of the city since it was included.

The Milford reservoir is close to the main service reservoir, and used to be supplied from a separate well, the pumps being driven by an ancient gas engine. When the water tower was erected near, and the rising main extended to supply it, the author took the opportunity of laying a branch main to the reservoir, as shown on Fig. 4, and dispensing with the separate pumping station.

* Paper read at the meeting of the Institution of Municipal and County Engineers at Salisbury last Saturday.

A water tower, shown in Fig. 4, was erected five years ago to supply part of the added area known as Bishops Down. The land is the property of the Ecclesiastical Commissioners, and by agreement they erected the tower and tank, the corporation extending

covered iron tank holding 5,000 gallons. The tank is built of Mather & Platt's cast-iron standard plates. The engineers for the work, on behalf of the commissioners, were Messrs. Lemon & Blizard; the author acting for the corporation.



FIG. 1.—PLAN OF THE CITY OF SALISBURY.

the rising main and laying the necessary distributing mains. The entire responsibility for the upkeep of the structure will shortly devolve upon the corporation. The tower is built of brick in cement, with a

As the engines were called upon to lift the water an additional height of 56 ft., a 9-in. rising main was laid so as to reduce the friction head to a minimum, and a 4-in. by-pass, with indicating and locking

valve, shown in Fig. 4, was provided. This valve is set so that only half of the water pumped is sent on to the tower when the main valve A is closed, thus avoiding unnecessary strain upon the engines. The tank now fills in ten minutes. It will be seen from Fig. 4 that a short length of main connects the tower supply with the distributing main from the Milford reservoir, so that by opening the valve B and closing the outlet valve from the reservoir, a much higher pressure can be obtained in case of fire.

The capacities and levels of the reservoirs are as follows:—

	Depth.	Capacity.	Top water level.
			Feet above O.D.
Main service reservoir	12 ft.	295,000 galls.	291.57
Milford reservoir ...	11 ft.	15,000 galls.	300.30
Harnham reservoir ...	9 ft.	47,100 galls.	355.11
Water tank on tower	6 ft.	5,000 galls.	347.25
Total		362,100 galls.	

The 12-in. rising and 12-in. distributing mains are connected outside the pumping station, so that the main service reservoir really acts as a balancing reservoir, except when the tank and Milford reservoir are being filled. The valve at the pumping station between the two mains is then closed.

Four years ago the corporation laid mains in the district supplied by the private company for three reasons: (1) To supply water for the sewer flushing wells, (2) to provide a more adequate supply in case of fire, and (3) for street watering. The hydrant plates on the company's supply are painted a distinctive colour. The saving of the amount paid to the company for water for sewer flushing meets the sinking fund and interest on the loan.

The charge for water for domestic purposes is the very low one of 6d. in the £ nett rateable value. Water by meter is supplied at 8d. per 1,000 gallons, with a sliding scale reducing to 3½d. per 1,000 gallons. The London and South-Western Railway are large consumers, taking equal to 6.3 gallons per head per day, the present price being 3d. per 1,000 gallons. No additional charge is made for baths or water-closets, and the garden charges range from 5s. for between 10 and 20 rods, to 15s. for 2 rods. These include use of hose, which must be held in the hand. Gardens under 10 rods are free, unless a hose is used, when 3s. is charged.

Baths have been provided to practically all new houses, however small, for many years past, and the number of houses in the city without water-closets can be counted on the fingers of one hand. Considering this, and that the legitimate use of water is in no way restricted, the average of 26 gallons per head per day throughout the year for domestic purposes cannot be considered excessive.

The total quantity pumped per head per day is about 41 gallons. Water used for sewer flushing, street watering and other municipal purposes is charged to the several committees at 1½d. per 1,000 gallons, to cover the cost.

A chemical and bacteriological analysis is made each quarter, taken from different parts of the city, at a house tap as far from the reservoir as possible, except once a year it is taken at the outlet of the reservoir itself. An average analysis is as follows:—

CHEMICAL ANALYSIS.		
Results expressed in grains per gallon.		
Saline ammonia	.. .. .	none
Albuminoid ammonia	.. .. .	.0070
Nitrogen as nitrate	.. .. .	.44
Nitrites	.. .. .	absent
Oxygen absorbed in 4 hours at 80 deg. Fahr.	.. .. .	.004
Chlorine as chloride	.. .. .	1.3
Total dissolved solids	.. .. .	24.0
Earthy carbonates	.. .. .	15.0
Earthy salts, not carbonates	.. .. .	2.0
Hardness	.. .. .	18.0
Poisonous metals	.. .. .	absent
Sediment	.. .. .	none
BACTERIOLOGICAL ANALYSIS.		
Colonies on gelatine plate at 22 Cent.	.. .. .	5 per c.c.
" " " (liquefying)	.. .. .	2 per c.c.
" " " on agar plate at 37 Cent.	.. .. .	0 per c.c.
Bacillus coli	.. .. .	absent
B. enteritidis sporogenes	.. .. .	absent
Streptococci	.. .. .	absent

SEWERAGE.

Until about 1849 there was no system of sewerage in the city, the drainage finding its way into the

rivers direct or by means of channels which ran along the sides of many of the streets. During the next five years £27,000 was spent on laying sewers, the engineers being Messrs. Rammell & Lister. Previously the water rose to the surface, and these sewers had the effect of lowering the level by 3 ft. 6 in., the sewer joints being left open for the purpose. When the city boundary was extended in 1904, Sir Alexander Binnie & Sons were engaged, and practically a new sewerage scheme, on the separate system, was adopted. In some of the side streets the old sewers were relaid or rejointed and made watertight, but all the principal sewers are new, receiving the drainage from those laid, at the same time, in the added areas. Where new sewers were laid, the old ones were converted into surface water sewers. The original 4-ft. 6-in. by 3-ft. brick outfall sewer, which has open joints, is still in use as the surface water outfall sewer; the newer 4-ft. by 2-ft. 9-in. concrete outfall sewer also being retained for sewage.

The sewage from two low parts of the city is raised by means of Shone's ejectors. Those in the Close (No. 1 on Fig. 1) have a capacity of 50 gallons, the ejectors being in duplicate. They are in a cast-iron shaft 9 ft. in diameter. The other ejectors (No. 2 on Fig. 1) lift the sewage from the south side of the river across Harnham Bridge. Again, they are in duplicate, each of 100 gallons capacity, housed in a cast-iron shaft 12 ft. 8 in. diameter, access being obtained from the footpath by a side entrance constructed of reinforced concrete. Compressed air is conveyed by a 2½-in. air main from the air compressors at the sewage disposal works.

SEWER FLUSHING.

The greater part of the city lies on ground which is almost level, and sewer flushing has had to be adopted to a considerable extent. There are twenty-four flushing chambers, with automatic syphons, of which twenty were constructed under the scheme of Sir Alexander Binnie & Sons, and are shown in Fig. 5. The capacities are from 250 to 1,500 gallons, and during most of the year are set to discharge about 1½ times each twenty-four hours. The old sewers in the city are flushed from vans during dry weather.

SEWER VENTILATION.

The sewers of the city are unusually well provided with 6-in. diameter wrought-iron vent shafts, 30 ft. high, which answer well and give rise to no complaint. As previously intimated, the separate system was put into operation when the boundary of the city was extended, and this had a curious result which it was difficult to foresee.

When the author took up duties, he found a great deal of complaint had been made of smell in the neighbourhood of the sewage disposal works. The works themselves (being all that could be seen) were blamed, and a petition was then being signed to send to the Local Government Board asking that they should be removed. The author tried to prevent this being forwarded until it was seen what could be done, but it had gone too far to be dropped. As a result of anemometer and meteorological observations, involving a good deal of night as well as day work by the author and his staff, it was quickly concluded that the works were not to blame, but the cause of the trouble was that the sewage in the outfall sewer was now so much more concentrated through the exclusion of subsoil water. This sewer is not too large in time of storm (when it assists the old brick culvert which is alongside and connected by overflows), but the reduced amount of the dry-weather flow occupied such a comparatively small space that the air in the sewer became polluted, and changes of temperature, in either direction (usually occurring about sunset), resulted in air movement, it being discharged out of the vent shafts. It was found possible to anticipate complaints according to the uniformity or otherwise of the temperature in the sewer during the preceding few hours. The gradient of the outfall sewer being 1 in 1,760, the sewage travels slowly, and is already somewhat stale, having been some hours in flowing from the other ends of the city.

The whole of the ventilating shafts on this length were disconnected, at first temporarily, which resulted in immediate cessation of complaints. They were then cut off permanently. The outlet end of the sewer was connected to the outer cavity of the refuse destructor chimney, with suitable flap valves to prevent the ingress of air at that end of the sewer. The influence of the chimney is noticeable nearly ¼ mile away. Two Webb's ventilating shaft lamps were erected, and these are alight day and night. Three

automatic flushing wells, about 250 gallons each, were constructed to assist the flow in old flat sewers near the affected area, and at week ends, during dry weather, these are set to discharge as frequently as possible—about every half hour. Aluminium flap valves were fixed at the outlets of the branch sewers,

water pipes to be connected direct to the sewers, and in view of the very dilute condition of the sewage at that time, there could be little objection. As it was difficult at times to get results through so much smoke being lost and varying wind conditions, the author intended, after this list of defects had been remedied,

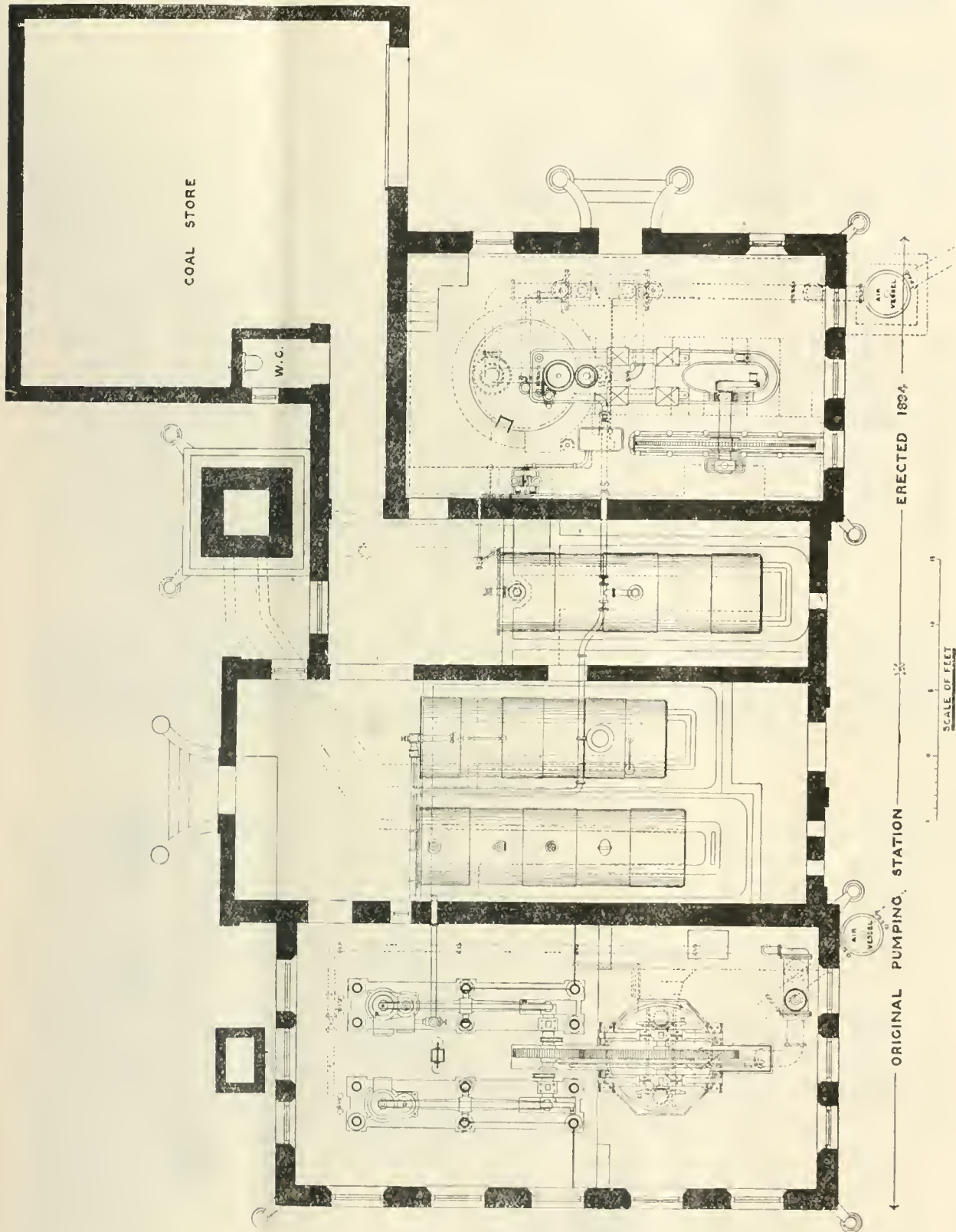


FIG. 2.—PLAN OF CHIEF PUMPING STATION, SALISBURY WATERWORKS.

so as to discourage air movement from the main out-fall sewer.

It was known that a number of rain-water pipes in the district were connected direct to the sewers without an intercepter. A large smoke-testing machine was purchased, and the sewers were put under smoke test in lengths between manholes, with the result that sixty defects were discovered. Nineteen cases were faulty drains, and the owners were called upon to put them in order; the remaining forty-one were untrapped rain-water pipes, and were remedied at the cost of the corporation with the consent of the owners. It must be noted that the building by-laws at that time (which were superseded in 1905) allowed rain-

to test again during the following spring of 1912, but the result of the work done has been so satisfactory that the testing has not been repeated.

HOUSE REFUSE: COLLECTION AND DISPOSAL.

There are only about a dozen ashpits in the city in connection with hotels, schools, &c. These are cleared periodically. The ashbins number 5,214. Rather more than half are emptied twice a week, and the remainder once a week. Those in the old city are emptied by the corporation employees; the added area is still dealt with by a contractor, the refuse being collected once a week. The cost is 9d. per head per annum.

The whole of the refuse is burnt in a two-cell Horsfall destructor, which is fed from the rear; the capacity is 140 tons a week, the quantity burnt being 100 tons per week. The destructor was erected in 1901, and is in connection with the sewage disposal works, the heat being utilised for raising steam to 125 lb. per square inch in a pair of Babcock and Willcox's

SEWAGE DISPOSAL.

Parts of the sewage disposal works date back to the year 1885, when the method adopted was lime precipitation, and the sludge was pressed. There were eight tanks, and these have since been modified except two which have been filled up. In 1901 four of the tanks were converted into two

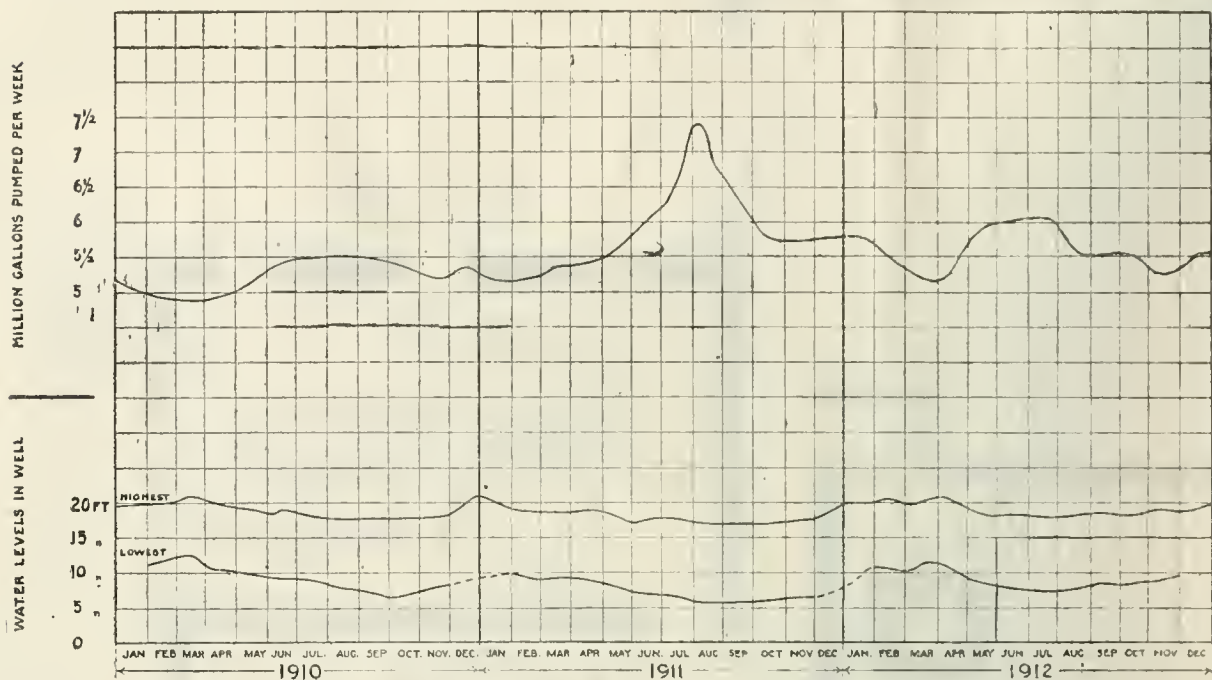


FIG. 3.—DIAGRAM SHOWING WATER LEVELS IN WELL, &C.

boilers, which can also be coal fired. An economiser of the usual type was fixed in the flue between the furnaces and the dust catcher, but, apparently through the moist gases from garden refuse, &c. (of which a considerable quantity is sent, most houses having gardens) attacking the lower ends of the tubes, they

septic tanks, the walls being raised 9 ft., and a pumping plant was laid down at the same time along with the refuse destructor. The pumps are double acting, the pump rod being the continuation of the piston rod of a pair of Worthington triple-expansion jet-condensing engines. The pumps are capable of lifting

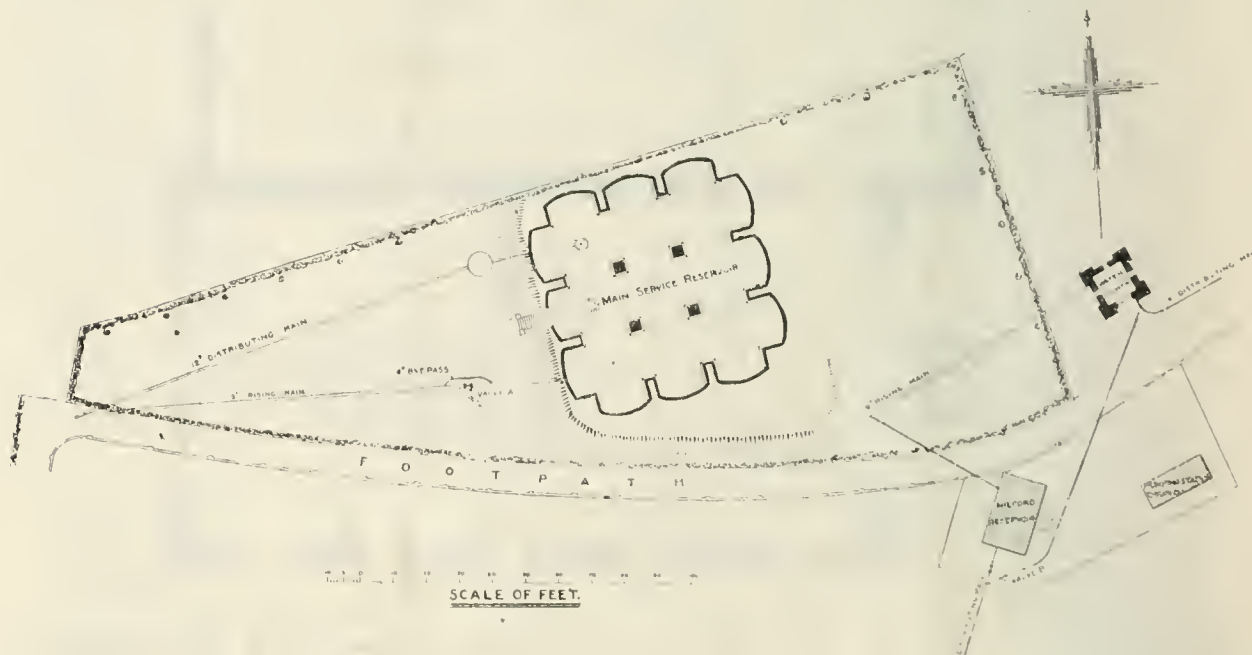


FIG. 4.—PLAN OF RESERVOIRS, &C.

had to be renewed in October, 1907. In June, 1910, the second set of tubes had wasted so much, at the same height, as to be condemned by the insurance company, and the author advised the council not to renew, but to remove the economiser, as the cost of upkeep was more than the saving of fuel. This was done, and a feed-water heater fixed on the exhaust pipe from the air-compressing engines, which raises the heat of the supply up to between 170 and 180 degrees without cost, and its upkeep is nil.

from 2,000,000 to 4,500,000 gallons per day about 14 ft., the necessary height for the sewage to gravitate through the tanks and beds to the outfall. At that time, the subsoil water being purposely admitted to the sewers, the "dry-weather" flow was 2,000,000 gallons per day.

The septic tanks are open, 80 ft. by 55 ft., and 17 ft. deep. Two of the primary filters, marked A and B on Fig. 6, were Stoddart's distributors, and three, marked C, D and E, were Adams' revolving sprinklers,

all made of clinker, either from the destructor or gasworks. There were also four small secondary beds, 18 in. deep. All this plant is still in use, one septic tank being worked at a time. Some sludge is usually drawn from the septic tank once a week, when the grit chambers are cleaned out, and the top scum is periodically removed, especially in warm weather, when the floating fat becomes offensive. The whole of the works already described had been laid out under either Mr. A. C. Bothams, ASSOC. M. INST. C. E., the author's predecessor, or his father, the late John C. Bothams, M. INST. C. E., and it is owing to the abilities and foresight of these two gentlemen, who between them held the office of city surveyor for fifty-five years, that the sanitary works of Salisbury owe their efficiency.

The system worked so satisfactorily that, when the works were extended under Sir Alexander Binnie & Sons, on the extension of the city, in 1907, the same method was adopted. The Worthington pumps are retained as the storm-water pumps, a pair of 20-horse power compound steam engines driving the air compressors which raise the dry-weather flow (now reduced by the exclusion of subsoil water to 630,000 gallons per day) by means of the air lift shown in Figs. 9 and 11 to the septic tanks, also providing compressed air for the two Shone's ejectors in the city. Compressed air is stored in a receiver, at the rear of the compressors, at a pressure of 16 lb. per square inch.

The primary filter area was extended by the erection

contract; the price at present received is £13 per annum, the contractor undertaking to keep the works clear. The quantity removed is about 1,000 loads each year. The effluent from the sludge lagoons returns to the main screening chamber for treatment.

The final effluent is remarkably bright and clear, and is perfectly free from smell. An analysis of samples taken by dippings over twenty-four hours in 1909 is as follows:—

Results expressed in parts per 100,000.

	Sewage.	Tank effluent.	Primary filter.	Final filter.
Saline ammonia	4.00	3.70	1.20	.50
Albuminoid ammonia	.67	.47	.28	.08
Nitrogen as nitrate and nitrite	—	—	1.58	2.06
Oxygen absorbed in 4 hours	2.60	1.7	.76	.46
Chlorine as chloride	6.60	6.0	5.80	5.80
Suspended solids organic	62.9	11.0	6.0	1.0
Suspended solids mineral	20.6	9.0	4.0	1.0
Suspended solids total	83.5	20.0	10.0	2.0

Incubator test

	non-petrescent	non-petrescent.
Loss of dissolved oxygen on keeping Royal Commission test.		
1 day	.536	.275
2 days	.794	.394

Between three and six times the dry-weather flow is dealt with on a storm-water bed, 3,900 sq. yds. in area of flints 3 ft. deep; all above six times being discharged over a separating weir direct into the stream.

The author, with the consent of the Local Govern-

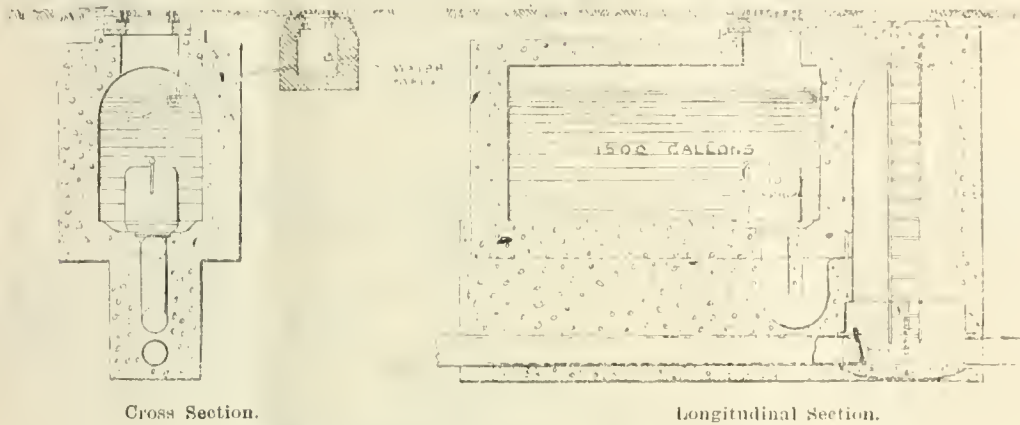


FIG. 5.—DETAIL OF SEWER FLUSHING CHAMBERS.

of five more filters of 500 sq. yds. area each, 6 ft. deep, with Adams' revolving sprinklers, marked F, G, H, I and J in Fig. 6. All the filters have open sides made of large clinker, stone, &c., and are filled in with smaller clinker, not graded, about 4-in. gauge. Fifteen secondary beds were constructed, with a total area of 4 acres. These are 18 in. deep, underdrained, and the clinker is not graded, except that the top 3 in. is fine to retain the particles of humus which come from the primary filters.

The first revolving sprinkler built (C in Fig. 6) is still in constant use after thirteen years' service. The primary filters do not show the slightest signs of clogging or disintegration, except in places where soft brick or stone was used for the containing walls. These have been repaired with clinker or old hard stone.

With reference to the secondary beds, under normal conditions they became choked when the depth of deposit was slight, and the labour of cleaning over the whole surface of the bed seemed out of proportion to the quantity of matter removed. The method now adopted is to allow the effluent to pond up the available depth of 6 in. to 12 in., the result being that the beds are worked much longer and the labour of removing the deposit is practically the same as for the thinner layer. Another advantage is that when a bed is choked it is not shut off from the carrier and the valve of the adjoining one opened, but a communicating pipe between the beds, at the opposite end to the carrier, feeds the new bed from the old one. The effluent, in travelling the length of the old bed, adds still further to the deposit there, and the greatest thickness being at the inlet, this, in the new bed, is where it can be most easily removed, which avoids wheeling across from the carrier end where it would normally deposit.

The sludge from the septic tanks and grit chambers is air dried in underdrained lagoons, and sold by

ment Board, four years ago carried out certain alterations to the grit chambers, and the "Waterloo" outfall, with a view to reducing the area of sewage exposed to the sun and air, and facilitating the cleaning of the grit chambers. The open channel between the outfall and the air lift was filled in, the sewage now being conveyed in pipes, and the area concreted over. In times of storm this is frequently submerged and, being the old chemical precipitation tanks, filled in with clinker, it was advisable to make it watertight.

It was found that the velocity of the sewage through the grit chambers was so much reduced that deposit of solids took place, which should be dealt with in the septic tanks. The channels were made narrower, giving an increased velocity, and a square drain constructed across the bottom, as shown in Figs. 7 and 8, controlled by penstocks; so that the storm-water sumps can be emptied into the small sumps next the septic tanks and pumped away by the centrifugal sludge pump, being either lifted into the septic tank or sent on to the sludge lagoons. The cross drains act as a check upon, and form pockets for, the grit, &c. The 18-in. by-pass was also laid at this time from the main outfall, for use while the grit chambers are being cleaned out, and the floors of the storm-water tanks were raised and concreted over, as shown in Fig. 8, the central channel sloping towards the grit chambers so as to facilitate cleaning and emptying after use. This section shows the shape of the original precipitation tanks.

It will be noted that the large tanks to the north of the grit chambers are not storm-water tanks, as so understood at the present time. They act as channels, conveying storm-water to the suction of the Worthington pumps. If a storm is of sufficient intensity to cause the sewage to flow over the weir, but it is not likely to continue, the water is allowed to remain there and is removed by the centrifugal

pump, thus avoiding starting the larger pumping plant unnecessarily.

The original centrifugal sludge pump was replaced in 1910, after about twenty-five years' service. One maker fixed two pumps which choked with the sludge; and another well-known firm, after quoting, declined to accept the responsibility of working with sludge. A Gwynne's "Invincible" was then fixed, and acts admirably. It is run by a 20-horse power Robey steam engine, which also supplies power for the lathe, drilling and other machines, all repairs being done on the premises. Electricity for lighting

haunches. The cost complete, including the removing of the old road crust, is about 2s. 6d. per square yard, made up as follows:—

	s.	d.
Scarifying and removing old surface	1	6
Granite, tar binder and chippings	11	5
Team labour	2	5
Manual labour and plant charges	1	5
Steam rolling	1	5
	2	6.6

The system was found to answer admirably, being quickly laid, and deluges of rain while the work was in progress having no effect upon the result. The

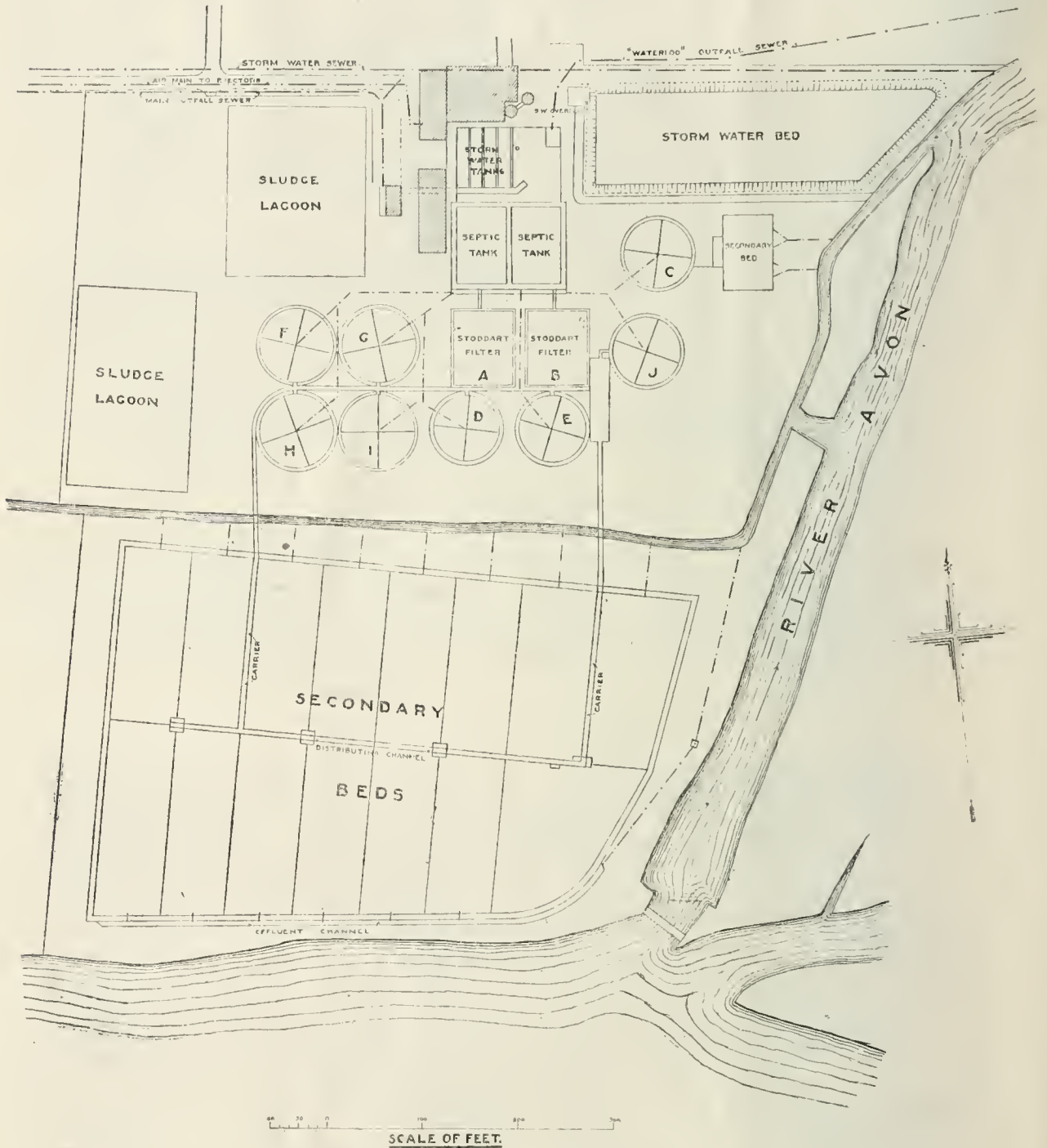


FIG. 6.—GENERAL PLAN OF SEWAGE DISPOSAL WORKS.

is generated at the works by a small steam engine of 5½-horse power.

ROAD CONSTRUCTION.

There are 7½ miles of main roads and 13 miles of district roads in the city. Flints are plentiful around Salisbury, and this accounts for the fact that when the author commenced duties, six years ago, there was not a square yard of granite in the city. Some of the heavily trafficked roads were therefore costly to maintain. In January, 1909, 300 tons of water-bound granite were laid on the main roads, and since then resurfacing has been carried out with granite, bound with "Targranix." The thickness averages 3 in., being two stones thick at the crown and one at the

first roads, laid four years ago, are still in excellent condition, although subject to heavy traffic. About a mile of main road has been resurfaced, and the allowance by the county council is now between 600 and 700 tons per annum. The amounts allowed by the county council for the past two years have been, maintenance and carriageways, £1,445; resurfacing with tar-macadam, £532; footpaths, £300; scavenging, £105; street watering, £110. Improvements to the value of about £300 a year are authorised, the cost being repaid by the county council in ten equal annual instalments. The council being anxious to improve the road surfaces as quickly as possible, spend rather more each year than is allowed. Several applications for assistance have

been sent to the Road Board, both direct and through the county council, but no grant has been made, which has caused great dissatisfaction.

Tar-spraying was commenced just prior to the author's appointment, but, crude tar being used, it was not a success.

Two years ago tar-spraying was again decided upon, Tarvia being used. All the tar-macadam surfaces are now tar-sprayed each year. Between £400 and £500 per annum is spent in tar-spraying the district roads. The machine purchased was Llewellens & James'. Various materials have been used for gritting, including beach grit, limestone and granite

PRIVATE STREET WORKS.

The making up of private streets used to be carried out on a very cheap specification, tar-concrete gutters were the rule. It was a coincidence that on the date upon which the author commenced duties the Private Street Works Act, 1892, came into operation in the city. In the first specification prepared after, stone channelling was introduced, set on concrete and with concrete behind the kerb to support it, as shown in Fig. 12. Frontagers objected to the small increased cost of 11d. per foot, and after the case was twice before the magistrates the specification was adopted. It is as follows: 12-in. by 4-in. Keinton

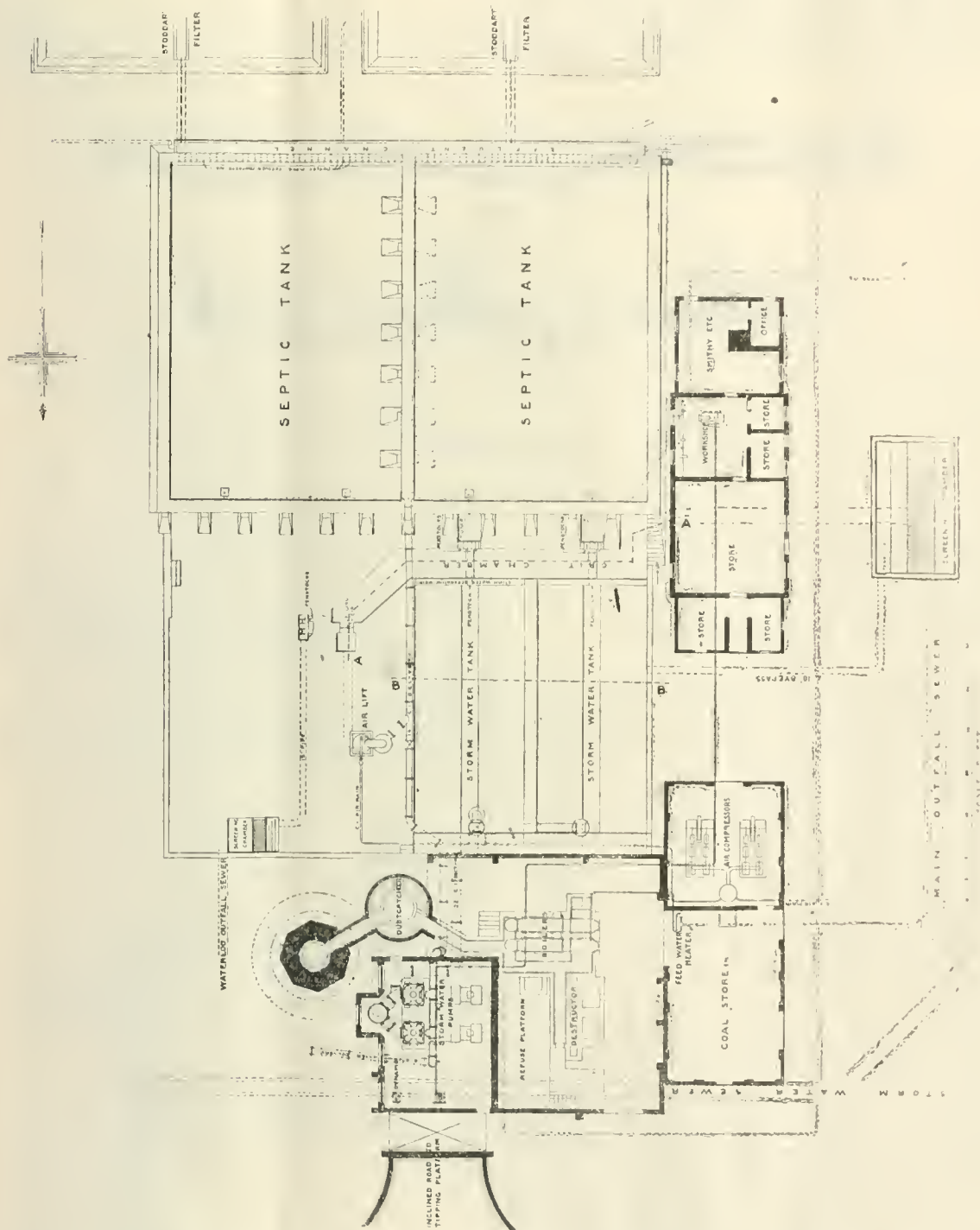


FIG. 7.—DETAIL PLAN OF SEWAGE DISPOSAL WORKS.

chippings, principally the latter. The tar "sets" better with it, and traffic is turned over it at once. The costs per square yard with Tarvia were as follows, for 1912:—

Tarvia, at 43d. per gallon, 4 1/2 yds. per gallon	d.	1.12
Granite chippings, at 12s. per ton, 150 yds. covered per ton	..	.97
Team labour	..	.10
Manual labour	..	.16
Total		2.35

Last year Tarco, being cheaper, was used, with very good results. It cost 4 1/2d. per gallon, and one gallon (being the second year of spraying) covered 5.3 square yards.

stone kerb, 12-in. by 4-in. Keinton stone channel, both on concrete, tar-concrete footpaths and gravel carriageways 8 in. thick. The cost, exclusive of sewers, is about 7s. per foot of frontage. The specification is the reverse of extravagant, but the author, knowing there would be opposition to stone channelling, decided to accept the remainder for streets with little traffic. As a consequence of the tar gutters previously laid down, which were soon useless, nearly £2,000 have been spent during the past five years in renewing some of them with stone.

STREET LIGHTING.

All the streets are lit by incandescent-gas lamps, with the exception of the Close, where electricity is the

illuminant, a special rate being levied by the waywardens on the residents there. In addition to a few high candle-power lamps in special positions, there are 297 100-candle-power lamps, for each of which £2 8s. 6d. is paid per annum, and 439 50-candle-power lamps, for which £1 15s. is paid per annum, the number of lighting hours per annum being 3,701. The council provide the pillars; the whole of the upkeep, including painting the pillars, is borne by the gas company. The price of gas in the city is 2s. 11d. per 1,000 cub. ft.

TREE PLANTING IN STREETS.

Although there are trees around the Market-square and the Green-croft, and a few of the streets were planted while they were still private, a commencement was not made by the council to plant trees in the roads until this year, when two roads were done, the trees selected being *prunus pissardi*, variegated

ing commenced on a cash basis, by which means all costs are accurately ascertained.

The combined depot is very convenient, having offices, workshops, stores, cart-sheds, house for the two road rollers, and ample yard space. A stable was also built to accommodate the contractor's horses during their midday meal. Every department under the author's control is connected to the telephone exchange.

MARKET.

The Market-square adjoining the council house is the property of the corporation, and brings in a net profit, including the annual pleasure fair, which is an old institution, of £250 per annum.

PARKS AND OPEN SPACES.

The Victoria Park, at the north end of the city, is about 16 acres in area. It was purchased in 1887 by

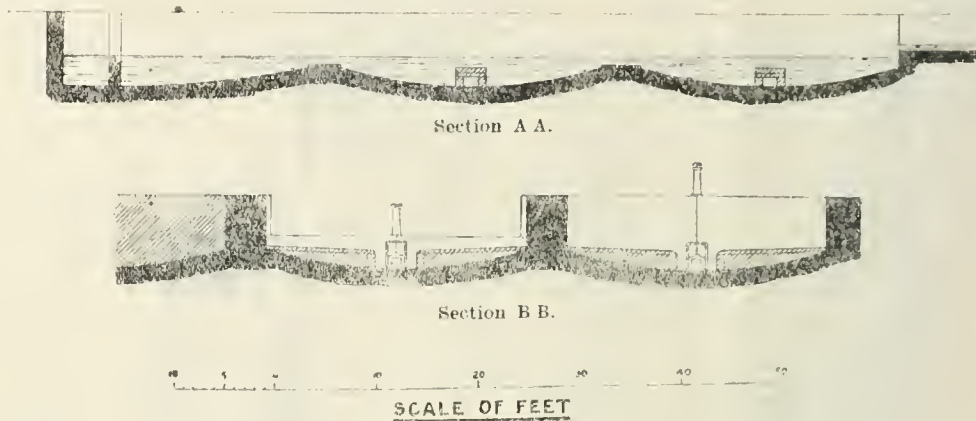


FIG. 8.—SECTION THROUGH GRIT CHAMBER AND STORM-WATER TANKS.

maple, laburnum, red and white may, white beam and almond. There was not room on the footpath for a tree-guard, and the trees are planted between 2-in. square stakes which protect as well as support them. The cost was 3s. each tree, planted complete.

HORSE HIRE.

The council own no horses, being able to hire a horse, cart and man at 5s. 9d. per day until two years ago. The cost had advanced to 6s. 3d., but from April 1st this year has been 7s., in consequence of a minimum wage of 18s. per week for drivers being made a condition of the new contract.

That cheap horse hire has not been inefficient is proved by the fact that the number of 400-gallon van loads of water distributed per day during the street-watering season, without any assistance, averages 27, and reached 28½ in 1910 when the season was unusually dry, and so less time was lost than usual in travelling back when rain came on. The council provide the watering-vans (nine four-wheeled and one two-wheeled), the house-refuse collection carts and iron tumbler carts, so the contractor is not called upon to provide many.

The author was instructed two years ago to report upon the purchase of a motor street-watering van, and it was decided not to buy one for the following reasons: (a) Salisbury being laid out in "chequers," there are cross-roads at frequent intervals, and such a heavy motor vehicle, run at an economical speed, would be a source of danger in the heart of the city; (b) horse hire is so cheap; (c) it was estimated that a motor van would displace three horse-drawn vans, in which case two districts would have to wait longer for the earlier watering of the roads than when three vans commenced together; (d) there is no suitable work for a motor lorry during the winter six months.

As an indication of the rapid changes which are taking place, and, incidentally, the increased wear on the roads, it is interesting to note that, while less than two years ago nothing heavier than a carrier's cart entered the square in front of the council house, there are now sixteen heavy motor buses using it, most of them being built at the Scout Motor Works, Salisbury, at a cost of about £1,000.

DEPOTS.

The present highways depot was built in 1907, the waterworks (distribution department) depot being erected adjoining in 1909 to the author's plans. At the same time a storekeeper's office and 10-ton weigh-bridge were provided, and strict stores account keep-

private subscription as a memorial of the Jubilee year of Queen Victoria, and is now under the control of the council. About 5 acres are laid out as gardens, and the remainder is a recreation ground with pavilion, grand-stand, cycle track, football ground, bowling green, tennis courts, &c. Concerts are given in the gardens during the summer, usually by military bands.

In the middle of the city is the Green Croft, an open space of about 4 acres, to be used for ever for "the practice of archery, beating of carpets, and other

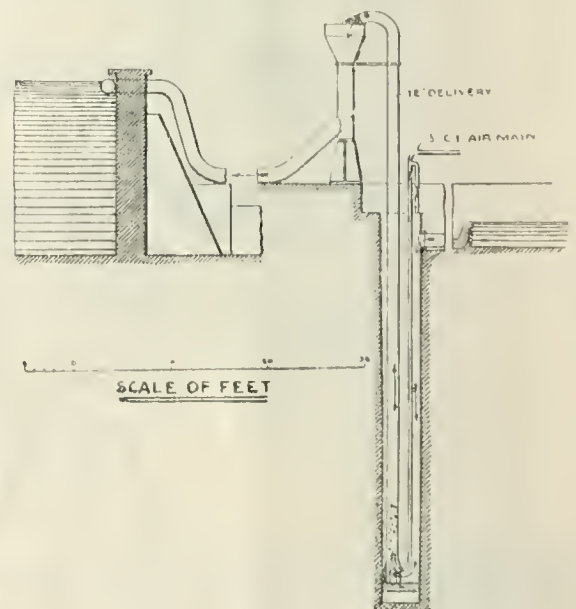


FIG. 9.—DETAIL OF AIR LIFT.

recreations." It is still used for carpet beating (whether as a recreation ground or not is probably a matter of opinion among the beaters), but, needless to say, football has taken the place of archery.

There have recently been laid out at the south end of the city a children's playground of 1½ acres, equipped with swings, &c., and a riverside walk, along the bank of the Avon, nicely planted and furnished with seats and shelters.

ALLOTMENTS.

The council let allotment gardens of 10 rods each, in different parts of the city, to 371 holders at from 9d. to 1s. 3d. per rod per annum, including the free supply of water where required on the high ground. About 13½ acres are owned by the council, and a similar area held on lease.

HOSPITAL ACCOMMODATION.

Until about two years ago the council ran their own hospital upon very efficient and economical lines. This has been abandoned, Salisbury being now served by a joint isolation hospital recently erected just outside the city boundary, and used by several neighbouring authorities. The council also own a smallpox

of the corporation (robed) are accompanied by the three Sergeants-at-Mace with the maces, the procession ending with the city beadle, also in uniform and carrying their staves.

CONCLUSION.

The author thinks it will be agreed that, although old cathedral cities are usually considered to move slowly and be more or less behind the times, Salisbury is so much up to date in municipal matters that the councils, past and present, are to be congratulated upon their progressiveness, and it might well arouse the envy of many a county borough in some respect or other.

He wishes to express his thanks to Mr. W. J. E.

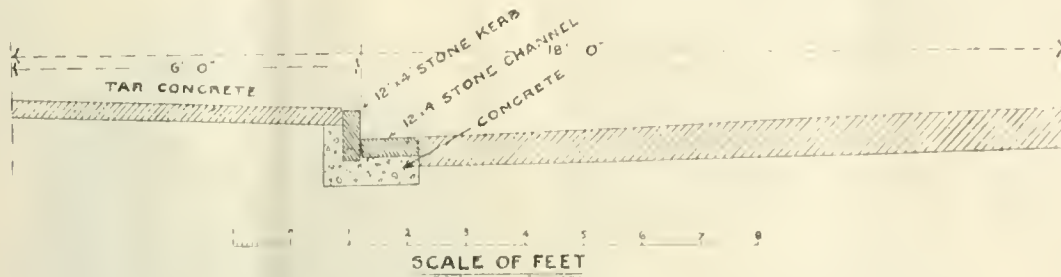


FIG. 12.—PRIVATE STREET WORKS: HALF-SECTION.

hospital, erected in 1900, but it has only been used once, some nine years ago.

MORTUARY.

A new mortuary was erected about five years ago, having glazed-brick dado and isolated viewing corridor.

PROTECTION AGAINST FIRE.

The fire brigade is a volunteer one, and the members are remarkably keen and efficient, call bells at their residences and places of business being rung from the fire station. There is a resident fireman at the fire station, which is a new and up-to-date building, equipped with the latest appliances, including a steamer, and a motor combination fire engine and escape of the Commer-Simonis type, with first-aid pump. The machine is 50-60-horse power, and was purchased by the council last year at a cost of £998. The two-stage turbine pump has a capacity of 350 gallons per minute, and the first-aid pump, for use while the turbine pump is being connected up, draws its supply from a 30-gallon tank, the jet being supplied through 150 ft. of 1-in. hose which is kept ready charged and is run quickly off a reel on the engine. The first-aid pump also creates the vacuum to start the turbine pump.

OTHER PROPERTIES.

The council own considerable remunerative property in the city.

The "Poultry Cross" is a beautiful piece of Gothic architecture, referred to as far back as 1335. The council house was erected in 1795, and is the gift of Jacob, the second Earl of Radnor, replacing the one which was burnt down. Some very interesting and valuable portraits are in the banqueting room and grand jury room; two of them by Hoppner, are valued at about £3,000 each. The municipal offices were enlarged by the author two years ago on the purchase of the adjoining property, and a new committee room was provided. A splendid public library was erected in 1905, and adjoining it is a new picture gallery, recently presented to the city. The whole of these buildings, including the police station and fire station, are within 200 yds. of the council house.

The council also rent an open-air swimming bath, let on a short lease, but they control the list of charges, which are nominal.

CITY PLATE AND INSIGNIA.

In addition to the pictures in the banqueting room, &c., already referred to, the corporation possess a quantity of valuable plate and insignia.

There are no fewer than three handsome silver-gilt maces made in the year 1750. The great mace is of very large size. Among 150 maces exhibited at the Mansion House in 1893 only one was larger. According to the amount paid for two maces recently at Christie's, the value of the Salisbury three is some thousands of pounds. The old-world customs are still retained. On all ceremonial occasions members

Binnie, M.INST.C.E., for permission to reproduce two detail drawings which were included in his paper on "Salisbury Drainage" to the Institution of Civil Engineers (*vide* "Minutes of Proceedings," vol. clxxxii.) also to his assistants, Mr. Charles Notley and Mr. Percy Williams, for their valuable aid in the preparation of the drawings, &c.; and his manager at the sewage disposal works, Mr. John Hamlin, for his revision of the history of the works of which he had had charge since their commencement, and to whose conscientious efforts the excellent result of the treatment is due.

THE DUNDEE TRACKLESS TROLLEY SYSTEM.

The engineer and manager of the Brighton tramways reported recently to the Tramways Committee of the corporation that, in consequence of statements which had been circulated concerning the alleged discontinuance of the trackless trolley service at Dundee, he had communicated with the general manager of the Dundee city tramways, from whom he had received the following reply:—

"The system has been in operation for one year and eight months, and so far as working is concerned it has been an unqualified success. It has been as reliable as an ordinary tramway service, and the working expenses have been very low. At busy times, such as week-ends, we have evidence that heavy rushes can be dealt with by this system. With two cars in service the receipts averaged for one day 25-31d. per mile run. The cause of trouble has been the roadway. To begin with, I understand it was the worst road in the city, with no bottoming beyond the natural subsoil. The roads department had, the year before it was proposed to instal the railless system, provided a sum in their annual estimates to put this road in a condition suitable for modern traffic, but the money was not spent. Some money has been spent on the roadway since the cars have been operating, but the road is not suitable; consequently the Tramways Committee have unanimously resolved to discontinue the service until the road is put in a reasonably suitable condition.

Swivel Nib Drawing Pen.—The outstanding advantage of this new pen, which Messrs. W. F. Stanley & Co., Limited, 286 High Holborn, London, W.C., have recently introduced, is that the nibs can be instantly opened out for cleaning and afterwards replaced without interfering in any way with the original adjustment of the thickness of line. In construction the lower nib is swivelled upon a central screw, and when the pen is in use this is securely held in position. To open for cleaning it is only necessary to slide back a ring and open out the nib, after which the nib and ring are replaced, which automatically readjusts the pen to its original setting.

SAND AND COARSE MATERIAL AND PROPORTIONING CONCRETE.*

By JOHN A. DAVENPORT, M.Sc.(VICT.), ASSOC. M. INST. C.E.,
A.M.I.MECH.E., and

PROF. S. W. PERROTT, M.A.(DUBL.), M. INST. C.E.,
Professor of Civil Engineering at Liverpool University.

In correctly made concrete the amount of sand should be just sufficient to fill the voids in the coarse material, and the amount of cement just sufficient to fill the voids in the mixture of sand and coarse material, and to coat all the particles with very thin jointing layers. It is a rational assumption that such concrete will give a maximum of strength with the minimum of cost, and if this assumption be justified by experimental results, it follows at once that the proportioning of concrete-forming materials is of the utmost importance. Greater strengths can be obtained by the use of excess of cement, as in the case of the ordinary mix of 1:2:4, but the increase in strength is less than the increase of cost of materials, and is, therefore, only justified in particular cases.

The strength of any concrete will depend not only upon the materials and their proportions, but also upon the method of using those materials. Any void in a mass of 3-in. coarse material may be filled in many ways. First, it may be filled with cement and sand and mortar, as in the 1:2:4 concrete; secondly, it may be filled with a piece of stone which practically fills the whole space; and, thirdly, it may be filled with a number of stones which vary in size with a minimum amount of cement-and-sand mortar. The first filling is composed almost wholly of joints, and on that account is weak; the second filling is strong, owing to the absence of joints, but it is impracticable; but the third is a compromise which is not only practicable, but also strong. It will be seen that the amount of the variations in size or the grading will depend upon the nature and quality of the work required. On the one hand there will be good but costly filling, and on the other a cheap but still good filling, and whether the gradation be large or small the filling will be better than one of cement-and-sand mortar only.

With a view to testing the

EFFECT OF PROPORTIONING

upon the strength and other properties, and also the cost of concrete, the authors drew up a series of experiments, the intention being to test compressive strength, modulus of rupture, specific gravity, water resistance and fire resistance. Various difficulties arose in the course of the work which not only prevented the paper being presented on the original date, but prevented also the inclusion of specific gravity, water resistance and fire resistance tests. The series involve 216 test pieces, to which must be added others prepared for water and fire resistance and specific gravity tests, but which could not be tested in the time available. The voids were measured in a patent apparatus designed by Mr. Davenport, which gives results to $\frac{1}{2}$ of 1 per cent. The preliminary data comprised tests on Portland cement, which was Martin, Earle & Co.'s brand "Rhinoceros," size of granite chips, volume of chips per batch, percentage volume of voids in chips, sizes of river sand used, volume of sand used per batch, percentage volume of voids in sand, and the volume of cement used per batch. Regarding the last-mentioned item, it must be noted that no allowance was made for the excess cement required for jointing, only the amount required to fill the voids being used. Had time permitted it, the correct allowance in each case would have been ascertained, and additional tests made therewith. The limited time made it impossible to test the cement before using it for the concreted test pieces, the brand only suggesting its probable good qualities.

The batches were hand mixed by engineering (senior honours) students, and as no special means of testing the thoroughness of the mix were adopted, the resulting concrete will probably compare favourably with machine mixed so far as uniformity of results go. Every care was exercised, however, in the mixing to get all the materials thoroughly intermixed and apparently uniform. This proved to be the case when the specimens were tested. The moulds were made of planed boards, bolted together with gangs, damped before using, and lined with paper on the under side to facilitate removal. In spite of this, several pieces

were damaged in removal, due more particularly to the relatively small sections used.

Immediately after mixing the moulds were filled and left in a tool shed till required for testing. They were wetted regularly every three or four days.

It was found that the ratio of compressive to tensile strength varied more in the one-month than the three-month tests, and is not sufficiently uniform to base any conclusions upon beyond the fact that such ratio is not constant. It is considered by the authors, however, that this ratio should be more or less constant as the failure, whether compressive or tensile, depends upon the adhesive strength of the cement.

The ratios strength at three months to strength at one month were more or less uniform, more particularly in the case of compressive strengths. In the case of 1:2:4 concrete the modulus of rupture appears to increase more rapidly than the compressive strength, while in the other series with cement accurately proportioned, the compressive strength increases more rapidly than the modulus of rupture, as out of six series only one runs the other way, probably due to rather dry mixing of those three-month test pieces.

Although the cement tests are unsatisfactory, it will be possible to compare the

STRENGTHS AND COSTS

of the concrete in the different series, as they will probably all be affected to the same extent. The most important point brought out by such comparison is the fact that for accurate proportions, the ratio $\frac{\text{cost of cement}}{\text{total cost}}$ is practically constant for all gradings taken in the tests, so that when the graded coarse material is used the total cost need only be further considered. Of course, the total cost is always the final criterion as regards economy, and it may be suggested that the ratio cost of cement to total cost need not be considered. But the relative values of total cost obtained may be altered when additional tests are made at other ages, and it is difficult to say whether they will be affected by the ratio; so that, if it can be shown conclusively that this ratio is constant, or nearly so, the total cost, age and proportions need only be dealt with.

The authors do not feel justified in attempting to generalise from the results given in the tables, as they consider such results do no more than open up the subject of proportioning and grading in relation to cost. They have no hesitation, however, in saying that the figures given by them show conclusively that the subject is well worth being made the object of special research, and while they cannot promise additional results for any special time, will continue the work, and hope to place their results before the institute at some future date.

Surveyors' Institution.—The annual general meeting of this institution, to receive the report of the council and the announcement of the result of the election of officers for the ensuing year, will be held in the Lecture Hall on Monday next at 5 o'clock. The prizes awarded to successful candidates in connection with the recent preliminary and professional examinations will be presented by the president.

Law of Private Street Works.—It is surely a commentary on our system of legislation relating to what may be termed domestic matters that the owner of house property (to say nothing of the occupiers of his houses) has to thread his way through a maze of statutes and decisions to ascertain his rights and his liabilities in connection with questions which may arise every day. Such, however, being the case, text-books dealing with what on the face of them might be deemed to be simple matters have become an actual necessity, although the owner of property is lucky if the text-book suffices and he is not driven to consult a specialist. The work before us* deals with one of such subjects, private street works under the Public Health Acts and the Private Street Works Act, 1882, but not with the Metropolitan Management Acts: the statements in the text are supported by decided cases, with references printed in the text; there is also a table of cases and an index, and it should prove a useful hand-book. We find the recent decisions included, and the work seems to have been carefully prepared.—*The Builder*.

* Summary of paper read at a meeting of the Concrete Institute on the 14th inst.

* "Notes on the Law of Private Street Works under the Public Health Acts." By J. B. Reigier Conder, a Solicitor of the Supreme Court. 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.

Institution of Municipal and County Engineers.

MEETING AT SALISBURY.

Gratifying success attended the meeting of the Institution of Municipal and County Engineers which took place at Salisbury on Saturday last. The weather conditions were all that could be desired. There was by no means a large gathering when the proceedings opened in the council chamber, but the papers prepared by Mr. W. J. Goodwin, the city engineer and



MR. W. J. GOODWIN, ASSOC. M. INST. C. E.,
City Engineer and Surveyor of Salisbury.

[Mr. Goodwin was educated at the Royal Grammar School, Newcastle-on-Tyne, and commenced his professional career as pupil under the late Hedley G. Himson, engineer to the urban district council of East Dereham, where extensive alterations to the water undertaking were being carried out. In 1901 he was appointed chief assistant under Mr. J. W. Wiles, surveyor to the Gorton Urban District Council, since absorbed in the city of Manchester. In 1903 he obtained an appointment under the city surveyor of Manchester, Mr. T. de Courcy Meade, M. INST. C. E., and quickly rose to a high position on the staff. In the spring of 1908 he came south to Salisbury, where important works have been carried out under him in connection with the waterworks, sewers, and sewage disposal works. The improvement of the road surfaces has engaged his special attention. He is an associate-member of the Institution of Civil Engineers, and a member of the Institution of Municipal and County Engineers, having passed both examinations, also the practical sanitary science examination of the Sanitary Institute.]

surveyor, and Mr. John H. Blizard, Sir James Lemon's late partner, were productive of a discussion of considerable length, and, as will be seen from our report, of undoubted excellence. Those present at the meeting—which was preceded by a short district meeting—included Mr. J. W. Cockrill, president, in the chair, Sir James Lemon (Southampton), Messrs. J. Beynon (Frome), J. H. Blizard (Southampton), W. Butler (Fareham), W. J. Goodwin (Salisbury), W. H. Grieves (Sutton), C. C. Hancock (Warminster), T. W. A. Hayward (Battersea), R. H. Jenkins (Portsmouth), F. W. Jones (Frome), L. W. Jukes (Southampton), F. C. Keen (Bournemouth), A. J. King (Devizes), C. H. Lawton (Warminster), R. B. Lees (Bradford-on-Avon), L. S. McKenzie (Bristol), F. G. Nicholson Lailey (Trowbridge), F. R. Phipps (Basingstoke, district secretary), J. S. Pickering (Cheltenham), W. S. Raine (Hungerford), J. W. D. Robinson (Westminster), J. Wilson (Bristol), O. E. Winter (Hampstead) and R. C. Woodhall (Blandford).

The Mayor (Councillor J. Macklin, J.P.) said he was very pleased to welcome the institution to the ancient city of Salisbury. He had no doubt many of them knew Salisbury, because the town possessed considerable attractions for visitors. First of all, they had their ancient cathedral, and that alone was probably a sufficient inducement to anyone to pay them a visit. Public bodies owed a great deal to the municipal engineer, and he realised that the members of their profession were able to attain the positions they occupied only after long years of study and self-sacrifice. The duties they performed were of the greatest importance, for the very life of the

people depended on their energies; the proposals they put forward necessarily involved the expenditure of much of the ratepayers' money, but, however costly the results of their deliberations might be, it had to be realised that their work was essential to the public health generally. One thing they could lay claim to in Salisbury was that they had laid down a most efficient plant for the disposal of their sewage. It had been an expensive matter, but the outlay was one which he did not think ought to be grudged. Public bodies were frequently criticised for their seemingly lavish expenditure; that might be the case, but the necessity for this should not be overlooked. They had also a very efficient water supply, which involved a charge of only about 6d. in the £ on the rates of the city. His duty was to extend them a very hearty welcome, and he trusted that their deliberations, and the conclusions they ultimately arrived at might be of service to the com-



MR. JOHN H. BLIZARD, ASSOC. M. INST. C. E.

[Mr. Blizard, who was born in 1862, served his articles with the late Mr. William Jurd, F.S.L. of Southampton, after which he joined Mr., now Sir James, Lemon, M. INST. C. E., as a junior assistant, in due course attaining the position of chief assistant. In 1891 he was appointed surveyor to the School Board of Southampton, and held that position until the passing of the 1902 Education Act, when his office was abolished, the work now being carried out by Mr. J. Crowther, ASSOC. M. INST. C. E., the borough surveyor of Southampton, for the council education authority. During his service as surveyor, Mr. Blizard designed and carried out some of the largest schools in the South of England. Sir James Lemon's practice increasing so rapidly, he offered a partnership to Mr. Blizard. This he accepted, and entered into it in 1887. The connection terminated in 1908, when Sir James retired, and the practice is now carried on by Mr. Blizard under the old name. Mr. Blizard, in his career, has had an unique experience. He has been connected with the sewerage of many towns, among which are Winchester, Farnham (Surrey), Lyminster (Hants), Poole (Dorset), Eastleigh Park and Bishopstoke (Hants), Bournemouth—disposal, Dorking (Surrey)—disposal, special filter beds—Havant, Bemerton (Wilts), Wyke Regis, and Dorset. He has also had a very large experience in estate development, and as an arbitrator and expert witness. Last year, in the matter of a compulsory acquisition of property, he was appointed as an independent arbitrator by the Local Government Board, as provided by the Housing and Town Planning Act, 1909, and held a public inquiry at Liverpool. He is now engaged as joint engineer for the execution of the main sewerage and sewage disposal works of Sunningdale and Ascot, for the Windsor Rural District Council, and is preparing a scheme for an important district in North Wales. Mr. Blizard was elected an associate-member of the Institution of Civil Engineers in 1887; he is also a Fellow of the Royal Institute of Public Health, the Royal Institute of British Architects, and the Institute of Sanitary Engineers, and a member of the Association of Consulting Engineers, and the Royal Sanitary Institute.]

munity, and that their visit to the city would prove of a pleasant nature.

The PRESIDENT (Mr. J. W. Cockrill), in acknowledgment, remarked that wherever the institution went they generally received a cordial welcome from the authorities, and that day was no exception to the rule. He moved that the thanks of the members

be tendered to his Worship for the kind reception he had accorded them.

Mr. R. READ (Gloucester), in seconding, congratulated the city on its ancient history and modern progress.

The vote of thanks was carried, and the Mayor, in response, said he hoped that the members would take away from Salisbury some very pleasant recollections of their visit.

The discussion of papers—"Some Notes on the Municipal Works of Salisbury," by Mr. W. J. Goodwin, and "Bemerton and Wilton Sewage Disposal," by Mr. John H. Blizard, Southampton—was next proceeded with. The papers referred to are reproduced elsewhere in this issue.

DISCUSSION OF PAPERS.

The PRESIDENT (Mr. J. W. Cockrill) moved that the thanks of the institution be accorded to the authors of the two papers. With regard to sewage disposal, that was a problem which did not trouble him. They were able to get rid of their sewage in a very effectual way, and at a comparatively small cost. Salisbury's history was a most interesting one, and he hoped before leaving to see something of the city.

Sir JAMES LEMON (Southampton) seconded the vote of thanks. He congratulated Mr. Goodwin on preparing such an interesting paper. It was full of most interesting information, and he had read it with a great deal of pleasure. He also wished to congratulate Salisbury on the splendid position it occupied in the matter of its death rate, which was only 10·8 per 1,000. That was a good answer to those grumblers who found fault with every expenditure. The water supply was another feather in the cap of the city council. They got it from a deep well, and delivered it at the extraordinarily low price of 6d. on the rateable value. He did not know of any other town that was able to do that. Water was supplied to baths without charge. He knew some water companies who charged for that. He had to pay the water rates of the water company outside his borough, and they charged a pretty round sum for bath water; but a company who did that sort of thing could not have much regard for the health and cleanliness of the community. He thought every house, however small, ought to be provided with a bath; cleanliness was next to godliness. With reference to the open joints of the sewers, which were laid years ago, of course, they must not criticise too much what was done by their forefathers; but, considering what the results must have been to the city of Salisbury, the engineers of that time were not quite up to date in their methods of draining the subsoil water. In dealing with a city of about the same population, he dealt with it by draining the subsoil water into rubble drains laid under the sewers, but he had not to deal with such a large quantity of water as they had in Salisbury, where they had succeeded in reducing the daily flow in their sewers from 2,000,000 gallons to about 600,000 gallons. They had had some trouble from smells, but that might arise in some measure from the flat gradients, which were 1 in 1,760. Another thing he had noticed was that the main-water pipes were formerly connected direct to the sewers. That was not done nowadays, and he was glad to see that it had been remedied. He remembered when the sewage of Salisbury was treated in a very different way from what it was to-day. It was treated by lime precipitation, and they had constant complaints as to the condition of the river. In regard to the clogging of the secondary beds, he had not worked out the area of the filters, but it struck him that it was ample for dealing with a dry-weather flow of 600,000 gallons, and the only reason he could advance for the clogging was that the beds were not graded. The grading of the material was a necessity if they wanted to get a free filtering medium. He recommended Mr. Goodwin to try the experiment of taking out the material from one of these beds, putting in graded material, and watching results for a certain period. Nothing was said as to cost in the case of either the Salisbury or Bemerton works, and he should have liked to see a comparison of the system adopted for Salisbury with the direct application of sewage to land, as carried out by Mr. Blizard at the latter place. Of course, one must deal with these matters according to local circumstances. He remembered in his early days, in dealing with the sewage of a certain town, the mayor asked: "What is your system?" His reply was that

he had no system, and the mayor looked horrified; but he (Sir James) explained to him that he adapted the system to the particular conditions of each case. The Bemerton scheme, which was carried out by his late partner, was a good instance of the application of sewage direct to the land, and he had no doubt that an inspection of the works would afford them considerable information.

Mr. R. READ (Gloucester) said he had not the knowledge of Salisbury possessed by Sir James Lemon, but he should like to congratulate Mr. Goodwin and the citizens on having such a good water supply within their own boundaries. Being very cheap, they used it very freely—at the rate of 40 gallons per head per day. He took it that was the penalty of the separate system, and he should like to ask the author if he insisted upon the houses being drained separately—one drain for foul water and the other for rain water—and whether a limited amount of the rain water went into the foul water drains. Where, as in Gloucester, they had to bring the water 6 miles in one direction and 11 miles in another, they could not do it for less than 10d. per 1,000 gallons, and 10d. on the rateable value—these being convertible terms. Sixpence per 1,000 gallons was very low indeed. He saw that Mr. Goodwin charged other departments at the rate of 1½d. per 1,000 gallons, but he should think that that was a losing figure. They had a very large number of flushing chambers, necessitated by the separate system. That was a very good thing. It was not stated how much gas the Webb lamps used. His impression was that they used a large quantity—10 or 12 cub. ft.—per hour. Salisbury, however, only had two. As to the connection of the destructor chimney with the lower end of the sewer, he did not think one could get much effect more than 300 yds. from the sewer. With regard to the Bemerton paper, he congratulated Mr. Blizard that the Wilton people had allowed the sewage of the other district to go down into their area, for, as a rule, a village did not like to take the sewage of an adjoining place.

Mr. F. R. PHIPPS (Basingstoke) added his thanks to Mr. Goodwin and Mr. Blizard. Mention was made by Mr. Goodwin of an 82-ft. well with a borehole, 50 ft. in depth, lower down. He had never been able to understand why boreholes in chalk districts were put down at the bottom of dug wells. One could understand a borehole being put down where one had to go through impervious strata. The chalk area was about 600 ft., and if one did not go through the gault, or any impervious strata, he could not see the advantage. The dug well was sunk into the basin, and if galleries were driven laterally to increase the flow he could not see that a borehole was going to increase the amount of water. The small reservoir storage rather struck one. Apparently the pumping was about 800,000 gallons per day, and the storage capacity 362,000 gallons—less than half the day's supply. He supposed that Mr. Goodwin was sanguine that the pumps were not going to break down, but half a day's supply seemed small for a city like Salisbury. The charge for the railway supply—3d. per 1,000 gallons—was very small indeed. At Basingstoke they had an agreement by which a charge of 4½d. per 1,000 gallons was made for this service. The hardness of the water was also interesting. At Basingstoke the figure was 15·5 deg., and they got a few complaints and suggestions that they should soften the water. As regarded the sewerage and the point about the sewer joints being left open for the purpose of taking the subsoil water their own specification for the sewerage system laid in 1879 contained exactly the same provision. The consequence was that they used to pump to the sewage farm about 1,000,000 gallons per day; but he did the same as Sir James Lemon had done, with the result that they got the amount down to 300,000 gallons per day. He saw that Mr. Goodwin had carried out the ventilation of the sewers by connecting the end of the sewer to the outer cavity of the refuse destructor chimney. Another means he had adopted was to connect the outlet and the pump well up with the air blast of the destructor. The whole of the air for the destructor was brought from the pump well, and it proved an excellent means of getting rid of any smell there was formerly. On the question of house refuse disposal, had Salisbury considered the desirability of making the owners or occupiers provide sanitary dustbins? They had many complaints about the receptacles used in Basingstoke, but he thought the powers—even if they were obtained—were very difficult to put into force. He should be glad of

any information on the point. He also congratulated Mr. Goodwin on getting from the county council the whole of the expenditure incurred in watering the main roads. He himself could only get one-fourth or one-fifth of the cost. He saw that Mr. Goodwin obtained £110 a year for the watering. The contention of his own county council was that that amount of watering was not necessary on the main roads, and merely allowed what they considered was sufficient for the purpose. The use of granite chippings in connection with tar-painting resulted in the formation of a good road surface, but he thought the price of 97d. per square yard for the chippings was rather high. He preferred to use beach grit, obtainable at about 5s. per yard; it consolidated well, and formed a mosaic-like surface on the tar. Their own cost for spraying, using distilled tar, was 130d. The price for street lighting in Salisbury was very low, but he took it that that was due to the competition between the electric light and gas. Thirty-five shillings a year for a 50-c.p. lamp was very moderate. The cost of horse hire was also low. At Basingstoke it was 8s. 6d., but he saw that at Salisbury 7s. was considered high. The wages of drivers at 18s. was, however, very small, and he should have thought the local trades and labour council would have had something to say about it. The rent of allotments—9d. to 1s. 3d. per rod per annum—struck one as high; at Basingstoke the allotments were let at a round figure of 7d. per rod, but the price of land probably had some influence on the charge made. In the sewerage paper the point as to one being able to obtain sufficient land of good quality was very helpful. They had had to do something on the same lines in Basingstoke. Their sewage farm was on the chalk, and there was no effluent. It had been in operation for about thirty-five years, and the land was getting very tired of receiving so much sewage. He thought it was very much better, under the circumstances, to extend the sewage farm than to go into the question of tanks and filters, especially as they had no means of getting rid of the effluent. The whole of the water had to soak away into the chalk. It might seem a wrong thing to do, but analyses of the water from wells nearest the area showed that the water was quite good.

Mr. R. H. JENKINS (Portsmouth) said he would be interested to know what was being done in the matter of dustbins. His view was that every place should have a sanitary dustbin, but the question was, who should provide it—the corporation, the landlord or the tenant? He saw that the steam from the refuse destructor was being made use of, but was it not the case that they had a job sometimes to get the necessary head of steam? In their own case they hardly raised sufficient to run the electrically driven lifting plant. It seemed to him that they must occasionally be compelled to use coal. The air lift seemed to discharge into the open air, and he would like to know if that were necessary, as it must create a smell. Twenty-seven loads of water were distributed by each man daily. That seemed to indicate that the men were rather hard worked, and he would like to know how long they were engaged each day. The average number of loads at Portsmouth was twenty-two, and although the men's wages were 27s., they wanted more. Would Mr. Goodwin also explain why he made use of ordinary instead of centrifugal pumps.

Mr. J. H. BLIZARD (Southampton) remarked that he felt rather envious of the splendid paper by Mr. Goodwin, which gave them a lot of information. Mr. Goodwin told them that until 1849 there was no system of sewerage in the city, the drainage finding its way into the rivers direct or by means of channels which ran along the sides of many of the streets. During the next five years £27,000 was spent on laying sewers. Previously the water rose to the surface, and these sewers had the effect of lowering the level by 3 ft. 6 in., the sewer joints being left open for the purpose. He had been reading certain books, and it occurred to him that certain results followed the lowering of the water level. Dr. Creighton, in his history of epidemics in Britain, said that "in 1849 (which was the year mentioned by Mr. Goodwin) one thinks of Salisbury as standing among high downs, but it had a wet subsoil, bad sewerage, and bad water supply, and in 1849 it had 200 deaths from cholera among all classes in two months." With every respect for the opinion expressed by Sir James Lemon as to the mistake of laying the sewers with open joints, if that had the effect of lowering the level of the subsoil water by 3 ft. 6 in. it was a good thing for the health of the city of Salisbury. The

death-rate from phthisis was very high, and Salisbury was in the unenviable position of being about third from the top of the death-rate from that disease. Dr. Buchanan reported in 1865-7 that there had been a reduction in Salisbury of 49 per cent in the death-rate from phthisis, the drainage causing the drying of the soil and the lowering of the subsoil water. That made him think of what he saw in the Press some time ago that Salisbury was anxious even to-day about this particular complaint of tuberculosis. There was no doubt that in 1849, when they thought of lowering the level of the subsoil water, they should have gone to the root of the evil, which, in his opinion, they ought to do to-day, by lowering the general water level of the valley. In Salisbury they had got the water headed up in hatches, and the city was only 150 ft. above sea level. It was only a question of removing the hatches which held up water for the mills. Then people would say, "What about the cost?" What Salisbury would have to face was—what was the value of health? They would have to decide whether they would face the cost of removing the root of the evil by lowering the level of the water, and so get rid of the dampness which existed at the present moment. Wilton was much in the same position, the town being 178 ft. above sea level. A few years ago everybody was stricken with horror to think that the poor people in Wilton were flooded out by heavy storms. That was due to the dampness caused by heading up of the water. The proneness to tuberculosis was due to the high level of the subsoil water of the district. He noticed that when the borough extension took place some years ago an area of 1,100 acres was added to Salisbury, and he would like to ask Mr. Goodwin how much land in that area could be utilised for building purposes. Could it be easily acquired for the purpose of small dwellings for the working classes? He noticed also that at the Harnham reservoir the top water level was 355.11 ft. above ordnance datum. The members did not know how ambitious the people were in that district. Wilton had got a magnificent water supply, with a pumping station 200 ft. and a reservoir 300 ft. above ordnance datum, and by laying a main another 800 yds. they would get a top water level of 420 ft. above ordnance datum, and they might say they could supply Salisbury's highest level. He did not know whether the Wilton people had got designs on Salisbury and Bemerton. He noticed with pleasure that the Salisbury Corporation made no charge for water for baths; that was a very good practice, though not usually adopted by water companies, who generally taxed sanitation. Then Mr. Goodwin said that the sludge at the sewage works was air dried, and sold by contract for £13 per year, the contractor undertaking to keep the works clear. It might be the best method of getting rid of the sludge at the present time, but why could he not put in ejectors and pump it on to land near to the works and bury it? That would be better than making an arrangement with a contractor to pay £13 a year, cart it through the city of Salisbury, and make a dumping ground of Bemerton. The latter was an arrangement of which he had had to complain. The sewage works were very good, but that was the blot on the whole thing. In these days when they had ejectors and compressors, and could get land at a reasonable distance, there was no need for carting the sludge away. The question of private streets work had always been a trouble to municipalities. The way in which the work had been done formerly in Salisbury might have been advantageous to the owners of frontages, but he considered that if a man made a private street he should be responsible until it was taken over by the authority, and that the work should be done in the best possible manner so as not to be a burden on the rates when the street was taken over by the public authority. With regard to the riverside walk, he believed that was a pet scheme, and a very nice scheme of an ex-mayor of the city. He believed in open spaces; but there, again, was a very serious danger with regard to dampness. The level of the ground was only just above the river level. They had to raise it for the river walk, which was so much the better for the children. There was in the paper an analysis in which saline ammonia was referred to, and he was inclined to think when the wind was in the east they might get some seaside breezes from this saline ammonia. He would like to ask for the rating of Salisbury in detail, so that he might compare it with Bemerton and Wilton.

Mr. W. H. GRIEVES (Sutton, Surrey) said, with respect to the sewage works, he was looking forward to seeing the works, and did not propose to take up much time with them just then. Mr. Goodwin stated in his paper that the filters were 6 ft. deep. He knew there was a great difference of opinion as to the depth of filter required for the purification of the sewage, but he was one of those who did not believe in filters of very great depth. He had found from experience that filters 4 ft. deep gave as good or better purification than those 6 ft. deep. Then there was the saving in the cost of filters by not having the extra depth. Mr. Goodwin received £13 a year for the sludge taken from the sludge chamber. He thought he was very fortunate in getting that £13. A good many local authorities had very great difficulty in giving it away. It might affect Mr. Blizard, but he did not suppose that Mr. Goodwin troubled so much if he could get some money from it. With regard to the contribution from the county council for the watering of the main roads, that was something Mr. Goodwin ought to be proud of. He would suggest that Mr. Goodwin might probably increase the contribution received from the county council if he adopted the method of doing more tar-spraying in the district than he apparently did at the present time. He noticed that Mr. Goodwin spent between £400 and £500 a year, and the price was 235d. per yard. These figures gave them 55,000 yds. super. dealt with. If flints were very plentiful round Salisbury, there was nothing better for a flint road than tar-spraying. He did not know any road which looked better or which stood the summer better than a flint road tar-sprayed. He might then save something on horse hire. He was very fortunate in getting a horse, cart and man at 7s. 3d. per day; they could not hire under 9s. per day. The price of horse hire was said to have gone up in consequence of the council insisting upon a minimum wage of 18s. per week for drivers. He did not wonder at the council making a condition of that sort. They could not get men to work for 18s. a week in his district; they paid their men 24s. and 26s. a week. He considered the price of 235d. per yard too much to pay for tar-spraying. They were doing 14 or 15 miles of tar-spraying in his district. He was doing the work in two different ways—one was by contract, the contractor doing the work at 1½d. per yard; he was doing the other roads by direct labour at 1½d. per square yard. If they increased the tar-spraying they saved on watering and horse hire. He was able to knock off ten water carts in his district; that was a great saving in the cost of water. The corporation of Salisbury having their own water supply, it might not be a great item there.

Mr. T. W. A. HAYWARD (Battersea) said he would like to ask Mr. Grievés a question with respect to tar-painting. Mr. Goodwin had given them an account of the cost of materials, showing clearly how the cost of tar-painting was arrived at. He took it that if Mr. Goodwin could buy chippings at 2s. 6d. or 3s., the cost would be very materially reduced, and the price of tar-painting would be lower by ½d. or ¾d. per square yard.

Mr. GRIEVES explained that he had intended to mention that Mr. Goodwin's price provided for granite chippings at 12s. per ton. They used grit from flint quarries near, which they got at 6s. That made quite good enough surface for tar-spraying. He did not think it was worth paying the extra cost of granite chippings.

Mr. HAYWARD said he would like to add his grateful appreciation to Mr. Goodwin for the vast amount of work which he had put into his paper. It was full of information from beginning to end. He would congratulate Mr. Goodwin upon the very fine advertisement which he had been able to give to the city of Salisbury. It was most remarkable in a city like Salisbury that the average death-rate for the past five years was only 10·8. He could not imagine that the residents of Salisbury ever wanted to go away to recruit their health. It must be almost a health resort. As the mayor said, visitors came to Salisbury to see the cathedral, but if they knew what a healthy place it was to live in, they would stay in the city. In regard to tar-painting, he had a good deal of sympathy with Mr. Goodwin, who had to pay a very high price for his material. Tar via at 4½d. per gallon, costing 1½d. per yard, and granite chippings 37d., thus leaving very little team and manual labour. There were very few of them who could tar-paint their roads for ½d. per yard for labour. He had to pay from 8d. to 8½d. per hour for labour, and 12s. to 12s. 6d. per

day for horse, cart and man. That made all the difference. They were to be congratulated upon getting their work done at so very low a price. Then they obtained their water on very favourable terms. They got water for less than half the price he had to pay for it. In London the waterworks authority could not even supply them with water at 5 per cent on the rateable value, but had to make a further call upon the rates to run the show at all. He was glad to know that all the engineers who had spoken had been full of appreciation of the fine work which had been done by Mr. Goodwin in Salisbury. They looked upon him as a man of great ability, who would further make his mark in the profession of municipal engineering. He was very pleased that Mr. Goodwin had given them the opportunity of meeting in the beautiful old city of Salisbury.

Mr. J. S. PICKERING (Cheltenham) remarked that one had nothing but congratulations to offer to Mr. Goodwin upon reading such an excellent paper on the municipal works of the city. He had the honour to represent a residential town, but they certainly could not compete with Salisbury in the matter of the death-rate. It was exceedingly low, as pointed out by Mr. Hayward, and if the particulars given were reproduced in one of the leading London papers it would be a very happy advertisement for Salisbury. Then the unlimited quantity and exceptional purity of the water supply was a very noticeable feature, and one which the inhabitants should be proud of. They also should be satisfied with the low charges made for water. He did not know whether Mr. Goodwin knew of any other town where the water charges were so low as in Salisbury; certainly he did not know of anything like it. He thought the council were to be congratulated upon making no charge for baths. It was a practice which they would all like to follow if they could. He would like Mr. Goodwin to tell them whether the 1½d. per 1,000 gallons charged to the committees for water was the working cost, or whether it included also the repayment of principal and interest on loans; and also what profit was made on the water undertaking. He took it that some surplus profits would be retained for emergencies. Mr. Goodwin referred to sewer ventilation, but it seemed to him that his remarks on this subject were a little contradictory. He said that the sewers of the city were unusually well provided with 6-in. diameter wrought-iron vent shafts, 30 ft. high, which answered well and gave rise to no complaint; but in the following paragraph he spoke of complaints of bad smells, and said the ventilating shafts on one section had been cut off permanently. The method adopted in meeting the complaints made was very interesting, and showed the energy and interest which Mr. Goodwin had devoted to his work. It was rather interesting to hear that the connecting of the outer end of the sewer to the outer cavity of the refuse destructor chimney had an influence nearly half a mile away, particularly as the sewer was not a modern one and would have many open shafts. The experience of many of those who had tried the ventilating of sewers from a chimney shaft was that it had very little effect, and was only felt for a short distance. He was surprised to hear that the use of sanitary dustbins was not general. In his district they had special powers, and required a dustbin to be provided for every house. He paid a visit to Berlin a short time ago, and noticed in one of the suburbs there how the collection of house refuse was done. They had very suitable vans, the dustbins were hermetically sealed, and as the bins were emptied into the cart there was a mechanical arrangement which allowed not a particle of dust to escape into the atmosphere. He had never seen anything approaching it in this country. He thought the way dustbins were emptied in our country was not a credit to us. They took the dustbin, or an old box containing the refuse, and emptied it in a manner which allowed the dust and microbes to be scattered broadcast. He would like to say a few words on the sewage disposal works. He visited the works some nine years ago, and therefore was particularly interested in seeing them again, and noting the improvements which had been made. His recollection of the works at that time was the enormous amount of work the percolating filters were doing. As Mr. Goodwin had pointed out, the surface water was then entering the sewers, and the beds were dealing with 2,000,000 gallons a day, at the rate of 600 gallons per square yard per day. The results were not all that could be desired, but

they did show the enormous amount of work which could be got out of a percolating filter. With regard to the beds, the material was of very large gauge—about 4 in. in size. In the North of England, and particularly in Staffordshire, it was the custom to put in very small gauge material, grading it down to as low as $\frac{1}{4}$ in. There was a very wide margin between $\frac{1}{4}$ in. and 4 in. His own experience was that the method adopted in Salisbury of using the larger gauge material had the greater advantages. The only disadvantage was, as perhaps Mr. Goodwin would agree, that with the large material they got a very large quantity of humus. In getting the humus through the beds it had the effect of prolonging the life of the beds. In one particular case one of these beds had been working for sixteen years. He very much questioned whether the beds in the North of England with smaller material would work for anything like that time. He thought the principle of doing without humus tanks was one to avoid, but, as Sir James Lemon had said, they must deal with each case according to its own conditions. The results obtained were exceedingly good. There was one other matter as to road construction. Mr. Goodwin said he had no difficulty in making his roads with tar-macadam, even when the road was deluged with rain. He thought that was an experience which most of them had not had. They had generally found it was necessary to make a tarred road in fine weather. If there was a material in the market which would enable them to make a good road with bituminous material in wet weather they would all be glad to hear of it.

The PRESIDENT mentioned that the town clerk of Yarnmouth had found a clause in the Town Planning Act by which sanitary dustbins could be required to be provided for houses under a certain rateable value, and in his town, with regard to new buildings, no plans were passed unless the owner agreed to provide an iron dustbin. When he was a young engineer, the Local Government Board insisted that sewers should be laid with clay joints. His first job in sewer laying—fortunately, it was not a big job—was done with clay joints. Twelve months later the sewers—one of 12 in. and the other of 9 in.—were completely filled with the roots of trees, and not a rod could be passed through them. He soon rectified that mistake in future work.

Mr. GOODWIN, in reply, thanked the members for the kind way in which they had received the papers. With regard to Sir James Lemon's remarks as to the sewage disposal works, he admitted that the area of the secondary beds was too big, but that was the Local Government Board requirement, and they were obliged to put them down. Mr. Pickering had mentioned the question of getting rid of the humus, and that was one of the chief points of the secondary beds. A large amount of purification took place in the primary beds, but all the humus went through. When the sewage had passed through the primary beds, 10 parts per 100,000 of solids remained, but 8 of those 10 parts were caught in the secondary beds. It was very easily removed, and practically caused very little labour in doing it. With regard to tar-spraying, he knew that the price was high. There were several reasons to account for this. One was that the first experiments were made with crude tar, and were not a success. It was said that more tar was found on people's carpets than on the roads. The council dropped the tarring of the roads altogether for a year or two, and when it was restarted they had to proceed with caution as they could not afford to have another failure. Then there were the proceedings against Winchester for the pollution of the streams, and the killing of fish by the tar washed off the roads. Then they decided to use Tarvia. With regard to the cost of granite chippings, he knew that it was a big price, but it was a very good material for this purpose. If they could get grit at 4s., 5s., or 6s. per ton it might be different; but beach grit cost them 10s. per ton, so when it was a difference of only about 2s. per ton in the cost of granite, it was not worth the money to use an inferior material. In their main street they could go up one side of the street tarring the surface, and turn the traffic over on to the other half of the street, and after covering it with the granite chippings they could tar the other side of the street the same afternoon. If they could do that for a cost of 2s. per ton in the material, it was worth the money. As to the cost of working at the sewage works, he might say that the sewage works and refuse destructor were combined, and they could not separate them. The total cost of the combined undertakings was about

£2,000 per year, of which they got about £200 back in the sale of old tins and other things. Mr. Read had raised the question of the water supply. Of the total consumption of 41 gallons per head per day, 26 gallons were for domestic consumption, 9 gallons were sold for trade purposes, and the remainder was used for street watering, sewer flushing, and so forth. The charge of 1½d. per 1,000 gallons for sewer flushing more than covered the actual cost of pumping. As to separate drainage, they did insist upon it, especially in those parts of the city where they had ejectors. In the middle of the city where they had not ejectors they did not mind a little going in. The yard water went into the foul-water sewers. Difficulty had been experienced in lighting and extinguishing the Webb lamps, but now they were not extinguished, and no additional charge was made by the gas company. As to the reason for sinking the borehole below the dug well, he could not reply to that question. He found the borehole there when he came to Salisbury, and left it there. The reservoir storage was, he admitted, on the low side, but this was more than compensated for by the unusual extent of the pumping plant, which consisted of two sets of pumps, three engines and three boilers. The railway supply was sold at the ordinary scale for trade consumption. If they got more for it they would be glad. They did not reduce the hardness in the water, but took it as it was. Some doctors said that the hard water was good for them, others that it was not, so medical opinion on the point was divided. The provision of sanitary bins for domestic refuse was a very big question, but, fortunately, it did not come into his department. They were doing a little. They compelled owners to provide an ashbin for every new house which was built, and the old houses were being provided with ashbins gradually. The drivers' wages had been mentioned as being very low, but they must remember that Salisbury was in the midst of an agricultural district, and the wages in the district were very low. The wages in Battersea were very different from what were paid to agricultural labourers in Wiltshire. The prices charged for allotments might seem comparatively high, but they were just sufficient to pay expenses, and there was a large demand. Mr. Jenkins mentioned the question of the utilisation of the steam from the destructor. They had not sufficient steam all the year round; they paid about £200 a year for coal. When they were short of the refuse they had to use coal. There was no smell from the funnel of the air lift. The hours for street watering were from 7 to 5.30. Some comments had been made on the cheapness of the horse hire, but cheap horse hire was not necessarily inefficient if properly looked after. With reference to the suggested lowering of the water level of the district, a river like the Avon was a very tricky one. The only thing that could be done would be by removing the hatches. It was a very big question to go into. If ever Salisbury took in Wilton or Wilton took in Salisbury, then they might think about it. Mr. Blizzard had criticised their selling the sludge to a contractor, but he did not mind what happened to it so long as they got rid of it. Street refuse, largely grit, was covered over it when it was carted away, and they got no complaints whatever. Mr. Blizzard had also suggested lowering the level of the subsoil water, but that was entirely controlled by the levels of the water in the river, and to interfere with river rights was a big matter. As to the river walk, Mr. Councillor Pritchard devoted the whole of his salary as mayor to the laying out of that walk, and it was much appreciated. Mr. Pickering referred to the profit on the water undertaking. They made from £500 to £600 a year profit to the rates after paying all expenses. As to rates, the district rate was 3s. 3d., and the poor rate 4s. 3d.; in the added area the general district rate was 2s. 11½d. Mr. Pickering referred to the apparent contradiction in the paper about the ventilation shafts. He admitted that, but it was really quite correct. There were only about six shafts cut off. As to laying tar-macadam in wet weather, it was important in a town like Salisbury, with narrow streets, to get the work carried out as quickly as possible. With a town like Salisbury they had to run some risks to get the work done. What happened was that in the first case they had a shower; they went on with the work and it did no harm. Last year they had a deluge extending over two days, and the making of the road was continued, and they had absolutely no difficulty with the road afterwards.

Mr. BLIZZARD said with regard to the remark made by Mr. Read about the amalgamation of the districts, there was a difficulty to start with. Bemerton was

drained first, then Wilton was going to get a separate scheme. First it was said they would have to pump, but then he was able to show that they would not have to pump, but could gravitate in. With regard to Mr. Jenkins' remarks, he was a great believer in plunger pumps where sewage was concerned. He did not believe in centrifugal pumps, except for clear water. They installed plunger pumps at Havant, and had absolutely no trouble there. At Wilton they had centrifugal pumps, and were always in trouble.

LUNCHEON.

The members were then entertained to luncheon by the mayor (Councillor J. Macklin, J.P.), who presided.

The loyal toasts having been honoured,

Mr. F. HODDING, town clerk, said they felt very much honoured that the members of the institution had chosen Salisbury for their meeting, and he thought that when they had seen their public works they would feel they were not behindhand in regard to water supply and other municipal undertakings of a kindred nature.

The toast having been honoured,

The PRESIDENT said they were grateful to the

various corporations who received them in so genial and kindly a manner, and he thanked the mayor for the reception which he had accorded to the institution.

Sir JAS. LEMON, in proposing "the Health of the Mayor," said it had been his lot as the senior member of the institution to visit a great many towns in Great Britain, and some in Ireland, and they had never been more kindly and hospitably received than in Salisbury.

The MAYOR, in reply, expressed a hope that the visit of the institution would be a benefit to the city and to the members, and that they would go away with pleasant recollections.

Mr. J. S. PICKERING (Cheltenham) proposed the toast of "The Visitors," to which Alderman HILARY (Basingstoke) and Mr. G. M. WILSON, clerk to the Wilton Rural District Council, responded.

During the afternoon visits were paid to the Salisbury sewage disposal works and refuse destructor, and to the chief pumping station of Salisbury and the Bemerton pumping station. On their return to the city the members were entertained to tea by Alderman C. J. Woodrow, J.P., chairman of the Sanitary Committee.

EASTERN DISTRICT MEETING AT IPSWICH.

An Eastern District meeting of the Institution of Municipal and County Engineers was held on Saturday at the Town Hall, Ipswich, under the presidency of Mr. H. T. Wakelam, M.INST.C.E., district chairman. The members present included Messrs. A. E. Collins (Norwich), E. Buckham (consulting surveyor, Ipswich), E. A. Slater (Colchester), A. G. Wheeler (Colchester), John R. Mead (borough engineer, Ipswich), J. Rowland Hill (Ipswich), D. Steward (Aylsham), Thomas Jones (Ipswich), R. E. Wilson (Leiston), Harold Collins (Norwich), Gordon Harrison (Stowmarket Rural District Council), G. W. Lingwood (Stowmarket Urban District Council), H. Miller (East Suffolk), Stanley C. Lloyd (district surveyor, East Suffolk), J. W. Birch (East Ham), F. Harold French (Harwich), S. Douglas Meadows (Ipswich), F. Prentice (Ipswich), S. Ball (London), Raymond Wrinch (Ipswich), G. W. Spurring (Harwich), Pinkham (London), Dr. W. Benton (East Ham), Dr. Pringle (Ipswich), and the hon. district secretary, Mr. James Webb (Hendon).

Mr. J. A. WEBB, hon. district secretary, read, and the CHAIRMAN duly confirmed, the minutes of the Chelmsford meeting.

APPOINTMENT OF SUB-DISTRICT SECRETARY.

Mr. G. W. LINGWOOD then moved that Mr. John R. Mead, borough surveyor of Ipswich, should be sub-district secretary for the counties of Norfolk, Suffolk and Cambridge. This was seconded by Mr. A. E. COLLINS (Norwich), and carried unanimously.

Mr. MEAD said he was pleased to accept the office of assistant secretary. There was one thing he would like to mention in the presence of the members of the council of the institution, and that was that there was a great deal of dissatisfaction throughout the district that the secretaries of the various districts were not on the council. As he intended to bring the matter up some time or other, he simply mentioned it now to state that he was in sympathy with those who desired the change.

The CHAIRMAN said that that was a matter entirely for the annual meeting of the institution, because it would have to be made part and parcel of the regulations. It would be necessary for a resolution to be passed at the annual meeting before the necessary alterations could be made to carry the proposition into effect. He would advise Mr. Mead to give notice to the secretary of the institution that it was his intention to raise the question at the annual meeting. He might say that he was quite in sympathy with what Mr. Mead had stated, and he should be glad, and he was sure Mr. A. E. Collins would also be glad, to do anything he could to further the views to which that gentleman had given expression.

Mr. MEAD: I quite see your point.

Mr. A. E. COLLINS said he was quite in favour of what had been said. No members of the institution could be more in touch with the members generally than the assistant secretaries, and if it was possible to get them on the council he thought they would be quite fit and proper people to be there.

THE PROPOSED IPSWICH HEALTH OFFICES.

Mr. MEAD then proceeded to say that he was pleased

to know that the chairman, Mr. Wakelam, had found time to come to Ipswich, and he was glad to see present Mr. Collins and other members of the council. At the same time it seemed to him that some explanation was necessary with respect to that meeting. It



MR. JOHN R. MEAD,
Borough Engineer of Ipswich.

[Mr. Mead is only thirty-two years of age, but has had exceptional opportunities of gaining valuable experience in the many branches of the profession he has adopted. From 1898 to 1905 he was a pupil and salaried assistant of Mr. George T. Lynam, M.INST.C.E., F.S.I., borough engineer and surveyor of Burton-on-Trent, where, in addition to being engaged on bridge widenings, tramways, extensions to the sewage farm, and other works, he was for about two years resident engineer on the Stapenhill and Winshill sewerage scheme, which cost £50,000. In 1905 he was appointed general engineering assistant to Mr. Chas. Brownridge, M.INST.C.E., F.R.G.S., borough engineer of Birkenhead, under whom he carried out a large scheme for the demolition of property, and the erection of dwellings under the Housing of the Working Classes Acts, the construction of a boulevard 60 ft. wide, extensions to parks, design of a large main outfall sewer into the river, and for some two years was in charge of the repairs, renewals and extensions to the whole of the corporation's tramway tracks. Mr. Mead was in 1911 appointed deputy borough engineer and surveyor of St. Helens, Lancashire, under Mr. Arthur W. Bradley, M.INST.C.E., and in that town was engaged on extensions to the cemetery, culverting Windle Brook, erection of a Carnegie library, tuberculosis sanatorium, school clinic, and new schools, in addition to assisting in the supervision of about 300 workmen, and the usual work in connection with sewerage works, markets, parks, destructors, and cemeteries.]

was held in Ipswich simply because that town was the most convenient centre. He wrote to say he was in favour of small meetings of this description being held as often as possible throughout the district, and that members should be prepared to pay their own expenses.

Mr. Mead then proceeded to describe the proposed accommodation which is about to be provided for the Ipswich medical officer of health, including the school clinic and tuberculosis dispensary. The reason for the provision of the new accommodation, he should say, was that at present the offices were scattered. The new departure was probably only the forerunner of what would happen in many other towns. The work and responsibilities of the medical officer of health had been so increased that it would be necessary to have such accommodation as was being provided in Ipswich in the larger towns of the country. The site, he would first of all explain, was very convenient. It was close to the town hall, in a quiet street. The property was in a dilapidated condition, and the corporation were glad to remove it to make an improvement in the district. The estimated cost of the building was £5,700, and the land came to another £2,000. They would observe from the plans that they had endeavoured to keep the building symmetrical as far as possible. They hoped they had arranged the details without wasting space, and that the offices would be found convenient. It was possible to get to any part of the building without going outside. There were four separate departments—viz., the medical officer's administrative department—the sanitary inspector's department and laboratories; the tuberculosis department, which had an entirely separate entrance; and the infants' department. The last-mentioned was quite a novel feature, and it was not usually found in the particular form in which it was carried out here. Then there was the school clinic. The ground-

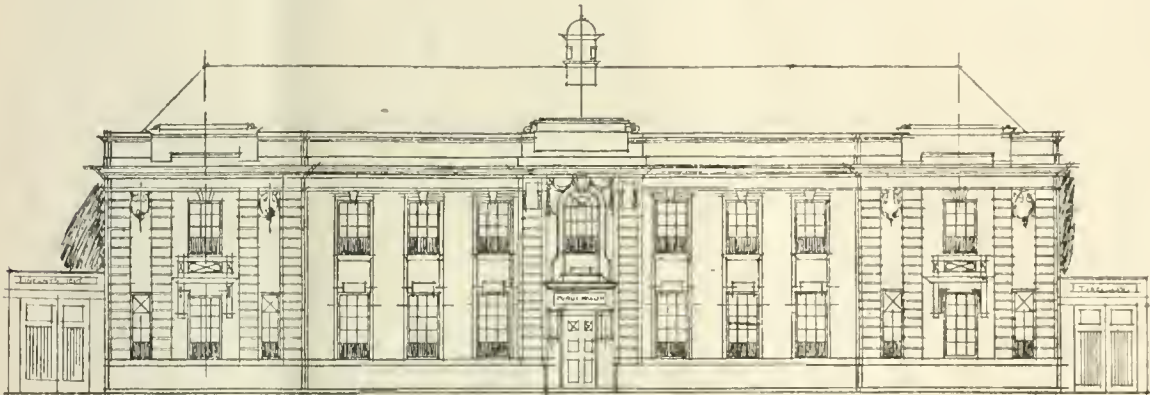
the whole of the school clinic. There was a waiting-room through which people passed into the consulting room, where there were two dressing-rooms and a dark-room. If necessary the patients passed into the operating-room in connection with which there was a recovery-room and a waiting-room.

THE MUNICIPAL TENEMENT DWELLINGS AND SANATORIUM.

A description was next given of the municipal tenement dwellings, which, Mr. Mead stated, were on rather a new principle. They were intended for persons who could not pay an economic rent—old-age pensioners, widows with one or two children, and people whose wages were such that they could not pay an economic rent. It was hoped that the council would be able to build for £200 per tenement. The extension of the sanatorium, at an estimated cost of £4,500, was also described. It was intended to provide accommodation for ninety patients. Generally, said Mr. Mead, sanatoria were one-story buildings, but this consisted of two stories. There were special features in connection with it. The work was commenced by private subscription before the passing of the Act, and the site was a gift to the council. With respect to St. Helens school, the plans of which were also on view, Mr. Mead said he did not think it was an expensive building.

ROAD MAKING AND MAINTENANCE.

Coming to the question of the roads, Mr. Meade remarked that he considered this the most important



Front Elevation.

IPSWICH PUBLIC HEALTH OFFICES

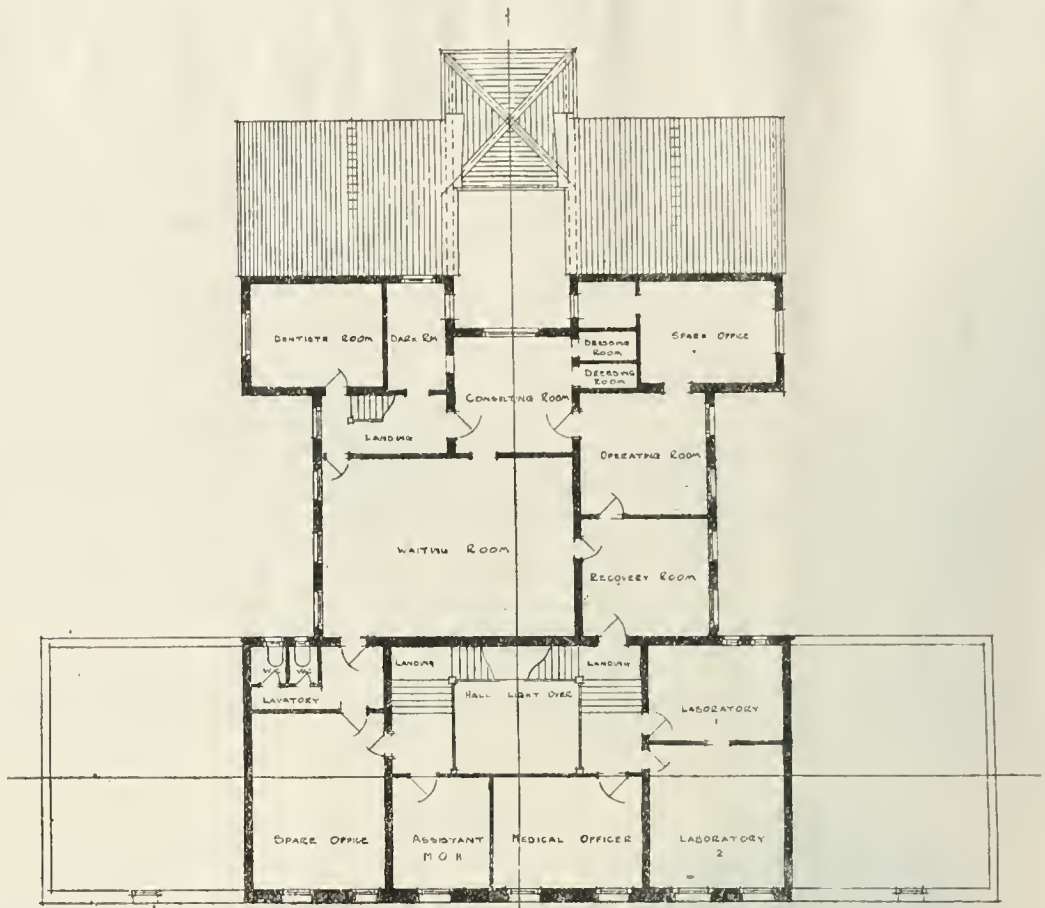
floor portion, the front rectangular portion, and the rectangular portion of the first floor were taken up by the administrative department and medical officer—the sanitary inspector's, the doctor's general offices, and the nurses' room. The nurses were not nurses for carrying on the work of the building, but were employed under the doctor in outside work; it was therefore necessary that they should have a room which they could look upon as their own. On the first floor was placed the medical officer's private room, his assistant's room with a spare office, and lavatory accommodation for himself and his assistant. On the right-hand side was the tuberculosis department. The only persons approaching on the right were persons who were going to the dispensary, and they went through the waiting-room and passed out into the consulting-room. There were two dressing-rooms, and adjoining these were the X-rays room, and from that they had the photographic room. Then there was a private entrance for the doctor or his assistant. Coming back to the administrative portion, there was a lavatory for ladies and tuberculous patients, but that would be revised. The dispensary was very conveniently situated for serving the whole of the different departments. On the left-hand side the children were on the ground floor. They entered a waiting-room, and were then taken to the nurses' room. The doctor found that he had as many as eighty people waiting, and the arrangements made in connection with the entrance portion were found to give very satisfactory results.

Describing the administrative, tuberculosis and entrance portion of the building, Mr. Mead stated that on the left-hand side there was a small building for disinfection purposes, and the treatment of verminous children, a bathroom, a dressing-room and a disinfectant. On the first floor, on the landing, they had

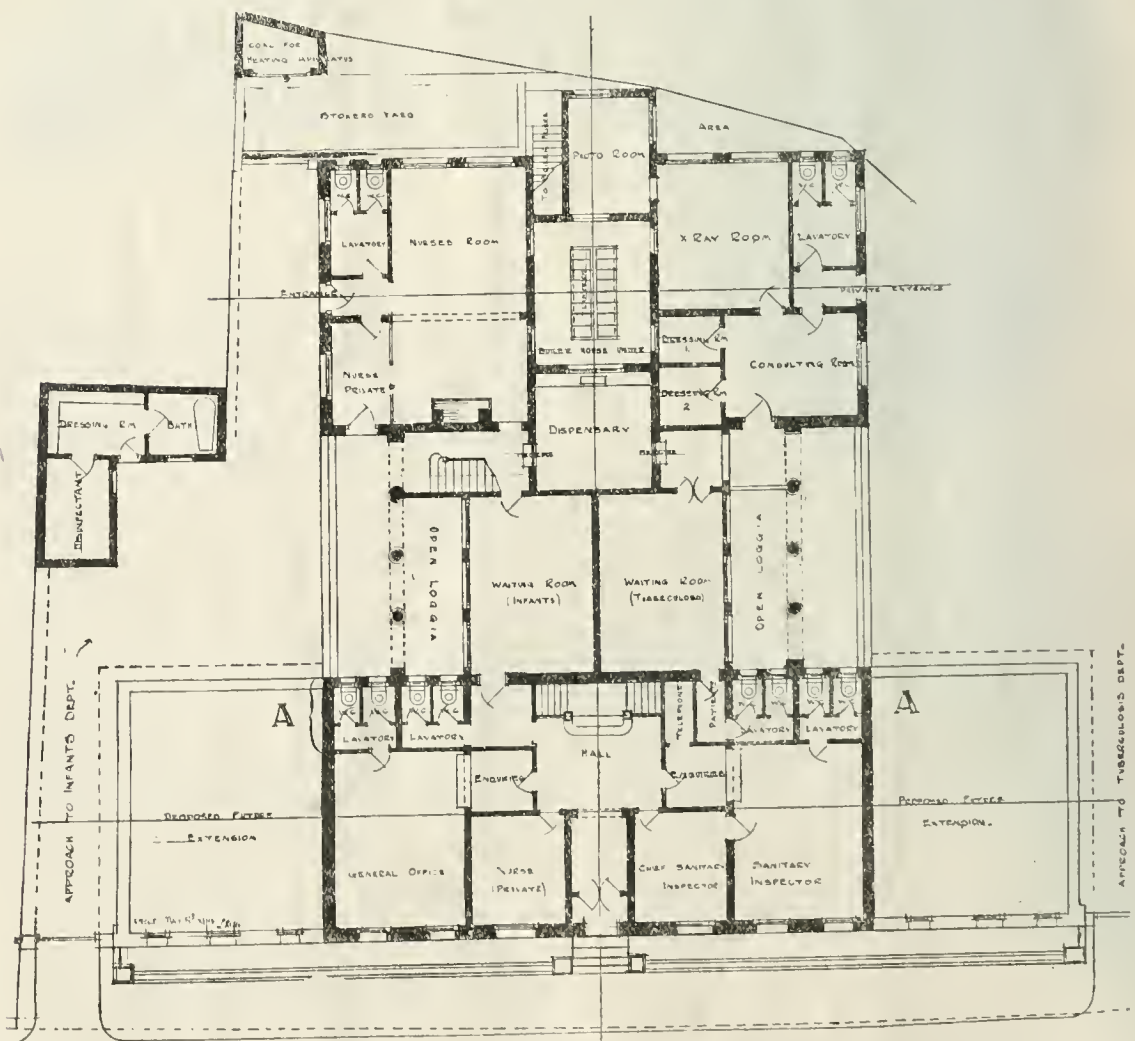
matter that a municipal surveyor had to deal with. A surveyor's duties were many, as they knew, but, owing to the change in the character of the traffic, they had become of a more responsible kind. The population of Ipswich was 75,000, and the area 8,432 acres. There were 1,750 houses, and the rates were 8s. in the £. There were 79½ miles of roads, consisting of water-bound macadam—granite 28½ miles, pit stones—29 miles, and flint 13½ miles. There were 6 miles of softwood paving, and ¼ mile of tar-macadam. They tar-sprayed about 18 miles, and the cost was, perhaps, a little high, being 12d. per yard. The work was done by hand with distilled tar. The standard road was 35 ft. wide, and it was made with 5 in. of core and 4 in. of local pit stone. The cost was £1 18s. 4d. per yard run, which he considered an exceedingly low price, and he thought they would agree that the streets were very good for such an outlay. The only expensive item was the gullies, which cost about £5 10s. each. He would like to say that he thought the corporation ought to congratulate themselves on the fact that they had the advice they did from their late surveyor, Mr. Buckham. That gentleman advised them to adopt creosoted wood blocks, and in the result it had been proved that this was the best advice that could be given. The cost was 10s. to 11s. per yard, and he (Mr. Mead) estimated that he could rely on the existing foundations at 9s. per yard. The price a short time ago for wood paving was 16s. per yard.

The CHAIRMAN: Soft?

MR. MEAD: No; hard wood. Then there was the question of grouting. Cement grouting had been used from the start, and he should consider long before he attempted to alter that system. The blocks were generally stored for a considerable time, and therefore there was not so much creosote to mix with the grouting. As to granite setts, he was glad



First Floor Plan.



Ground Plan.

IPSWICH PUBLIC HEALTH OFFICES

The Surveyor

And Municipal and County Engineer.

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to say they had very little of such paving. What they had cost about 12s. per yard, put down on a concrete foundation. Water-bound macadam was a paving as to which they disagreed on account of the number of materials used. They used flints, gravel, pitstone, slag, and various kinds of granites. At Ipswich Guernsey and French granite were used chiefly. The standard road consisted of 5 in. of local pitstone and 5 in. of hard core, and the cost was 2s. 4d. per square yard. In some towns where they put down 17 in. the cost was about 5s. 9d. per yard, and in a particular town he knew it was 4s. In Ipswich he thought they got a very excellent road at very little cost. With regard to bituminous roads, including tar-macadam, he would say, without going into detail too much, that he personally preferred tar-macadam as against pitch grouting.

The CHAIRMAN: Do you mean tar slag or granite?

Mr. MEAD replied that his preference was for tar granite, as he had had an unfortunate experience with tar slag.

The CHAIRMAN inquired the price of the tar slag, and the tonnage of traffic.

Mr. MEAD replied that the cost was 3s. per square yard, and the traffic was of a purely suburban character. The 3s. did not include maintenance, as at the time it was laid down maintenance was not a common practice. As to tar-painting, they got distilled tar, and the results were really excellent. They used the local pitstones, which in the ordinary way might be termed gravel. Personally, he believed in tarring by hand, which, he thought, gave the best results.

DISCUSSION.

The CHAIRMAN moved a vote of thanks to Mr. Mead, and congratulated him upon the interesting address he had given. He might say he was quite with him in what he said about members paying their own expenses. They attended these meetings for business chiefly, and it was far better that the members should pay their own expenses than that somebody else should be asked to entertain them. The plans of the medical officer's quarters which Mr. Mead had described seemed to be well worthy of great consideration and thought. There were not many places where such buildings were put up for this purpose. In Middlesex, where they had seven medical officers, they had nothing like the accommodation which Mr. Mead had described. As an architect of some experience and practice, he agreed that the best thing to do was to frame one's building on some sort of centre line, for by this means more scope was obtained, and it was preferable to a haphazard scheme and planning the rooms as thought dictated. As to the tenement dwellings, he understood Mr. Mead to say that the rent would not meet

the payment of the principal and interest on the loan.

Mr. MEAD explained that the rent would possibly be half-a-crown per week.

The CHAIRMAN said he hoped the Ipswich rate-payers would be satisfied with that. As to tar-spraying, he would be very glad if they could do it at 1-2d. per yard in Middlesex; but their work was different. They always employed clean granite chippings. He could not say he was in love with sand. With respect to soft wood, they had laid probably 60 miles of wood in Middlesex, and they never had to pay anything like the price Mr. Mead had stated for soft wood blocks, *per se*. As to grouting, he could not say he agreed with Mr. Mead in his remarks, as in his experience pitch answered very much better than cement. He (Mr. Wakelam) had always had his painting done by hand, except where large areas were to be covered. But the cost in Middlesex did not come out at anything like the figure mentioned by Mr. Mead. The cost in the rural roads was 2½d. or 2¾d., but their conditions with respect to material were not so satisfactory as at Ipswich.

Mr. E. BUCKHAM (consulting surveyor to the Corporation of Ipswich) explained, with respect to the sanatorium, that the sewage had to be lifted by ejectors, whence it was conveyed to the Ipswich drainage system.

Mr. HAROLD COLLINS (Norwich) thought that at Ipswich they were well advised in separating their public health department from the town hall, for it was found at Norwich that the corridors of the municipal building became congested with people. The cost of tar-painting in Norwich was over 2d. per yard, for granite chippings or local gravel. At Norwich wood paving cost 8s. per yard, which provided for a small layer of cement about 2 in. in thickness; and with respect to tar-painting they made use of water-carts. Into these the gas company put tanks, and they obtained the tar hot for use.

Mr. E. A. SLATER (Colchester) said that in Colchester they had been paying 3d. a gallon for tar, but this year it had been reduced to 2¾d. Refined tar was out of the question with them, because they did not know where to go for it. Did they get refined tar in Ipswich?

Mr. MEAD: Yes.

Mr. SLATER, in continuation, suggested that the institution might usefully take action to deal with rings and combines in connection with the production of materials. He thought that there might have been some slight economy in the cost of the cottages, and explained that in Colchester they had obtained a revision of the building by-laws. He was pleased to see they were proposing to provide four rooms, for generally in that part of the country it was impossible to get less than six rooms.

Mr. A. E. COLLINS thought that rings had good points as well as bad, though, of course, he would agree that if unfair prices were charged the ring should be broken down. The question of the depth of road foundations depended upon the nature of the subsoil and the traffic, but more especially upon the weight of the vehicles.

Mr. BUCKHAM said that the subsoil of Ipswich, being sand and gravel, and generally dry, made all the difference in favour of good roads.

Mr. J. A. WEBB (Hendon Rural) inquired if the price, 2s. 4d., referred to the lineal yard.

Mr. MEAD: 2s. 4d. per square yard.

Mr. WEBB said that his experience of the price of tar-painting was very different to that at Ipswich.

Mr. MEAD said he ought to have explained that they had a company in Ipswich that distilled tar, and they took their carts to the yard for the tar.

Mr. BUCKHAM: The reason sand was used was because it was a local material. He agreed that fine granite chippings were better.

Mr. A. E. COLLINS said he now used ¾-in. gravel for tar-painting, and as far as he could see the results were as good as he previously got from granite chippings. He had not had a single complaint from motorists.

Mr. G. W. LINGWOOD (Stowmarket) stated that he used crude gas tar, and found that the granite dressing worked out at 1-6d. per square yard, and flint 1-7d. This year he had gone in for granite chippings, and had had a little trouble with the motorists.

After luncheon visits were paid to the sanatorium, the new vertical refort-house at the gasworks, and also to St. Helen's school, which has been erected at a cost of £13,000 to accommodate 1,000 children.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

393. Surveying.—In carrying out a large survey (by triangulation) describe in full detail how you would use the centre of a tower or shaft as a station on the ground without actually setting up the theodolite inside. Give proofs of any formulæ involved. (T. W. P., *Bexhill-on-Sea*.)

397. Testing Cement.—Explain in detail, giving sketches where necessary, how a sample of cement would be tested in practice. (B. W., *Tadcaster*.)

398. Road Construction.—Should the stones in a macadam road be all of one gauge, or are varying sizes preferable? Give reasons. (Junior.)

399. Fireproof Construction.—What fireproof preparations can be used for protecting timber, and what independent coverings may be applied for the same purpose? (S.A., 1905.)

400. Structures.—What is meant by a redundant member in a truss, and why are such members introduced? Sketch two simple trusses, each having at least one redundant member. (I.C.E.)

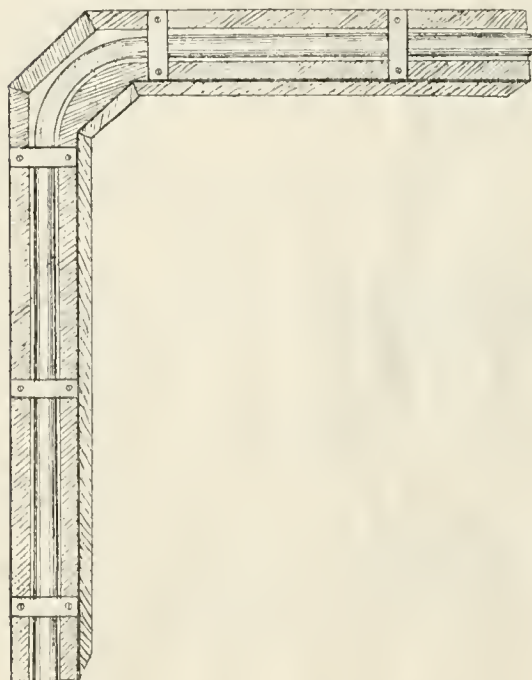
[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

395. Plumbing.—A lead pipe has to convey both hot and cold water in horizontal and vertical directions. Show by a sketch how it should be fixed, and give reasons. (B. W., *Tadcaster*.)

Lead pipes are not to be recommended for hot-water supply if the water to be used contains carbonate of lime—i.e., temporary hardness—because of the deposit, which is very difficult to get out without damaging the pipes. If the water is very soft, lead pipes must never be used, as water, when heated, is a more powerful solvent of lead than cold water.

However, where lead pipes are to be used for hot water (and particularly in this case, as the pipes are



to be used to convey both hot and cold water alternately, they must be properly fixed on wooden fillets, so as to allow for the expansion and contrac-

tion of the lead, and so prevent bulging. If the pipes are fixed firmly to the wall, they will soon become bulged and out of place, and this would prevent proper circulation of the water.

The sketch shows how the pipes should be fixed. (Sanitas.)

396. Strength of Materials.—A horizontal uniform bar 18 in. long, is laid over two supports, each 4 in. from its ends. Find two points at which the bending moments are zero.

In order to arrive at a formula applicable to all cases of beams similarly supported,

Let a denote the length of the overhanging ends,
 b the span between the supports,

R the reactions at the supports,

w the weight per inch run of the bar.

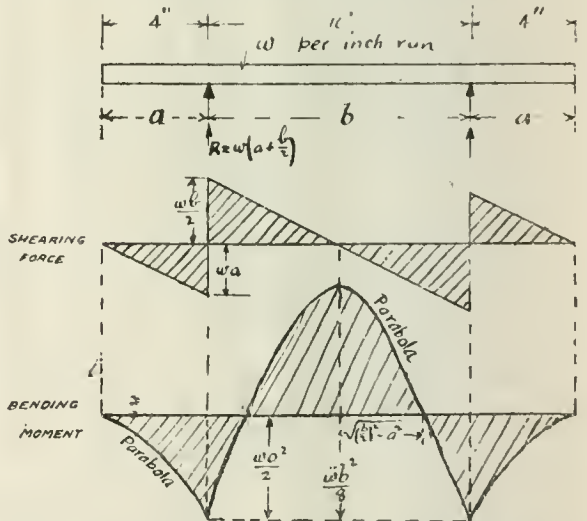
The bending moment at the supports is—

$$M = wa \times \frac{a}{2} = \frac{wa^2}{2}$$

Between the supports, at any distance x from a support, the bending moment is—

$$\begin{aligned} Mx &= w(a+x) \times \frac{a+x}{2} - Rx \\ &= \frac{w}{2}(a+x)^2 - wx(a+\frac{b}{2}) \text{ since } R = w(a+\frac{b}{2}) \\ &= \frac{w}{2}a^2 - \frac{w}{2}(bx-x^2) \end{aligned}$$

the first term of which is the bending moment at a support, and the second is the bending moment for a uniformly loaded span of length b . The two



terms are of opposite sign, and, provided b is sufficiently long the bending moment will be zero, and change sign at two points within the span—viz., when $M = 0$, or

$$\begin{aligned} \frac{w}{2}a^2 - \frac{w}{2}(bx-x^2) &= 0 \\ x^2 - bx + a^2 &= 0 \end{aligned}$$

$$\text{Solving the equation } x = \frac{b}{2} \pm \sqrt{\left(\frac{b}{2}\right)^2 - a^2}$$

that is, at two points which are situated

$$\sqrt{\left\{\left(\frac{b}{2}\right)^2 - a^2\right\}} \text{ inches}$$

on either side of the centre of span.

Substituting the values of the particular case in question, we have—

$$\begin{aligned} \sqrt{\left(\frac{b}{2}\right)^2 - a^2} &= \sqrt{\left(\frac{10}{2}\right)^2 - 4^2} \\ &= \sqrt{25 - 16} \\ &= 3 \end{aligned}$$

∴ the bending moments are zero at two points, each 3 in. from the middle of span.

NOTE.—The two points will be coincident at the centre of span if $b = 2a$, and they will not exist if b is less than $2a$, when the bending moment will not change sign. (H. G. L., *Crombie*.)

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

SEWAGE DISPOSAL: RIVER POLLUTION.—In *Port of London Authority v. Rochford Rural District Council* (King's Bench Division, April 22nd), the council appealed from an order of the magistrates convicting them of suffering the flow or passage of sewage from two sewage chambers at South Benfleet under their control into that part of the Thames known as Little Creek. Notice had been served upon the council by the Port Authority, under sec. 94 of the Thames Conservancy Act, 1894, to discontinue the flow within fourteen weeks, and this notice not having been complied with these proceedings were instituted. The council had not provided a system of sewage for South Benfleet, but there were two old brick sewers discharging into the Little Creek. These sewers had not been constructed by the council, and it was, in fact, not known who constructed them; but they had been in use for upwards of thirty years, and until the year 1909 they discharged crude sewage into Little Creek. In that year the council constructed a chamber or catchpit in each sewer to intercept solid matter, and prevent its discharge into the Little Creek, but they did not interfere with the sewers above or below these chambers, the effluent from which (containing some sewage) discharged into the creek. On behalf of the council it was contended that the mere fact of the construction of the two catchpits for the purpose of purifying the sewage before its discharge into the river was not "suffering" it to flow therein. The Court, however, held (affirming the decision of the magistrates) that, having constructed the chambers and exercised control over the sewage passing into and out of them, the council had "caused or suffered" sewage to flow into Little Creek within the meaning of the Act. The appeal was therefore dismissed.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as noms de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

PRIVATE STREET WORKS: OCCUPATION ROAD AND PUBLIC FOOTPATH.—"H. G." writes: In a portion of my council's district there is an occupation road and public footpath combined (shown by thick black lines on accompanying plan), the total length of which is about 1½ miles. The whole of the thoroughfare is



in indifferent repair, but about ¼ mile (marked A to B) is in very bad repair. The whole of the road passes through agricultural land, with very few houses abutting thereon, but is extensively used both by vehicular and foot passenger traffic, and is not repairable by the inhabitants at large—at least there is no evidence of its having been repaired out of

public rates—and it is connected at four points with public roads which are repairable out of public funds. My council have written to the landowners whose lands abut on the ¼ mile of bad road above named, but they repudiate liability, and hint at indicting the urban district council for its bad repair. The council have no means of proving that any of the landowners are liable, *ratione tenura*, for its repair, and the only parties left to do the repairs are the parties using the road, and the work, as I have before remarked, is very indifferently done. My council would be glad of your opinion on the following points: (1) Is there any means of compelling the adjoining landowners to keep such a road in repair in face of the fact that it is used without restriction by the public generally? (2) Could my council proceed to schedule the road under the Private Street Works Act, 1892 (as the road varies in width from 11 ft. to over 40 ft. between the boundary fences), and charge the frontagers with either the whole cost or a portion thereof, as provided by sec. 15 of the Private Street Works Act, 1892? (3) Generally.

(1) Unless it can be shown that the adjoining landowners are liable to repair the road, *ratione tenura*, the only way in which they can be charged with the repairs is by proceeding under the Private Street Works Act, 1892 (which I assume is in force in the district), or (if not in force) under sec. 19 of the Public Health Acts Amendment Act, 1907. (2) Yes, unless the footpath is repairable by the inhabitants at large, in which case the frontagers might object. (3) Assuming that the road is an occupation road strictly—i.e., open as of right only to the occupiers of certain land and not to the public generally—it is not a public highway, and therefore cannot be repairable by the inhabitants at large. But if the public footpath was in use as such before the passing of the Highway Act, 1835, it would, *prima facie*, be repairable by the inhabitants at large.

THE PUBLIC HEALTH ACTS AMENDMENT ACT, 1907.—"Ynys" writes: I require to report to my council upon the question of adopting this Act, or certain sections thereof. Will you kindly say whether you have given any abstract or recommendations thereon in THE SURVEYOR that would assist me to discriminate the sections that would best serve for this urban area? If so, I shall be glad if you will kindly give me reference thereto, or some other source.

A full summary of this Act was given in THE SURVEYOR for January 31, 1908, pages 123-127.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain; Each man's opinion freely is his own Concerning anything, or anybody.

—MASSINGER: "The Fatal Dowry," Act. ii., 2

ROAD TERMINOLOGY.

To the Editor of THE SURVEYOR.

SIR,—May I ask you once again for a little space to reply to "Engineer's" direct question, if I consider coal-tar pitch and all other pitches as bitumen? He refers to my letter published in your issue of 17th ult., he will find I advocated that neither bitumen nor bituminous could properly be applied to coal-tar products, and should therefore be dropped in that reference. In connection with coal-tar treatment, I suggested the use of "tarred road," "tar-macadam road," and "pitch-bound road." What was uppermost in my thoughts at the time was, while discarding the words bitumen or bituminous in all connection with coal tar, to annex the word pitch, and have it identified and used solely with reference to that material.

To this desire to detach the word pitch from all other substances except coal tar I attribute my too hastily formed opinion on the proposed classifying of petroleum pitch as bitumen, on which point "Engineer's" contention is undoubtedly sound.

I trust, however, with a view to avoiding confusion in the lay mind, that some other word than pitch may be found for the residue of petroleum distillation.—Yours, &c.,

JOHN HUTCHINSON.

May 19, 1914.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bradford T.C. (May 20th. Dr. F. J. H. Coultts).—£30,270 for the erection of a sanatorium at Grassington, near Skipton, for the treatment of tuberculosis cases.—Dr. Buchan, the medical officer of health, said he did not think the proposed sanatorium would be detrimental to the district. On the contrary, he thought it would be rather an ornament.

Flaxton R.D.C. (May 13th. Major C. E. Norton).—£2,200 in respect of sewerage works for Heworth Without and the township of Heworth, including works in the city of York; also for the consent of the Local Government Board to an agreement entered into between the York City Council and the Flaxton Rural Council for the communication of the sewers to be provided, with the sewers belonging to the Corporation of York.

Grantham T.C. (May 5th. Mr. F. H. Tulloch).—£467 10s. to purchase a piece of land adjoining the Grantham cemetery for extension purposes when the necessity arises.—There was no opposition.

Reigate T.C. (May 6th. Mr. M. K. North).—£3,300 for the improvement of London-road, Redhill, and £1,100 for the widening and improvement of Frenches-road, Redhill.—The town clerk, Mr. Alfred Smith, stated that the proposed improvements started at Gatton-corner and extended southward to the Lingfield-lane and Frenches-road cross roads, where they would terminate. The council asked for this loan for ten years, because the county council had entered into an arrangement with the town council with regard to the loan, and their (the county council's) payment extended for ten years. For that reason he took it that the Local Government Board would not grant part of the loan for ten years and the other part for a longer period. The road was the main road from London to Brighton, and carried an ever-increasing volume of traffic. The borough surveyor, Mr. F. T. Clayton, explained that there was a good margin inside the present tar-paved footpath. The surface water flowed from the lowest point into an open ditch and thence into a pond connecting with the Merstham Brook. With reference to the second application, Mr. Clayton stated that by the proposed improvements the width of the Frenches-road would be increased by 6 ft. or 7 ft.

APPLICATIONS FOR LOANS.

Ashbourne U.D.C.—£3,000 for improvements at the gasworks.

Basingstoke T.C.—£7,200 for the erection of workmen's dwellings.

Bodmin T.C.—£850 for footpath improvements.

Boston R.D.C.—£8,340 for the provision of forty cottages.

Bournemouth T.C.—£650 for sewer extension.

Cottingham U.D.C.—£2,900 for works of sewerage.

Darlington T.C.—£24,613 for road construction and improvement.

Hammersmith B.C.—£10,650 for wood paving.

Hastings T.C.—£530 for repaving works.

Hove T.C.—£3,500 for wood paving.

Llanfyllin R.D.C.—£1,585 for workmen's dwellings.

Mansfield T.C.—£5,000 for the extension of the Forest Hospital.

Nelson T.C.—£13,260 for the purposes of the gasworks.

Newport (Mon.) T.C.—£17,000 for additional police accommodation.

Normanton U.D.C.—£1,800 for a housing scheme.

North Riding C.C.—£600 for a school at Pickering Marshes.

Northwich R.D.C.—£1,352 for the provision of workmen's dwellings.

Redditch U.D.C.—£18,000 for the purposes of the electricity undertaking.

Ruislip-Northwood U.D.C.—£6,900 for sewage disposal works extension.

Rye T.C.—£300 for improvements at the town hall.

Sunderland T.C.—£50,000 for electricity extensions.

Thakeham R.D.C.—£5,172 for the Storrington water supply scheme.

Turton U.D.C.—£1,460 for electricity mains.

Wells U.D.C.—£1,300 for the purpose of the gasworks.

LOANS SANCTIONED.

Chippenham T.C.—£1,000 for street improvement, £2,320 for building twelve houses in Wood-lane in place of the workmen's dwellings, to be demolished, and £140 for the purchase of the land.

East Grinstead U.D.C.—£3,700 for a refuse destructor, £630 for allotments, and £475 for a public convenience.

Gravesend T.C.—£13,150 for the electricity undertaking.

Harrington U.D.C.—£1,000 for the extension of the gasworks.

Hemel Hempstead T.C.—£2,349 for private street improvement.

Leyburn R.D.C.—£220 for the purposes of water supply.

Mansfield T.C.—£2,000 for the purchase of gas stoves.

Paignton U.D.C.—£105 for purchasing a portion of the foreshore.

Radcliffe U.D.C.—£15,000 for a housing scheme.

Saltash T.C.—£750 for the extension of the recreation ground.

Tonbridge R.D.C.—£1,555 for a housing scheme.

Walsall T.C.—£1,945 for electricity purposes.

Wombwell U.D.C.—£925 for a fire station and fire engine.

Yarmouth T.C.—£7,563 for street improvement.

FORTHCOMING INQUIRIES.

MAY.

	£
25.— Bristol. For street improvement (Major J. Stewart)	2,114
25.— Lincoln. For the provision of workmen's dwellings (Mr. Courtenay Clifton) ...	9,000
25.— Spalding. For the provision of workmen's dwellings (Mr. Edward Leonard) ...	4,385
26.— Kendal. For the provision of vertical gas retorts (Major C. E. Norton) ...	9,000
26.— Monmouth. For relaying electricity mains (Mr. H. R. Hooper)	1,800
26.— Norton. For works of water supply (Mr. W. M. Cross)	1,432
26.— Scarborough. For street improvement (Mr. Edgar Dudley)	1,493
26.— Southgate. For street and recreation ground purposes (Mr. F. H. Tulloch) ...	2,659
26.— South Mimms. For the erection of workmen's dwellings (Mr. Edward Leonard)	2,750
26.— Ystradgylais. For road widening (Mr. P. M. Crosthwaite)	868
27.— Penybont. For bridge reconstruction (Mr. P. M. Crosthwaite)	1,700
27.— Resolvent. For recreation ground and road purposes (Major J. Stewart) ...	1,500
27.— Ulverston. For works of sewage disposal (Major C. E. Norton)	5,612
27.— Wakefield. For works of sewerage (Mr. W. M. Cross)	9,542
28.— Newbury. For the purposes of the gasworks (Mr. P. M. Crosthwaite)... ..	2,000
28.— St. Helens. For the purposes of the gas undertaking (Major C. E. Norton) ...	42,191
28.— Selby. For the purchase of a hall (Mr. Edgar Dudley)	330
28.— Sleaford. For works of water supply (Mr. W. M. Cross)	268
28.— Willesden. For street improvement (Mr. M. K. North)	1,773
28.— Wincanton. For the erection of workmen's dwellings (Mr. H. A. Chapman) ...	1,750
29.— Abingdon. For the purposes of the market, fire station, and a public convenience (Major J. Stewart)	750
29.— Bexley. For electricity purposes (Mr. H. R. Hooper)	8,000
29.— Wantage. For works of sewage disposal (Mr. P. M. Crosthwaite)... ..	1,500

TOWN PLANNING.

JUNE.

9.—**Sidmouth.** (Mr. George L. Pepler)

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works particulars of which appear below: Buildings—Cardiff £20,500, Paddington £41,000; housing and town planning—Glasgow, Newport; roads and materials—Hove, Langholm; sewerage and sewage disposal—Darlington £26,000, Mexborough, Turton, water, gas and electricity—Cardiff £50,497, Carlisle £59,250.—Particulars of other works projected will be found in our "Local Government Board Inquiries" page.

BUILDINGS

Bacup T.C.—The borough surveyor, Mr. W. H. Elce, has received instructions to prepare a scheme and estimate for converting the Mechanics' Institute into municipal offices.

Bideford T.C.—It is proposed to build a bandstand in the park at a cost of £50.

Cardiff T.C.—It has been agreed to increase the grant for the erection of the new fire brigade station in Westgate-street from £17,500 to £20,500, this to include architects' fees and all contingencies.

Cornwall C.C.—Steps are being taken to provide a site for a sanatorium.

Edinburgh T.C.—The Cleansing and Lighting Committee recommend that alterations be carried out at the municipal workshops in King's Stables-road, at an estimated cost of £1,000.

Godalming T.C.—The council have approved a scheme for an open-air swimming bath, at an estimated cost of £1,500.

Hartlepool T.C.—An improvement scheme is to be proceeded with providing for the demolition of old property in Durham-street and Brougham-street and erection on the sites of modern dwellings, the estimated cost being £8,200.

Paddington B.C.—The council have adopted the plans prepared by Mr. Harold Burgess for new public baths. The estimated cost of the scheme is £41,000.

Paignton U.D.C.—With reference to an application for sanction to borrow £5,600 for laying out a part of the foreshore at Preston and the erection of shelters, the Local Government Board have written stating that they were advised that the proposals were generally satisfactory, but that sanction to a loan would be deferred until calculations had been submitted as to the strength of the reinforced concrete roof over the convenience. Sanction would be given on condition that the council undertook to employ a competent clerk of the works who had had experience of this form of construction, and would be on the spot when any concreting work was being done.

Saltcoats T.C.—The Public Health Committee have been authorised to go into the question of providing a pavilion with two wards at the hospital, at an estimated cost of £2,500.

Sunderland T.C.—It is proposed to erect a hostel at a cost of £4,330, and a principal's house, at a cost of £1,500, at the new training college.

Withernsea U.D.C.—The plan for the first section of the new sea wall at the South Cliff has been approved.

HOUSING AND TOWN PLANNING.

East Riding C.C.—It has been decided to provide houses for those of the council's employees who are not properly housed, and for those who occupy houses which would probably be occupied by other people if they were vacant. It has been further resolved that, for the purposes of giving effect to the resolution, application be made to the Local Government Board for an Order conferring on the council the powers of a local authority under Part III. of the Housing of the Working Classes Act, 1890, as to the provision of houses for the labouring classes.

Glasgow T.C.—The City Improvement Committee are considering a proposal to erect tenements in Moncur-street, Calton, for the poorest classes. The proposal is to erect two balcony tenements, the houses to be let either separately as forty-eight single apartments, or, if desired, as two-apartment dwellings. These houses are to be let out furnished at an average of 4s. 6d. per week. Two tenements are

also to be erected similar to those at Kennyhill, containing twelve two-apartment houses and six houses with living room and bedroom, and to be let unfurnished at £9 5s. and £6 10s. per annum.

Hamilton T.C.—The Local Government Board have been invited to send their architectural inspector to confer with the Housing Committee on the question of providing working-class dwellings at a moderate rental.

Kingstown (Co. Dublin) U.D.C.—The council are advertising for an architect to prepare all plans and specifications in relation to the proposed building scheme at Glasthule, Monkstown and Byrne's field at Sillynoggin, at a fee of 2½ per cent on the accepted contract, and for a quantity surveyor to prepare approximate estimates, &c., of the various dwellings at a fee of 20s. per cent.

Newport (Mon.) T.C.—The corporation are considering the question of providing municipal houses in various parts of the district. One of the proposals is to provide four different types of houses on the Somerton estate, near the Ladyhill golf links. The borough architect, Mr. C. F. Ward, A.R.I.B.A., and Mr. Norman T. J. Moses, controller of finance, have prepared reports on the subject. These deal with houses to cost £190, let at 6s. 9d. per week, with a ground rent of £2 5s.; houses to cost £220, rented at 7s. 6d. per week, with a £2 10s. ground rent; houses to cost £300, rented at 12s. per week, with a ground rent of £3 10s.; and houses to cost £420, let at 16s. 3d. per week, with a ground rent of £4; 5½ acres of land are allocated for allotments, and nearly 2 acres for playing fields and play centres.

Wells R.D.C.—Official sanction has been given to a scheme for the erection of seven workmen's dwellings in Meare.

Wick T.C.—The council are considering a proposal to build houses consisting of a room and scullery and sanitary conveniences downstairs, and two bedrooms upstairs, which could be put up for about £200, and rented at £11 or £12.

PARKS AND OPEN SPACES.

Exmouth T.C.—£1,050 is to be expended upon the purchase of property adjoining the undercliff walk for laying out new tennis courts.

ROADS AND MATERIALS.

Aberdeen T.C.—Beachgrove-terrace is to be widened at an estimated cost of £550.

Brighton T.C.—The Marine Palace Pier Company have consented to assist the corporation in carrying out a widening scheme at the Grand Junction-parade to the south up to the line of the present turnstiles of the pier. This will involve giving up to the public the approach to the pier between the existing footpath and the turnstiles.

Hastings T.C.—It has been decided to carry out works of repaving footways in parts of London, Bohemia, Laton, Mount, Old London, and Elphinstone roads, at an estimated cost of £530.

Hove T.C.—It has been agreed to wood pave New Church-road between the end of the present wood-paving at the Hove-Aldington parish boundary and the west side of Carlisle-road, and to borrow £3,500 for the purpose.

Langholm T.C.—A scheme has been adopted for paving High-street at a cost of between £2,000 and £3,000.

Penmaenmawr U.D.C.—The council on Wednesday passed a resolution urging the county council to widen the Penyclip-road (the main road to Bangor on the side of the Penmaenmawr headland) from 15 ft. to 20 ft., in view of the great increase in the traffic, and especially the motor and motor bus-traffic.

Shrewsbury T.C.—It has been agreed to carry out a number of street improvements, including street widening, to facilitate traffic to the Royal Agricultural Society's Show.

Sidmouth U.D.C.—The surveyor, Mr. R. Lake, has received instructions to prepare a scheme for street watering by means of a hose and standpipes.

Stepney B.C.—Consideration has been given to a communication from the Local Government Board with regard to the arterial roads of Greater London, and a report on the traffic using the roads to and from the docks in Stepney has been presented to the council by the borough engineer, Mr. W. Jameson, Assoc.M.Inst.C.E. The existing traffic on the six main roads of the borough is excessive and incessant, says the report, and it is well known that Whitechapel High-street is probably one of the most congested thoroughfares in the Metropolis. The heavy goods traffic to and from the various docks, wharves, and railways by which this borough is entirely surrounded contributes further to the already sufficiently harassed condition of vehicular traffic along the main roads of Stepney. The report adds: "It is evident that the existing arterial roads in this borough are by themselves quite inadequate to cope with the large volume of traffic passing through Stepney, and any increase in such traffic in the future must inevitably tend to make confusion worse confounded." The formation of a new road is suggested leading from Tower-hill, *via* Royal Mint-street, Cable-street, Brook-street, and White Horse-street, to the Commercial-road East. "The execution of this scheme," the report proceeds, "would at once afford an extremely valuable alternative main route from London Bridge, the Tower Bridge, and the City generally for the large amount of traffic proceeding from the London docks and wharves, while a further important improvement could be effected by the widening of Hanbury-street and Vallance-road, to facilitate the passing of traffic from Shoreditch to Whitechapel, and also provide an excellent means of approach to the Spitalfields Market."

Warwickshire C.C.—In recognition of the increased duties of the road inspectors, it has been agreed to make them an extra allowance of £30 per annum towards their travelling expenses as from April 1st last.

SEWERAGE AND SEWAGE DISPOSAL.

Clevedon U.D.C.—The tender of Messrs. J. Coles & Son, at £2,050, has been accepted for the construction of a new sewer.

Darlington T.C.—A scheme has been approved for the improvement of the sewage disposal works, at an estimated cost of £26,000.

East Grinstead R.D.C.—Sewer extensions are to be carried out at a cost of £363.

Mexborough U.D.C.—The tender of Mr. H. Cliffe, of Mexborough, at £1,712, has been accepted for the structural work in connection with the sewage disposal works extension scheme. The total estimated expenditure involved is between £7,000 and £8,000.

Turton U.D.C.—The Local Government Board have approved generally of the scheme prepared by Mr. Lomax for the extension and improvement of the Eagley sewage disposal works, but advise certain necessary alterations. These the council have agreed to carry out at an estimated cost of £371. The total estimated cost of the scheme is £8,736.

Whitehaven R.D.C.—The scheme for sewerage works at Beckermel, estimated to cost £2,200, has received the sanction of the Local Government Board.

WATER, GAS, AND ELECTRICITY.

Cardiff T.C.—The Waterworks Committee on Monday accepted the estimate of the waterworks engineer, Mr. C. H. Priestley, at £50,497, for new mains from the Llanishen reservoir and Heath filter-beds to the city. The engineer stated that the works were absolutely necessary. The scheme provides for taking the pipes through the side streets of the city so as to avoid disturbing the wood-paved thoroughfares more than necessary.

Carlisle T.C.—A scheme to supply water to several parishes, at an estimated cost of £59,250, is being considered by the Water Committee.

Dunfermline T.C.—A scheme is to be carried out for the extension of the gasworks, at an estimated cost of £41,000.

Hastings T.C.—New electricity mains are to be laid between the west end of York Buildings and the Cinema de Luxe, Marine-parade, at an estimated cost of £435.

Kidderminster U.D.C.—The council on Tuesday sealed an agreement with Bewdley Town Council for a supply of water in bulk at 4½d. per 1,000 gallons for

the parish of Wribbenhall, and it was decided to instruct Mr. Fiddian, engineer, to prepare plans for carrying out the scheme.

Portsmouth T.C.—The Electricity Supply Committee report that the past year's work has been very satisfactory. After all expenses have been paid, and a large sum set aside for interest and sinking fund, there is an available profit balance of £4,364. This the committee propose to allocate as follows: £3,000 to the relief of the rates, £1,000 to reserve, and £364 to the fire insurance fund.

Weymouth T.C.—The profit on the water undertaking last year was £996. This has been carried to the reserve, making this fund £9,800.

MISCELLANEOUS.

Bournemouth T.C.—Authority has been received for the borrowing of £4,000, repayable in five years, for the purchase of four motor omnibuses.

Edinburgh T.C.—The Plans and Works Committee recommend that the four steamers of the fire brigade be replaced by three motor fire engines.

London C.C.—For rendering the backs of fountains in their schools, the county council have used the powder Pudlo. They report that it has been very satisfactory, and that they expect to use more.

Warrington T.C.—The municipal tramways earned a nett profit of £3,239 last year.

PERSONAL.

Mr. E. E. Barlow, borough surveyor of Wisbech, has had his salary increased by £30 per annum.

Mr. J. H. Willis, borough surveyor of Eye, has been granted an increase of salary.

Mr. John Young, burgh surveyor of Ayr, has been voted an increased salary of £50 per annum.

Mr. W. R. Maxwell, burgh surveyor of Dunfermline, has had his salary increased by £15 per annum.

Mr. R. J. Angel, borough engineer of Bermondsey, has an etching entitled "Rochester" hung in this year's Academy.

Mr. F. W. Pearce, surveyor to the Twickenham Urban District Council, has received an increase of salary of £100 a year.

Mr. W. Wentworth Hyde, building surveyor to the East Preston (Sussex) Rural District Council, has resigned owing to ill-health.

Mr. M. F. Dunn, of Ballygawley, has been appointed assistant surveyor of Castlederg district under the Tyrone County Council.

Mr. C. Owen Baines, engineer and surveyor to the Paignton Urban District Council, has been elected a member of the Concrete Institute.

Mr. J. Bainbridge, surveyor and building inspector to the North Riding Education Committee, died recently, we regret to state, at the comparatively early age of forty.

Messrs. H. P. Hill, partner, Messrs. G. H. Hill & Sons, consulting water engineers, Manchester; S. B. Winsor, engineer to the Derwent Valley Water Board; and E. C. Young, consulting water engineer, Tientsin, China, have been elected members; and R. C. F. Busfield, resident engineer on waterworks extensions, Aberdeen; J. C. Cruickshank, assistant to consulting water engineers, Aberdeen; N. R. Kapur, assistant to corporation water engineer, Cardiff; S. Reason, assistant to water engineer, Antofagasta; and T. H. Tyson, assistant to corporation water engineer, Halifax, associate members of the Institution of Water Engineers.

FOR OTHER ADVERTISEMENTS

See End of Paper.

ENGINEER, 24, B.A., B.Sc. Engineering (Lond.), with Diploma Civil and Municipal Engineering, Medallist and Prizeman, capable, energetic, and reliable, good mathematician, designer, and surveyor, over 1½ years' practical training, desires position, any capacity, United Kingdom or abroad. Excellent references. Moderate salary.—Box 1,426, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,637)

EAST SUSSEX COUNTY COUNCIL.

WANTED, A SURVEYOR AND DRAUGHTSMAN IN THE COUNTY SURVEYOR'S DEPARTMENT.

The person appointed must have a good knowledge of Surveying, Levelling, &c., and preference will be given to one who has had experience in the use of the theodolite.

Applications, stating age, qualifications, &c., and accompanied by not more than three recent testimonials, to be sent to the undersigned on or before Wednesday, the 3rd June, 1914.

Salary, £78 per annum.

F. J. WOOD, ASSOC. M. INST. C. E.,
County Surveyor.

County Hall,
Lewes.

May 20, 1914.

(1,635)

**EARBY URBAN DISTRICT COUNCIL.
SURVEYOR'S ASSISTANT.**

The above Council invite applications for the appointment of Surveyor's Assistant at a salary of £65 per annum.

Applicants must be neat and expeditious draughtsmen, and accurate surveyors and levellers, and preference will be given to candidates with experience in the carrying out of Private Street Works and duties under the Housing Acts.

Applications, in the candidate's own handwriting, stating age, qualifications, experience, accompanied by copies only of not more than three recent testimonials, to be sent in to me on or before Saturday, the 6th June, endorsed "Surveyor's Assistant."

Canvassing is strictly prohibited, and will be deemed a disqualification.

JAS. E. ALDERSLEY,
Engineer and Surveyor.

Council Offices,
Earby.

May 20, 1914.

(1,634)

**URBAN DISTRICT COUNCIL OF
BURNHAM, SOMERSET.
TEMPORARY ASSISTANT.**

A Temporary Assistant in the Surveyor's Department is required for a period of 6 to 9 months. Applicants must be neat and accurate draughtsmen, competent to take levels, prepare drawings, and have a good knowledge of sewerage work, building construction and sanitation. Preference given to one capable of making inspections of premises under the Housing and Town Planning Act. Salary, £2 10s. per week. Applications, with particulars as to qualifications and experience, together with copies of not more than three recent testimonials, must be sent to the undersigned on or before the 8th of June next.

WM. H. CHOWINS,
Engineer and Surveyor.

Public Offices,
Burnham,
Somerset.

May 21, 1914.

(1,638)

**CUDWORTH URBAN DISTRICT COUNCIL.
STEAM ROLLER DRIVER.**

The above Council require the services of an experienced Steam Roller Driver.

Wages, 30s. per week.

Applications, stating age, experience, with two copies of recent testimonials, to be sent to the undersigned on or before Wednesday, June 3rd, 1914.

W. T. LYNAM,
Surveyor.

Council Offices,
Cudworth.

(1,63U)

BARNET URBAN DISTRICT COUNCIL.

Tenders are invited for the Laying of about 140 yds. of 9-in. Pipe Sewer in New-road and Wrotham-road, Barnet.

Plans can be seen, and Bill of Quantities and Form of Tender obtained, from Mr. W. B. Chancellor, Engineer and Surveyor to the Council, at 40 High-street, Barnet.

Tenders, marked "Pipe Sewer," must reach the undersigned not later than 5 p.m. on Thursday, May 28th, 1914.

H. W. POOLE,
Clerk of the Council.

May 20, 1914.

(1,636)

CITY OF LIVERPOOL.

NORTHERN OUTFALL SEWER.

The Health Committee of the Council of the City of Liverpool are prepared to receive Tenders from responsible Contractors for the construction of a Main Sewer, known as the Northern Outfall Sewer, between Brasenose-road, Kirkdale, and the existing Walton Outfall Sewer on the Walton Hall Estate.

Plans may be seen, and copies of Specification, General Conditions, and Bill of Quantities may be obtained on application at the office of the City Engineer, Municipal Buildings, Dale-street, Liverpool, upon making a deposit of £10 (Ten Pounds) to the City Treasurer and Controller, which will be returned on receipt of a *bona-fide* Tender.

Sealed Tenders, endorsed "Tender for Northern Outfall Sewer," must be sent to the Town Clerk so as to be delivered at his office not later than 12 o'clock (noon) on Tuesday, the 16th June, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender, or to defray any expenses incurred in connection with tendering.

(By order)

EDWD. R. PICKMERE,

Town Clerk.

Town Clerk's Office,
Liverpool.

May 19, 1914.

(1,639)

**THE URBAN DISTRICT COUNCIL OF
ESHER AND THE DITTONS.
TO CONTRACTORS.**

The above Council is prepared to receive Tenders for the Laying of the undermentioned Sewers, and Constructing Manholes and other works connected therewith within their District—viz. :—

No. 1.—A 12-in. Cast-iron Sewer in Ember Court-road, Thames Ditton, about 730 ft. long, average depth about 13 ft. 4 in.

No. 2.—A 9-in. Stoneware Pipe Sewer in Alexandra-road, Thames Ditton, about 380 ft. long, average depth about 6 ft.

Plans and Specifications can be inspected, and any information obtained, at the Office of Mr. H. C. Fread, Engineer and Surveyor to the Council, on or after Tuesday, the 26th instant.

Tenders, on the prescribed Form, to be received by me, endorsed "Tender for Sewers," not later than 5 p.m. on Wednesday, the 3rd June.

JOHN T. METCALFE,

Clerk to the Council.

Council Offices,
Portsmouth-road,
Thames Ditton.

(1,632)

MANCHESTER CORPORATION.

The Rivers Committee invite Tenders for the Construction of Main Drainage Work No. 11 (2) (Gorton Intercepting Sewer).

Plans may be seen, and Specifications, Bills of Quantities, and Forms of Tender obtained, on application at the City Surveyor's Office, Town Hall, Manchester, on payment to the City Treasurer of the sum of £10 10s., which sum will, after the Corporation have come to a decision upon the Tenders received, but not before, be returned to the person submitting a *bona-fide* Tender.

All cheques or postal orders are to be made payable to the order of "The Corporation of Manchester."

Tenders, enclosed in the official envelope and addressed to the Chairman of the Rivers Committee, are to be delivered at the City Surveyor's Office not later than 9.30 a.m. on Monday, June 15, 1914.

The Corporation do not bind themselves to accept the lowest or any Tender.

THOMAS HUDSON,

Town Clerk.

Town Hall, Manchester.

May 19, 1914.

(1,633)

**SELBY URBAN DISTRICT COUNCIL.
STREETS AND SEWERS.**

The Council invite Tenders for the Making of a Street and Sewer on land at Fairfax-avenue, Selby. Plans and Specifications may be seen and all particulars obtained at my Office on and after Wednesday, May 27, 1914. Sealed Tenders, endorsed "Street," must be delivered to me not later than 12 noon on Tuesday, 8th June, 1914. The Council do not bind themselves to accept the lowest or any Tender.

BRUCE GRAY, C. E., F. R. S. (Edin.).

New-lane, Selby.

(1,630)

Bemerton and Wilton Sewage Disposal.*

PUMPING STATION AT BEMERTON.

By JOHN H. BLIZARD, ASSOC. M. INST. C. E.

Bemerton is a small suburb of Salisbury and Wilton in fact, it is situated between the two towns, in the rural district of Wilton, and lies in the valley of the river Nadder. Having regard to the growth of the district in 1903, the Wilton Rural District Council instructed my firm (Messrs. Lemon & Blizard) to prepare a scheme for the sewerage and sewage disposal of it.

The scheme was prepared, and in due course carried out and completed in October, 1906.

The main valley sewer was constructed at such a level that, in the event of the Wilton Corporation having to dispose of the sewage of Wilton, it could, by arrangement and agreement, flow into the Bemerton district by gravitation, and thus join the two districts for sewage disposal.

When the Bemerton scheme was in process of construction, the Wilton Corporation decided to have a scheme for sewage disposal, and called in an engineer to advise them on the question for Wilton. An agreement was entered into, and a pumping station was provided for pumping the sewage into the Bemerton system, as it was then thought the sewage could not gravitate into it. In 1903 I stated at the Local Government Board inquiry that the valley sewer I then proposed would be laid at such a level that, by a simple extension of the sewer, Wilton could come in by gravitation; however, it was not then done.

The main sewer was laid up through the valley, through the Wilton Park, to the Wilton Corporation boundary, where a receiving chamber was constructed, into which the Wilton sewage was pumped.

After a lapse of a few years it was thought that the statement I made in 1903 was correct, and the sewage could flow into the system by gravitation. Owing to the excessive leakage in the Wilton sewers, the pumps were unable to do the work required of them, and the sewage overflowed into the river and caused serious contamination. The late Lord Pembroke naturally objected to such a state of things, and I was called in by him to prove that Wilton could be drained by gravitation, and thus get rid of the pumping station, save the annual cost of pumping, and particularly stop the contamination of the river. I reported it was practicable, and the Wilton Corporation, at the suggestion of the late Lord Pembroke, retained me to carry out my scheme, which I did successfully, and the sewage is now gravitating to Bemerton as originally intended.

THE BEMERTON SEWERAGE WORKS

briefly are as follows: From the pumping station, for a distance of 220 ft., a 15-in. C.I. pipe is laid, and from thence to Wilton a 12-in. C.I. pipe, which is the main intercepting or valley sewer.

The branch sewers are of cast-iron and glazed stoneware socket pipes of 7 in., 8 in. and 9 in. diameter respectively, and of a total length of upwards of 4 miles. The usual manholes are constructed, and those at the heads of branches are arranged to act as flushing chambers.

The ventilation is by shafts, each 30 ft. high, placed at convenient points, the inlets being open manhole covers fixed in positions where they will not become a nuisance; in the streets they are closed, as it is well known that the open manhole cover is as often an outlet as an inlet, consequently there must be a nuisance at times; however, this has been guarded against as much as possible.

The gradients are all good and self-cleansing. The main valley sewer provides for the Wilton Union workhouse as well as Wilton town.

The present estimated population of Bemerton is 1,800, and Wilton 2,200, total 4,000; and, taking the water supply at 25 gallons per head per day—100,000 gallons dry-weather flow, or 70 gallons per minute average flow. This quantity is quite theoretical, as such a quantity as 25 gallons per head per day is never used in such districts as Wilton and Bemerton, with small houses and not many baths; but the quantity is a requirement of the Local Government Board, and is provided for. The unavoidable rainfall is

estimated at six times the dry-weather flow; this is quite theoretical, too. The sewers were well laid, as were also the house connections, and before Wilton came in by gravitation, six times the dry-weather flow was never reached; but since then it has exceeded owing to leakages in the Wilton sewers.

The whole of the sewage gravitates to the pumping station; it first runs through two iron screening tanks, then to two circular iron pump wells. From the pump wells it is pumped through a 12-in. cast-iron main to a sewage farm about 1½ miles in a south-south-west direction, with about 60 dead lift, and is delivered into two receiving tanks.

The pumping station is a brick building with slated roof, well lighted and ventilated; the floor is paved with white and black tiles, and a glazed-brick dado is built round the walls.

The accommodation is as follows: Engine and pump room, 40 ft. by 32 ft., there are now two engines and two sets of pumps, and a space is reserved for another engine and set of pumps to deal with the increasing population when necessary; space for bench; store; gas-plant house; fuel store and water closet. Over the bench room and store is a tower with two floors; the first is for the cooling tanks, and the second or upper floor the water tank, into which water is pumped from a well in the yard.

The gas engines and three-throw horizontal plunger pumps are in duplicate; each set will pump 500 gallons per minute, as against 420 gallons per minute now expected to be pumped; there is, therefore, ample pumping power for some considerable time yet. If the population of Bemerton should continue to rapidly increase—and I hope it will—it will be a simple matter to put in another engine and pump in a space provided for it, as before mentioned. The gas is made from anthracite from a suction-gas plant; it is made and used directly by the engines, and has been successfully and economically worked for the past eight years. The town gas is laid on as an auxiliary in case of breakdown or repairs to the plant, but very little is used beyond that required for the lighting of the building.

The adoption of this scheme has been proved to be very economical, and, compared with the town gas at 2s. 6d. per 1,000 cub. ft., there is an actual saving of at least 60 per cent. The engineer-in-charge keeps a daily record of the actual work done and fuel used, and can be inspected at any time.

The annual cost of the pumping station is as follows: Staff, two men and lad, £210; 45 tons of anthracite coal, £67 10s.; 45 gallons of oil, £3 15s.; waste, about 1½ cwts., £3 3s.; total, £284 8s.

The repairs and renewals spread over eight years have not been very considerable. The plungers have been turned, and glands rebushed. The engines now require an overhaul, which, doubtless, will be done in due course. The fact of the machinery having been worked for eight years with so small an amount of repairs reflects great credit on the engineer-in-charge, Mr. C. Castle, who has been here since the work started.

THE SEWAGE FARM.

The area of the land for the purification of the sewage is 30 acres. The sewage is lifted to the highest corner, and delivered into receiving tanks in duplicate, from which it flows along stoneware carriers or conduits, and distributed therefrom through branches or junctions over the land, as circumstances may direct, having regard to the nature of the crops growing. The land is let to a tenant under an agreement for the proper distribution of the sewage for purification.

The land is the best which can be obtained for the purification of sewage; it has a chalk subsoil, and there is no effluent from the land after distribution.

Bemerton has no further capital to spend for sewers; if more sewers are required the landowners must put them in and connect up to the general sewerage system. If any more land is required for purification, there is plenty adjoining the present area, and which can be obtained through the kind consideration and public spirit of the late Lord Pembroke; the price is fixed for the future, which is looking well ahead. By

* Paper read at the meeting of the Institution of Municipal and County Engineers at Salisbury last Saturday.

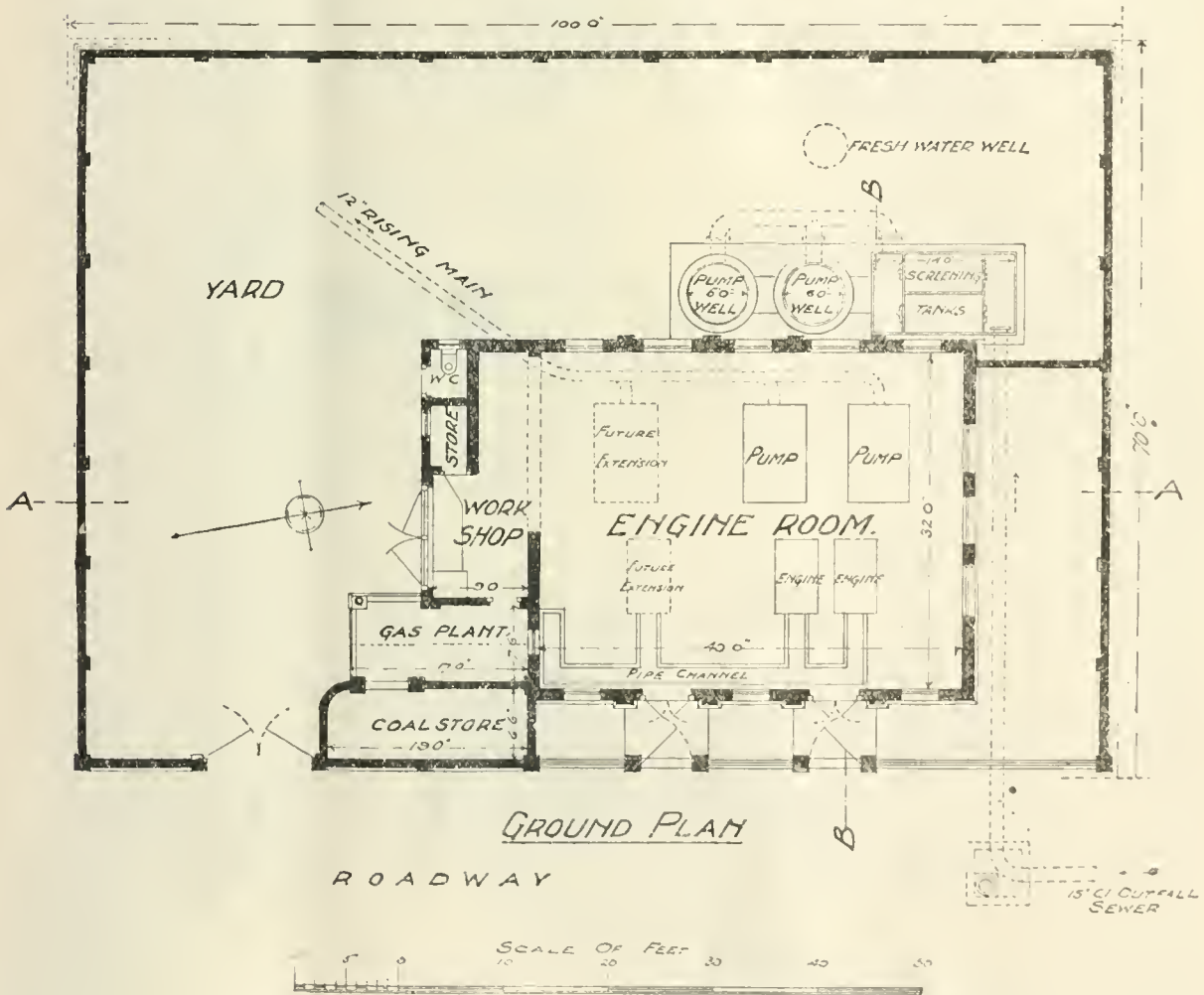
this arrangement not only does Bemerton benefit, but Wilton also, the two districts now being "married" for sewage disposal purposes.

It has been suggested that Bemerton ought not to have an old-fashioned sewage farm; my answer to that is, the old-fashioned sewage farm is good enough for Bemerton or any other place provided the land be suitable—that is the secret, suitability of soil for the purification of sewage, and plenty of it. Tanks and bacteria beds, as such, are quite good when they are

uninteresting, but trusts that the visit of inspection will compensate for it.

DESCRIPTION OF ENGINES AND PUMPS.

The engines and pumps are installed in duplicate. The rising main is of 12-in. cast-iron pipes, 2,100 yds. long, with a dead lift of 60 ft. above the pumping station. The sewage is raised by each out-stroke of the pumps through the suction pipes which are fitted with foot valves and strainers at the lower ends. The



BEMERTON MAIN SEWERAGE: PUMPING STATION.

required. I am now carrying out one scheme of bacteria beds, and preparing another scheme of the same character. Why? Because land is not available for sewage purification in either case. I have also been asked why we have no bacteria beds; my answer is, Bemerton has a very fine one now of 30 acres to start with, and a good one too. There is no expense for maintenance, as the crops will always pay for that. Attached hereto is a plan of the pumping station. The author is afraid that this paper may be somewhat

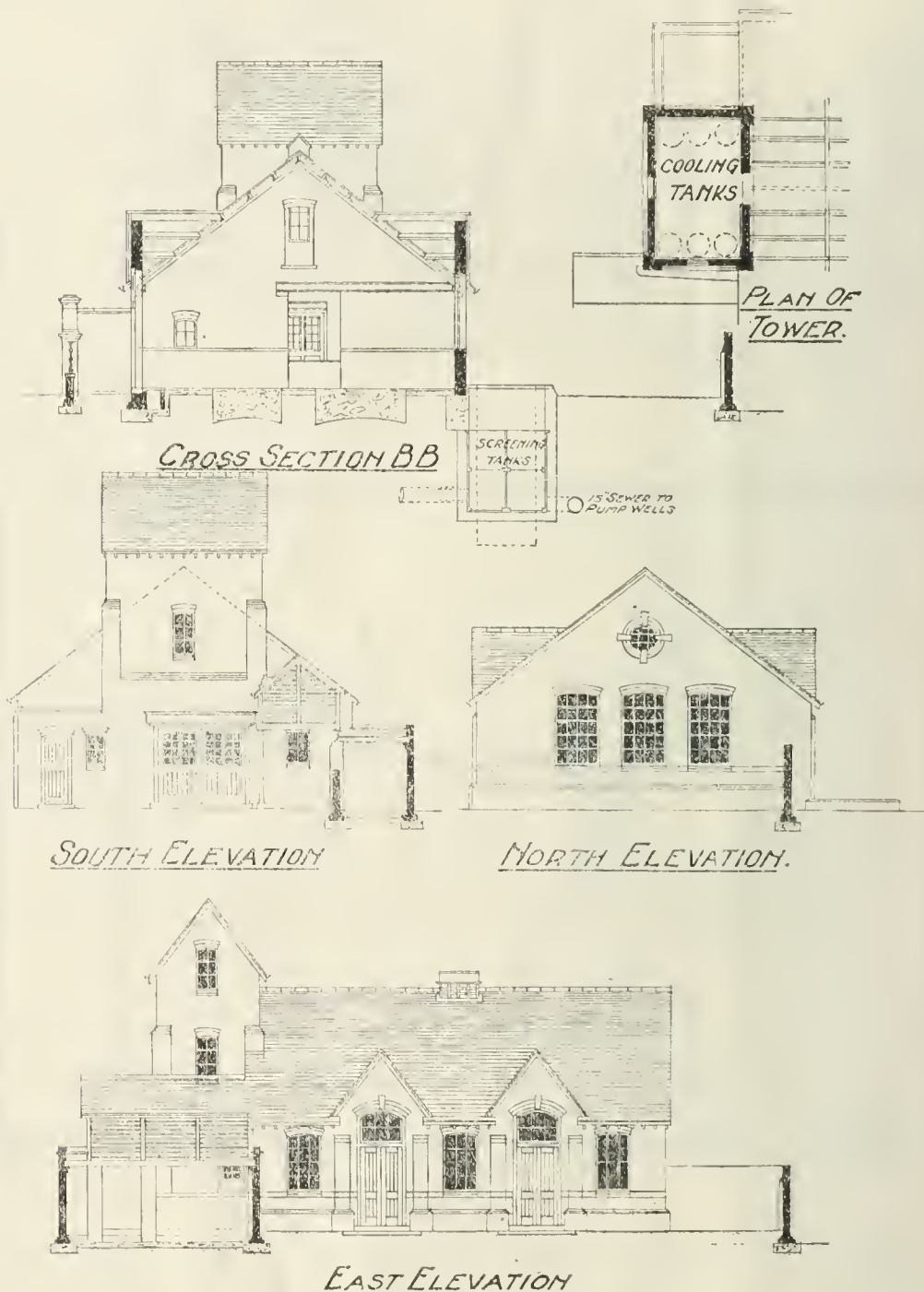
strainer arrests any floating insoluble matter which may have passed the screens. On the in-stroke the valves shut and the delivery valves open, thus allowing the sewage to be forced into the delivery main (upon which is fixed an air vessel), thence passing a retaining valve, and into the unobstructed rising main to the land. The air vessel is fitted above each set of delivery valves, and acts as a cushion to the pumps, and causes a continuous flow in the sewage through the mains without jerks. In case the air in the air vessel

should become exhausted, and in some way or other escape, an air cock is fitted for regulation. The relief valve fitted near the air vessel, above the delivery or top valve, acts as a safety valve, for without it, if a sluice valve on the delivery main was shut and the engines started, the sewage, having nowhere to go, would cause such a pressure that some part of the machinery would burst; but by having a relief valve the pumps will in no way be damaged, as the valve would open at a certain pressure and flood the floor of the engine-house, which would be such a reminder to the engineer-in-charge that he would never forget it again; this has actually happened once.

The sluice valve fitted to each set of pumps is for

the rising or delivery main, it is done as follows: At the rear of the building is a valve fitted in a pipe leading from the 12-in. main to the pump wells; when this is opened it discharges the sewage back into the wells and receiving tanks.

The pumps are arranged to be coupled together by means of a clutch, so that one engine can drive both pumps, or either engine either set of pumps. Each set of pumps has two gears or speeds, both of which can be thrown in and out separately. One speed is nine revolutions and the other thirty-six revolutions per minute. If the pumps are driven together on the slow speed it is equivalent to a speed of eighteen revolutions for one set of pumps. You have, there-



BEMERTON MAIN SEWERAGE: PUMPING STATION.

the purpose of shutting off the delivery main to examine the relief and retaining valves, or to admit air to the air vessel; it would also be used when the pumps required attention. The valve is fixed next beyond the retaining valve, and shuts off the sewage from every working part of each set of pumps. A retaining valve is fitted to each set of pumps, and is for the purpose of stopping the sewage from being forced back into the pumps after it has entered the delivery main, and also to take the pressure off the pump valves. It is fitted close to and below the sluice valve, and between that and the delivery valves.

If it should be found necessary at any time to empty

fore, three speeds—nine, eighteen and thirty-six revolutions per minute. The speeds were devised by us in conjunction with Messrs. Hayward, Tyler & Co., in order to properly deal with the varying flows of sewage. On the spur wheel shaft of each set of pumps a small single-cylinder pump is fitted for pumping fresh water from a well at the back of the station to the circulating tanks in the tower for cooling the gas engines when they are running. This fresh-water well means a great saving in the annual working expenses of the installation.

The pumps are of three-throw type, which makes the working much steadier, and, moreover, the strain

on the pumps is considerably lessened and more equalised. On each pump shaft two cog or pinion wheels are fixed, one larger than the other. Similarly, on each driving axle there are two sliding cog or spur wheels, both of which can be engaged or disengaged with the respective pinion wheels by means of levers. The larger spur wheel can be engaged with the smaller pinion wheel, thus giving a slow speed, and the smaller spur wheel can be engaged with the larger pinion wheel, thus giving a fast speed. Each of the pump axles has a counter fixed, which registers the number of revolutions made, so that the work done can always be ascertained by reference to it. Each driving axle is fitted with two wheels, one of which is a loose or free wheel, and the other the driving wheel for the belt. About half way between each pump and its engine is a standard, upon which is fixed the striking gear for the belts; when the pump is to be stopped the gear is pushed over, and the belt pushed with it on to the loose wheel; thus the pump is stopped, but not the gas engine, and to start the pump again the reverse is done.

The gas engines are in duplicate, by Messrs. Fielding & Platt, of Gloucester, and made to the order of Messrs. Hayward, Tyler & Co., of Luton and London, who supplied the whole of the installation. Each engine is of 17-b.h.p. with suction gas, and 20-b.h.p. with town gas. The fly-wheel is 5 ft. 6 in. in diameter, and makes 200 revolutions per minute. The ignition is by magneto, with an auxiliary tube ignition. The gas which is chiefly used is the producer or suction gas, but the town gas is laid on as an auxiliary to the producer plant in case of breakdown or sudden emergency, and for lighting the station. The engines, being internal combustion engines, must be cooled; as before stated, there is a small pump attached to the sewage pumps, which pumps water from a well; this is forced up to a tank at the top of the building.

On the floor beneath—that is, on the middle floor—are four other tanks, used as circulating tanks, supplied from the tank above. Each of the five tanks has a capacity for 200 gallons. From the circulating tanks the water flows to the engines, where it circulates in the water jackets of the cylinders, and back again to the tanks. This water quickly gets hot; hence the necessity for a good supply of cold water to the tanks, to keep the engines cool, which is an absolute necessity for their proper and efficient working. The gas, on leaving the producer plant, passes through a pipe into an expansion box, and from thence through another pipe into the engine. The expansion box is the reservoir for the gas from which the engines suck; they require more gas for each explosion than the pipes hold; hence the necessity for a reservoir. The town gas is taken from a 150-light meter to a gas bag, which is another form of expansion box or reservoir. A pipe connects the gas bag to the pipe taking the producer gas to the engine. Just below the junction of the town gas pipe and the producer gas pipe a tap is fitted, so that the producer gas may be shut off if the town gas is used. Similarly, a tap is fitted so that the town gas may be shut off when the producer gas is being used. The exhaust gases from the engines pass through a pipe to an exhaust box in the front of the building.

On the suction stroke of the engine, air as well as gas is sucked in, which causes the gas to explode in the cylinder. On the end of the air pipe, which is outside the building, an air box is fitted, which stops the noises caused by the sucking of the engines on its suction stroke. Close to one engine is a wrought-iron cylinder, connected to the engine by means of a small pipe; in this air is compressed by the engine when running (the pressure being registered by a gauge), and is used to start the engines again if stopped. When the engine is to be started a tap is turned on the compressed air chamber, as also is one on the engine; the air is forced into the cylinder of the engine, when the fly-wheel at once begins to revolve; the air is then shut off, and the gas admitted into the cylinder, it fires, and thus the engine is started. Without the compressed air the engine would have to be started by hand, which would be a very difficult and unsatisfactory way of working, especially in case of emergency; with the compressed air there is no difficulty whatever.

GAS PLANT.

The gas plant consists of a generator and a "scrubber." A fire is lighted at the bottom of the

generator, and anthracite (coal) "beans" or "nuts" put into the top; the anthracite is burnt and creates an intense heat, and gives off gas.

The generator is lined inside, up to a certain point, with firebricks; at the bottom is a revolving grate, which can be moved by means of a handle, to get rid of any clinker, which drops into an ash-space beneath and so keeps the fire free.

The fire is lighted in the ordinary way and a draught created by a fan (worked by hand) attached to the side of the generator; as soon as the fire is well under way a bucket full of anthracite beans is allowed to drop from the hopper. The fan is kept revolving, and within ten minutes of lighting up the gas engine can be started.

The gas leaves the generator at the top and enters the scrubber at the bottom; the pipe connecting these two is fixed vertically to a height of about 15 ft., and a valve is fitted just above the point of projection, also a small pipe and valve are fitted in gas pipe, at the top, where the gas leaves the generator. The gas passes through a pipe and enters the scrubber at the bottom, thence through $\frac{1}{2}$ in. of water, and ascends through coke, over which water is dripping, and is thus prepared for its work. After this process it is sucked through a pipe into the expansion box, and thence to the engine. When the engine stops the valve in the vertical pipe is opened, allowing the gas to pass up into the air. The pipe also causes a draught and keeps the fire from dying down quickly. The short pipe which is fitted is for ascertaining whether gas is being given off, which is tested by applying a lighted taper; when the engine is running the valve in this pipe is shut.

The plant is sufficient to run both engines at once, with the ordinary flow of sewage, or one engine when pumping six times the dry-weather flow. A complete record is kept of all the work done by the engines and pumps, the time they work, the quantity of town gas used, the quantity of anthracite coal used for the producer plant, the number of revolutions made by the pumps, and whether running at slow speed, pumps coupled together, or fast speed. There is also a rain gauge kept, and a record of the weather temperature inside and outside.

INSTITUTION OF MUNICIPAL ENGINEERS.

NORTH-WESTERN DISTRICT MEETING AT OLDHAM.

The members of this district met at Oldham on Saturday last, when among the members present were Messrs. A. R. Bleazard, chairman of the district, E. Walker (Stretford), J. W. Gleave (Heywood), R. E. Miles (St. Helens), A. Dempsey (Eccles), J. Liddell (Furness Vale), J. Jones (Gobowen, Salop), E. Green Davies (Gobowen, Salop), J. D. Hurst (Wardle), E. Ryder (Manchester), R. Aspinall (Manchester), J. H. Moore (Bucklow, Cheshire), and R. J. McKenn, the hon. district secretary. The party were received at the Oldham sewage works by Dr. Wilkinson, medical officer of health, Oldham, and Dr. Grossmann, patentee of the grease-extracting plant. Beginning at the precipitation tanks, Dr. Grossmann explained the method of raising the sludge by compressed air through ejectors to the higher settling tanks, where, by treatment with sulphuric acid, the sludge is concentrated and rises to the top, the liquid below being drawn off by valves and pipes placed at various levels. From these tanks the sludge is removed by means of a worm-conveyer into a channel, in which operate conveyers, which lift the sludge to the top retort-house. Here the sludge, after passing through the retort, has the moisture evaporated and is ready for passing to the de-greasing retort-house, which is situated below the former house. Passing through these retorts, the grease is extracted in a vapour, which is conveyed through pipes to a condensing plant, consisting of vertical pipes. The vapour rising in these pipes comes into contact with cold water entering at the top of the condensing pipes, and is condensed into a solidified grease, which discharges with the condensing water into collecting chambers, whence it is taken.

After inspecting the grease-extracting plant, the members were escorted round the works.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

Greater New York's Water Supply Scheme.

DISCUSSION AT JOINT MEETING OF INSTITUTION OF MUNICIPAL ENGINEERS AND SOCIETY OF ENGINEERS.

In last week's issue we reproduced, together with the interesting illustrations that accompanied it, the paper by Mr. William T. Taylor, Fellow A.M.I.E.E., A.M.I.MECH.E., M.A.SOC.M.E., F.R.G.S., of New York, on the subject of "Greater New York's Water Supply Scheme," which was presented at a joint meeting of the Institution of Municipal Engineers and the Society of Engineers held in London on Monday of last week. The attendance at the meeting included Messrs. H. C. H. Shenton, president of the Society of Engineers—in the chair—H. Boot, president of the Institution of Municipal Engineers, H. C. Adams, Chas. V. Biggs, F. Ball, Charles T. Walrond, Percy Griffiths, members of council of the respective bodies; W. C. Easdale (Westminster), Harold J. F. Gourler (Westminster), Alex. H. Jameson (Golders Green), J. W. Cable (London), H. R. Askew (Streatham), L. Askew (Streatham), E. Sandeman (Westminster), E. A. P. Wood (Westminster), E. Malkinson (Westminster), G. Watson (Westminster), J. G. Sharp (Workington), Digby C. Wingfield (Streatham), Herbert Lapworth (Westminster), F. W. Poynter (Watford), J. D. Haworth (Westminster), J. R. Fayers (Watford), Edgar Graves (Westminster), D. C. Fidler (Hayes), A. S. Everett (Westminster), S. Rideal (Westminster), E. K. Rideal (Westminster), C. Buntin (Wandsworth), H. M. Jordan (Westminster), R. Harben (Finchley) and A. S. E. Ackermann, secretary of the Society of Engineers, and B. Wyand, secretary of the Institution of Municipal Engineers.

Mr. H. C. H. SHENTON, president of the Society of Engineers, said it was to be regretted that the author of the paper was not in England at the present time. The subject of the paper was of the very greatest importance, because it not only dealt with the largest waterworks in the world, but it was, he believed, the first paper on the subject that had been read before a representative engineering society in this country. That night it had been read before two representative English engineering societies, and it therefore became doubly important. Probably one of the first things which struck one in reading the paper was that the author did not state his authority for coming before them with that description of work which was not his own, and upon which he had apparently not been employed, and it seemed strange that at first there was no acknowledgment of the source from which the information was obtained, and the drawings—which were quite familiar—were taken. But it went without saying that a paper like that was not accepted without such matters being looked into as a preliminary, and he ought to say that Mr. Taylor had the best authority for his statements and the use of the illustrations, that of the chief engineer of the Board of Water Supply of the City of New York. He (Mr. Shenton) had before him the letter from Mr. Taylor, in which the latter told them that Mr. A. D. Flynn, the departmental engineer on the work, and the author of many well-known papers on the subject, had presented him with a complete set of reports dealing with the scheme and all other available data and drawings, and the matter was delivered to him at the Engineers' Club, New York, with the compliments of the chief engineer. He ought to mention also that not only had the New York Water Board empowered Mr. Taylor to write that paper to be read before a British Institution of Engineers, but they had at the same time sent copies of their reports to the Institution of Municipal Engineers, and these valuable publications were therefore available to the members of that body for reference. That showed, he thought, the very friendly feeling American engineers had towards them. The mention of the Engineers' Club made one sorry there was not some similar club in London. Mr. Taylor, he might tell them, was a mechanical and hydraulic engineer in private practice in New York, and a member of American and British Institutions of Civil and other engineering societies, and he had also had an eventful military career. That was, however, beside the subject of the paper, but as he had to propose a vote of thanks to Mr. Taylor, he thought they would like to know

something about him and his authority for writing the paper. The author had been able, from the sources stated, and from personal investigation, to gather special information with regard to his subject. The paper was, of course, general rather than particular, and to that degree he was rather disappointed, because there were so many points of detail in the scheme that well deserved discussion. There was mention in it, for instance, of concrete lined tunnels, but it was one thing to line a tunnel and another to make it watertight, and the methods employed in doing that were of interest. The lining of steel mains with cement was also very interesting, and there was a great deal to be said about that, and there were innumerable other matters of particular interest which ought at some future time to be discussed by the society and the institution. He did not propose to discuss the paper now, but he asked them to accord a vote of thanks to the author.

The vote of thanks was carried with acclamation.

Mr. E. SANDEMAN (Westminster) said it was difficult to avoid being very greatly impressed with the magnificence of these works, and with the efficient methods of the engineers. When one considered that the 500 million gallons of water which New York was going to take in was simply supplementary to their existing supply, and was sufficient to supply half of England, it gave some conception of the vastness of the scheme. Having been engaged for twenty years in the construction of impounding dams, it was natural for one to turn to the section of the Olive Bridge dam. As they had already heard explained, the whole length of the embankments and dams was about $5\frac{1}{2}$ miles, but the masonry part was only a very short length of that mileage. The dam he had referred to apparently had a thickness of 190 ft. at the base. Some 15 or 20 years ago New York built the new Croton dam, which was higher than the one under notice, and a much thinner one. When proposed, as it was going to be one of the biggest in the world, a special Board of Experts—that of the engineers of the Aqueduct Commission—was called together to consider the design. The board thickened the dam considerably, probably on account of the ice pressure which might affect the structure, but notwithstanding the decision of the Board of Experts, the design was again altered and the thinner section was adopted. It was interesting to compare what had been done in these two designs. At 50 ft. from the top the new Croton dam was 34 ft. thick, but this new dam would be 53 ft.; at 100 ft. from the surface the new Croton dam was 72 ft. thick, but the Olive Bridge dam would be 93 ft.; at 150 ft. from the top the new Croton dam was 156 ft. thick, whereas this new one would be 154 ft. So it was practically 20 ft. thicker the whole way down. There must be some strong reason for that increased thickness, as it now appeared that the engineers had reverted to the thicker design originally proposed by the Board of Experts. The effect of making the dam so thick was to give it increased strength, and whereas the Croton dam had a factor of safety of rather more than 2, this would have one of $4\frac{1}{2}$. There was another peculiarity about it. The resultant of the water pressure and the weight of the dam combined struck the exact middle of the dam, so that when the dam was full of water there was an exactly even pressure over the whole base. When the dam was empty the pressure on the up-stream side seemed to be about $11\frac{1}{2}$ tons, and on the downstream side apparently about half a ton. The weight per foot down to about 180 ft. was about 1,000 tons. In the dams which he had just been finishing in the Derwent Valley, down to about a similar level the cross-section would weigh about 880 tons, so that the Olive Bridge section was a much heavier one. He noticed that a great part of the embankment was formed in the American fashion with a concrete core, instead of puddle as used here. It seemed somewhat surprising that the Americans did not use puddle if it were available, because one could not help thinking that where large embankments were made with a central core the core must of necessity be bent to one side by the settle-

ment of the earth unless a reinforced core were adopted. It was difficult to make an embankment that would settle exactly evenly, and the pressure was almost bound to come on one side of the core. A noteworthy point was the rather high cost of the plant employed on these works. £500,000 invested in this way on two reservoirs seemed very large; but it was difficult to grasp what plant was required unless one had more details.

Dr. HERBERT LAPWORTH (Westminster) congratulated the members on having this interesting account of American engineering practice placed before them. He supposed many English engineers were rather inclined to think they had not much to learn from American engineering practice. That might have been true, possibly, fifty years ago, but he thought that at the present time they had a great deal to learn from them; certainly, as regards water supply, the Americans had the finest literature in the world. The Catskill scheme was of very great interest to water engineers in this country, and they could learn a great deal from it. It was without parallel in the history of waterworks engineering, not only by reason of its heroic dimensions, but also by reason of the extremely careful investigations from which the designs were prepared, and the painstaking attempts made to effect economies in location, and, lastly, by the extraordinary rapidity with which (in spite of these exhaustive preliminaries) the work had been carried out. In a paper like the one before him the subject was too vast to go into details, but there was one point of the utmost importance, namely, the question of the geological investigations. Throughout the whole of the scheme geology had played an essential part, and the location and designs were based largely on the results of geological investigations. The methods adopted in crossing wide and deep rivers afforded a good illustration of the care and yet boldness with which everything was done. When they considered the scheme in all its aspects, he thought it would be agreed that even the most experienced of them must greatly benefit by the study of its details.

Mr. HORACE BOOT (president of the Institution of Municipal Engineers) observed that the subject of the paper was of great interest to municipal engineers, especially in this country, where one was struck by the small, inadequate water schemes, which were so often carried out by our municipalities. If they traced the history of the water supply of our great towns, they found that the town councillors generally could not bring themselves to realise that their cities must grow and the requirements increase. In tackling a water supply, they should not be afraid of dealing with it on a large scale. He thought the thanks of the two societies were due to Mr. Taylor for sending over a paper of such great interest. It would have one effect, he thought; in the future, when they came to design a water scheme, they would be encouraged to put forward a sufficiently large one. One would have liked to see the analyses of the water for drinking purposes, also what Mr. Taylor expected would take place with regard to the expansion of the steel pipes. Mr. Taylor coated many of these pipes with concrete. In this country, if we were to treat water pipes in that manner, he was not altogether sure that it would be successful. To be able to judge a scheme like that of New York, one required to know something of the quantity and quality of the water, the capital cost of the work, and the selling price of the water before one could judge whether the scheme was going to be an engineering success. It was not difficult to design a scheme costing millions of money, provided that money did not matter. He did not for one instant suggest that in this particular scheme that point had not been borne in mind, but it was useless for engineers to put forward a gigantic scheme without regard for these important items. In one part of the paper the author spoke of the trouble arising from lead corrosion. If that were gone into a little closer, it would probably be found that it was set up by the presence of dissimilar metals causing electrolytic action rather than by corrosion. Mr. Taylor had included in his paper a rather elaborate diagram of the organisation of the engineering department, and there again it was quite possible that in this country their water schemes were not sufficiently organised. In one's travels abroad one could not but be surprised by the magnificent organisation that existed in such matters, and especially in water departments.

Mr. PERCY GRIFFITH (Westminster) said he thought it was right to say that they were proud (with their confreres the municipal engineers) to be the first of

the societies in this country to have a paper on this important subject read and discussed. He was bound to say that he considered the paper a very valuable and interesting forerunner of what would no doubt be available in greater detail later on. A great scheme had been undertaken, and an important section of it was nearing completion. In the paper they had a general summary of the dimensions, scope, cost, and other interesting features relative to the work. The figures presented to them did not tell them much more than that the scheme was a stupendous one, and one representing an epoch in the history of water engineering. That was enough to make the paper welcome and worthy of discussion. Their attention in these days was so often monopolised by small details that they were unable to take a broad and comprehensive view of any large scheme. It was for that reason that he thought it useless to raise certain questions that had occurred to him, questions in the nature of "asking for more." There was one matter, however, that he would refer to—namely, the relationship between the storage and the flow of the stream in each case. He was not sure whether or no information was published in book form and available to them at their leisure, and if so, he would not criticise the author for not giving details of that nature. The question of the relation between the dimensions of the scheme and the population to be supplied reduced itself to the quantity of water required per head per day.* He had not before him the proportion of the supply in New York required for trade and municipal purposes, but he knew that the so-called domestic consumption was in most American cities very large, while experience showed that health and sanitary conditions could be maintained on a much smaller quantity. It was a serious question whether it would not be worth while to attempt some reduction in the consumption of water rather than spend enormous sums on gigantic water schemes, such as the one described in the paper. A comparison between the expenditure necessary to reduce consumption and the expenditure necessary to increase the supply seemed worth consideration, and he would like to know something of the figures which could apply to this case. He did not hesitate to suggest that it would be more economical to check unnecessary consumption.

Mr. J. D. HAWORTH (Westminster) remarked that a consumption of 100 gallons per head per day appeared enormous. In Manchester, he believed, it was only from 40 to 42 gallons, in spite of the large consumption on account of the various trades carried on in that city. His own experience was that the supply to the ordinary consuming population should not exceed 20 gallons per head, and he had known it to be even as low as 15 gallons where means of preventing waste were adopted. Referring to the section of typical cut-and-cover construction in the paper, he thought there must have been some special reason for the Board of Experts constructing a concrete culvert on foundations of the nature shown in the section. For his own part, he would be very diffident in putting such a structure as the one illustrated on a foundation of filled-in earth, even when rolled. There was always the difficulty to be borne in mind of the filling material not consolidating sufficiently. If any settlement took place in the filling after the culvert was constructed, a fracture might occur in the concrete, which would not only be difficult to repair, but would cause serious inconvenience. It would be interesting to know what were the reasons which led the board to decide on the method of construction adopted in the dams.

Dr. S. RIDEAL (Westminster) remarked that he had had opportunities of studying on the spot the question that had been raised by Mr. Griffith and Mr. Haworth. He believed the population of New York was now approaching 6,000,000, and they certainly used more than 100 gallons per head per day. The Sewage Commissioners were counting on a population of 9,000,000 in 1940. He thought with Mr. Griffith that the consumption of water could be considerably reduced in the future, and many American towns were now being metered. It was a curious fact that, although New York had a larger water consumption than either London, Paris, or Berlin, the death-rate of the former was higher than that of any of the other three. It was noteworthy that in Mr. Taylor's paper there was not a word about purification, and they had to ask themselves what was going to take place in these large reservoirs. The large quantity of water was going to be very short

of oxygen in time, and would encourage all sorts of growths, so that before it arrived in New York he expected it to have a smell, a colour, and a taste. The experimental aerators were giving good results, but probably other methods of purification would be required.

Dr. ERIC RIDEAL (Westminster) followed with some remarks regarding the choice of steel in preference to wrought-iron pipes, and the protection of pipes by means of cement.

Prof. ALEX. H. JAMESON (Professor of Engineering, King's College, London University) said he recommended the members to read the book recently published, *The Catskill Water Supply*, by Lazarus White (Wiley & Co.), which was splendidly illustrated, and gave a very full account of the construction methods and plant used in the New York works. As to filtration, he called attention to the profile of the Catskill aqueduct in which, at 80 miles on the section, a "filter connection chamber" was marked. That was not, he thought, marked on the original drawings, but looked as if the idea now was to filter the water south of the Kensico reservoir. He thought it would be more advisable to filter the water at the head of the aqueduct so as to avoid organic growths therein, and he could point to the experience of Manchester on their Thirlmere aqueduct, where frequent cleaning of the cut-and-cover and tunnels was necessary to remove evil-smelling *Spongilla*, &c. That was a matter of considerable difficulty in lined tunnels, and he was therefore glad to see that the Catskill tunnels were lined with concrete. The cut-and-cover section was quite different to our British practice. The idea seemed to be to have shallow excavation, and no timbering of the trench, allowing the use of steam excavators and using the spoil for an embankment on top of the conduit, which got very little support from the sides of the trench, and was therefore of a horse-shoe section. The author referred to this aqueduct as "skirting many a steep hillside," but the many photographs in Mr White's book all showed the ground as nearly level across. For "steep hillsides" the type of section shown in the author's paper would not, he thought, be suitable on account of the risk of landslips and surface creep unless the trench were cut much deeper, and then a section deriving more support from the sides of the trench would be more economical. In bad cases, however, a lateral tunnel would be the best. His experience was that concrete became worn and pitted after a time by moving water, the velocity varying from 4 ft. per second in the Catskill cut-and-cover to 4.8 ft. per second in the grade tunnels, and 5.8 ft. per second in the pressure tunnels. He thought a vitrified-brick facing to the invert, at least where the wear was greatest, would have been found to have been advantageous. The pressure tunnels were certainly the most novel feature of the aqueduct, although there was a valuable precedent for them in the pressure tunnel, 7 miles long, under the Harlem River, on the New Croton aqueduct for New York City. They necessitated an immense amount of boring to locate in suitable watertight rock, but when constructed, were absolutely permanent; no maintenance was required, there was no danger of burst pipes, and no costly automatic arrangements to mitigate their effects. Under the Hudson River and Croton reservoir, undoubtedly, pressure tunnels were by far the best form of construction, as also under New York City, for security, and in order to avoid the enormous disturbance of the streets and cost of laying the equivalent thirty-two 48-in. pipes or the sixteen 66-in. pipes; but he questioned whether it was economical to construct them for the Rondout, Wallkill, Moodna and Yonkers syphons, which aggregated 16 miles, or nearly half of the total length of pressure tunnels (35 miles). The steel pipe syphons, of which only 6 miles were constructed, formed in reality a reinforced-concrete aqueduct of great strength and permanence, and had the advantage of far greater accessibility than a pressure tunnel, and would, he suggested, have cost far less for the above four syphons. Three of such steel-pipe syphons should not have cost more than twice as much per foot as the cut-and-cover, and allowing for the saving of interest on capital by laying each pipe only when demanded by the consumption, they would probably not have cost more than $\frac{1}{2}$ times the unit cost of cut-and-cover, whereas Mr. White stated that pressure tunnels cost 2 $\frac{1}{2}$ times the cost of cut-and-cover per unit length. Possibly the engineers had doubts as to the durability of the steel-pipe syphon construction, but there seemed every reason to expect that it would be a success and solve the difficulty of the in-

crustation of pipes with consequent greatly reduced delivery and necessity of renewal. He might point out that the pipes, after riveting together and caulking, were tested at working pressure, then concreted outside, while filled with water, to a thickness of from 6 in. to 18 in. in a horse-shoe section. The water was drawn off, and the 2-in. internal lining formed of 2 to 4 cement mortar by screening the invert and grouting the remainder behind flexible wooden moulds. Experiments of two years' duration made in Croton water with naked steel plates, plates bedded in cement, and plates separated from the cement by a $\frac{1}{2}$ -in. gap, showed, respectively, great corrosion, perfect condition and very slight incrustation of the steel plates, indicating that even when the cement did not perfectly adhere, it neutralised the acidity of the water, and prevented rusting. There were only 16 miles of ordinary pipe line, wholly in the delivery area.

[Since the meeting, Prof. Jameson has pointed out that the tunnel under New York is 15 miles and not 31 miles in length, and that the maximum available pressure there is 295 ft., not 590 ft. He proceeds to point out that the longest aqueduct in the world is Coolgardie, Western Australia, which has a length of 352 miles. In regard to the Kensico reservoir, the "elevation of water (full reservoir) above tide" is 355 ft., not 270 ft. He further points out that the downstream face of the Kensico reservoir is of granite masonry, and the upstream of concrete blocks. At Olive Bridge both faces are of concrete blocks. The seven pressure tunnels total 35 and not 17 miles, and Prof. Jameson adds, in regard to the thickness of the steel pipes being 7.68 in. to 0.75 in. wide, that the first is an absurd value.]

Mr. HENRY C. ADAMS (London) said that he thought it was recognised, to some extent, that the immense quantity of water delivered to New York was not actually consumed or used by the people, but that large volumes were wasted. Whatever the facts were, the problem of distributing the water supplied by this scheme was one of great importance. Calculating the water consumption on the usual per capita basis, a sufficiently accurate result would, no doubt, be obtained in the bulk, but when considered in detail, the size and character of both population and buildings varied to such an extent that the estimate was likely to be a long way out. The waste could be divided into two parts—that from the mains and that from the house services—the relative proportion of each depending on different circumstances. In general terms, it may be stated that the waste from the mains is proportional to their total length, while the waste from the house services is proportional to the population. The engineer in whose hands the distribution of the water had been placed had adopted the novel method of basing the consumption on the floor area. He assumed that the amount of water used in each building was proportionate to its cubic contents, or, more strictly, to the floor area in the building, which was arrived at by taking the ground area of the building from the maps and multiplying it by the number of floors, adopting 1,000 sq. ft. as the unit of area. In order to be satisfied that this basis was a satisfactory one, it was checked by observations made in two representative areas—one containing high-class property, and the other tenement property. It was found, after counting the inhabitants in the two blocks, that the consumption in the former area was 128 gallons per head per day, while in the tenement property it was 31 gallons. Basing the consumption in these two districts on the floor area, the consumption in the high-class dwellings was 151 gallons per 1,000 sq. ft., and in the other 149 gallons. It was therefore apparent that much greater accuracy would be obtained by designing the distribution system on the basis of the floor area. Of course, they must bear in mind that the figures quoted were United States gallons, and they ought, therefore, to take off 17 per cent to get British gallons; but there was no doubt that in America more water was used than was the case here, while in summer large quantities were used for cooling purposes. At the same time the waste was far greater than the use, and that was the reason why meters were being adopted so much on the services. Generally, a meter had the result of reducing the quantity of water lawfully used, and to that extent was undesirable; but it also prevented waste, and that had proved to be the case in many cities where the consumption had been reduced from about 100 gallons to 50 gallons per head per day. What took place was not a reduction in the ordinary domestic consumption; it meant that the waste had

been noted and stopped because the people had to pay for it. Chicago, with only 6 per cent of the services metered, used 237 gallons; Philadelphia and Denver, with 1 per cent metered, used 200 and 231 gallons respectively per head per day.

THE CLASSIFICATION OF ROADS.

LOCAL GOVERNMENT BOARD PRESIDENT'S EXPLANATION OF A CIRCULAR.

On Monday evening, in accordance with leave granted earlier, Mr. Rupert Gwynne moved the adjournment of the House of Commons in order to call attention to the recent circular issued by the Road Board requesting local authorities to classify the roads of the country, the object of this classification being to enable it to be used as a basis for the new grants promised by the Chancellor of the Exchequer towards the maintenance of roads. He contended that there was no legal authority for requiring the local authorities to make this classification, which would entail great expense upon the local councils. He suggested that it had been done in a hole-and-corner way to prevent Parliament having an opportunity of discussing the matter.

Mr. Hayes Fisher seconded the motion, condemning as extraordinary and unwarranted what he termed the grossly irregular procedure of the Road Board and of the Local Government Board. The date of the circular was April 30, and the Budget was not introduced until May 4th, yet the House was always being told that the Government had no control over the Road Board.

Mr. Herbert Samuel, President of the Local Government Board, said that for a long period it had been pressed on the Government that additional grants should be given to local authorities to assist them in bearing the cost of main roads, and the Government were now prepared to ask Parliament to vote an additional million and a quarter for local authorities. It was admitted that classification of the roads was essential, and the Government thought it should be done by the Road Board, because the board was independent of any Government department and could be trusted to determine fairly the basis on which grants should be distributed by Government departments. As soon as the Government decided this year to make proposals to Parliament for increasing the grants to local authorities it devolved upon him to take measures to secure that that policy should be carried into effect, and he consulted with the chairman of the Road Board as to the steps that were desirable and practicable. That was before the Budget—as soon as the Government had decided on their policy.

Mr. Hewins: Before Parliament knew anything about it?

Mr. Samuel: Yes, of course. It was an administrative matter. The Road Board had already in the course of their duties obtained particulars from time to time on the lines now suggested. With respect to a very considerable number of roads for which they were requested to make grants for some time past, the Road Board had decided that it was necessary for their own purposes to have a general survey and classification, but they held back issuing a circular knowing that the day was not far distant when classification of the roads would become necessary, not only for their own purposes, but for the purpose of future grants. They came to the conclusion that no statutory authority was necessary for the issue of the circular, and no local authority need supply the particulars if they did not wish to do so—but he rather thought they would need no compulsion. It was estimated that the total expense would be between £6,000 or £7,000 divided among sixty-four county authorities. The whole amount was quite trivial compared with the immensely increased grants, and it must be remembered that this was only one expense, whereas the grant of a million and a quarter would be made annually unless Parliament otherwise determined. The Government desired to distribute increased grants this year, but the grants would not be distributed until a provisional classification was made. If they postponed the classification they postponed the grant, and it was impossible to say how much any local authority would receive until there had been such classification. He was informed by the Road Board that no local authority had refused to give this information, or had ever complained with respect to it. On the

contrary, the board had received a vast quantity of material from the various local authorities.

The motion to adjourn was defeated by 229 to 110.

THE PROPOSED GRANTS.

Replying to questions in the House of Commons on Monday, Mr. Herbert Samuel, President of the Local Government Board, stated that until the provisional classification of roads had been made it was impossible to calculate, otherwise than roughly, the estimated receipts of local authorities under the new scheme of grants proposed in the Budget. Detailed estimates published at the present time would necessarily be misleading, and it was desirable that any return should be deferred until the materials necessary for the calculations were complete.

Mr. Rupert Gwynne asked what was the estimated cost of the classification of roads under the proposals of the Budget; and by whom the cost is to be borne.

Mr. Samuel said the Road Board would pay out of the Road Improvement Fund their expenses in connection with the classification of roads, estimated at about £8,000, and highway authorities would bear any expenses they might incur in submitting proposals to the Board.

Mr. Gwynne asked whether, under the Budget proposals, it was intended that the roads at present under the control of various local highway authorities should, after classification, still remain under the same authorities, or whether it was proposed to transfer all roads coming within Class I. to the county authorities.

Mr. Samuel said that was a matter for separate consideration. The legislation at present proposed would not deal with this point.

Mr. Gwynne asked whether, under the proposals of the Budget, highway authorities were being asked themselves to prepare and send in the classification of the various roads in their areas; whether it was intended to accept this classification as a basis for grants from the National Exchequer; and what expectation he had under this system of obtaining a classification on a uniform basis when it was left to the discretion of the respective county, rural, and urban councils throughout the country to decide hurriedly the basis on which the classification of their particular roads should be made.

Mr. Samuel, in reply, stated that the highway authorities had been asked by the Road Board to send in their proposals for classification, but the classification itself would be settled by the Road Board after consideration of those proposals.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

WEST MIDLAND DISTRICT.

A meeting of the West Midland District is to be held at Birmingham to-morrow (Saturday), the 23rd inst.

PROGRAMME.

Assemble at Victoria-square entrance to the Council House.

- 2.15 p.m.—Leave Council House.
- 2.30 p.m.—Arrive Aston Church-road Bridge (two-span girder bridge, with trough flooring, spanning river Rea and canal).
- 2.40 p.m.—Leave Aston Church-road, travel *via* Alm Rock-road (60-ft. road laid out with grass margins and trees).
- 3.10 p.m.—Arrive Kings-road Bridge (single-span brick arch bridge over canal, with retaining walls to street).
- 3.20 p.m.—Leave Kings-road.
- 3.35 p.m.—Arrive Stratford-road Bridge (two-span brick arch over river Cole, with stone superstructure; note raising of levels of Stratford-road and new double line of tramway).
- 3.50 p.m.—Leave Stratford-road.
- 3.55 p.m.—Arrive Foremans-road Bridge (two-span brick arch over river Cole, with made-up approaches).
- 4.10 p.m.—Leave Foremans-road.
- 4.30 p.m.—Arrive Council House, where members will be entertained to tea by Mr. H. E. Stilgoe, city engineer.

District Business:—

Elect district chairman for the year 1914-15.

5 p.m.—Discussion on paper entitled, "Recent Highway Bridges in Birmingham," by Mr. A. S. Parsons, ASSOC.M.INST.C.E. (Birmingham).

F. C. COOK, A. T. DAVIS, M.INST.C.E.,
Hon. District Secretary, District Chairman,
Nuneaton. Shrewsbury.

SCOTTISH DISTRICT.

The annual Scottish meeting of the institution will be held in Dunfermline on June 5th and 6th.

The following papers will be read—viz.:—

"A Town Planning Scheme: Its Effects on Housing and Architecture," by Mr. Raymond Unwin.

"Edinburgh and Its Early Examples of Town Planning," by Mr. A. Horsburgh Campbell.

"Town Planning from a Lawyer's Point of View," by Mr. John L. Jack.

"The Advantages of Steam Tractor Haulage over Team Labour for Road Material," by Mr. W. L. Gibson.

On the first day the members are to be entertained to luncheon by the corporation of the city of Dunfermline. On the second day, by the courtesy of the Admiralty and Messrs. Easton, Gibb & Co., the members are to be permitted to visit the works at Rosyth.

SOUTHEND MEETING.

The programme of the meeting of the institution to be held at Southend-on-Sea on Saturday, June 6th, was issued yesterday, and is as follows:—

11 a.m.—Members will assemble at the Palace Hotel. Reception by his Worship the Mayor (Alderman Joseph Francis, J.P.).

11.35 a.m.—Leave hotel to inspect the following works in course of construction: (a) Pier extensions (electric cars to pier head, kindly provided by the Pier Committee); (b) Esplanade improvement and sea wall; (c) large swimming bath.

1.30 p.m.—Lunch at the Palace Hotel by kind invitation of the Mayor.

2.15 p.m.—Discussion on paper by Mr. E. J. Elford, M.INST.C.E., on "The Main Sewerage and Sewage Disposal Works, and other Recent Municipal Works, Southend-on-Sea."

2.45 p.m.—Leave hotel to inspect the following works: (d) Reinforced-concrete loading pier; (e) tramway boulevard; (f) sewage disposal works.

4.45 p.m.—Tea on the site of the sewage works at the invitation of Mr. E. J. Elford, followed, if desired, by further discussion on paper.

J. A. WEBB,
Hon. District Secretary.

Great Stanmore.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on Saturday, June 13th.

PROGRAMME.

11 a.m.—District executive meeting.

11.30 a.m.—District meeting.

Reception in the council chamber by the chairman of the council, Mr. Councillor J. Pearson, J.P.

District business.

Paper by Mr. Arthur J. Price, engineer and surveyor, on "The Municipal Works at Lytham," which will be taken as read.

Discussion.

1 p.m.—Lunch at Clifton Hotel.

2.15 p.m.—By the kindness of the Blackpool, St. Anne's, and Lytham Tramway Company, cars will be provided to enable the members to visit the West End outfall sewage works (in course of construction), the East End sewage and destructor works and slaughter-houses.

4.30 p.m.—Afternoon tea will be provided for the members at De Grey's Café.

ANNUAL GENERAL MEETING AND TOWN PLANNING, HOUSING AND ROAD CONFERENCES.

The forty-first annual general meeting of the institution will be held at the Town Hall, Cheltenham, on Wednesday, Thursday, Friday and Saturday, June 24th, 25th, 26th and 27th. Conferences will take place with delegates from the various corporations and local authorities of the United Kingdom and representatives of the different bodies interested in

the subjects of town planning, housing and roads. An important exhibition of plans, maps and models of town planning and housing schemes has been arranged, and it is believed that the collection will be one of great educational and practical value. The exhibition will be open during the four days of the meeting. Ladies are invited to attend the meeting, visits and annual dinner, and the permission of the president may in their case be assumed, but due notice must be given on the reply form.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

EAST MIDLAND DISTRICT.

It is hoped that a District meeting will be held in South Leicestershire in the near future. Provisional arrangements are also in hand for a meeting (probably an Institution meeting) to be held at Cleethorpes (C. H. Waithman, ASSOC.M.INST.C.E.) during September.

J. W. DUDLEY ROBINSON, B.SC.(LOND.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—MR. HORACE BOOT, M.I.E.E., M.I.MECH.E.

COUNCIL MEETING.

The next meeting of the council will be held in London on Wednesday, May 27th.

NORTHERN DISTRICT.

Meetings will be held in Cumberland in June, at Alnwick on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

WESTERN DISTRICT.

A Western District meeting will be held at Tisbury on Saturday, June 13th, when the municipal works of the town will be inspected and a paper, "Wiltshire Roads, Past and Present," will be read by Mr. E. Plummer Davies (member).

NORTH-WESTERN DISTRICT.

A meeting of this district, followed by a social evening, will be held at the Mitre Hotel, Manchester, on Friday, July 3rd.

EASTERN AND NORTH-EASTERN DISTRICTS.

A joint Eastern and North-Eastern District meeting will be held at Hunstanton in July.

B. WYAND,
39 Victoria-street, S.W. *Secretary.*

INSTITUTION OF WATER ENGINEERS.**SUMMER GENERAL MEETING.**

The nineteenth summer general meeting will be held at Stockport on Thursday, Friday and Saturday, the 11th, 12th and 13th of June next, under the presidency of Mr Thomas Molyneux, ASSOC.M.INST.C.E., corporation waterworks engineer.

By kind permission of the mayor and corporation, the meetings will be held in the Town Hall, Stockport, and at the opening of the proceedings on Thursday the institution will be welcomed to Stockport by his Worship the Mayor (Councillor Thomas Worthington Potts, J.P.).

Ladies will be cordially welcomed at the meetings and visits, and all official functions except the annual dinner.

The programme will include the presentation of premiums awarded by the council for papers presented during the year 1913.

PAPERS AND COMMUNICATIONS.

The following papers have been promised for reading and discussion at this meeting, and advance copies

will be sent out as soon as printed to members who signify their intention of attending the meeting, also, so far as the stock will allow, to those who, being unable to attend the meeting, are anxious to assist in the discussion by correspondence:—

- (1) "The Character of Mechanically Filtered Water," by Prof. Sheridan Delépine, of the University of Manchester.
- (2) "The Aération and Filtration of Water for Swimming Baths," by L. Holme Lewis, M.I.M.E.C.U.E. (member).
- (3) "Notes on Scraping a 15-in. Water Main," by J. S. Barrowclough (member).

A lecture, entitled "The Geological Structure of the Stockport District," will be delivered by Prof. George Hickling, D.Sc., of the University of Manchester.

The president-elect (Mr. Thomas Molyneux) will deliver his presidential address on Thursday, June 11th, and will also supply a description of the Stockport waterworks, with map of the district of supply, which will be circulated among those present at the meeting.

VISITS TO WORKS.

On Thursday afternoon, June 11th, starting from the Town Hall, Stockport, visits will be made to the Wilmslow pumping station and softening works, and to the Alderley balancing reservoir (reinforced concrete, under construction), where afternoon tea will be provided by the president and Mrs. Molyneux.

On Friday, June 12th, starting from the Midland Hotel, Manchester, at 10 a.m., visits will be made to the recently completed Kinder reservoir and filtration plant, where lunch will be provided by the corporation of Stockport, and to the Lyme Park reservoirs; also to the works of Messrs. Mierles, Bickerton & Day, Limited, Hazel Grove (Diesel oil engines under construction), where afternoon tea will be provided.

On Saturday afternoon, June 13th, members will be free to visit the Colliery Exhibition or the Victoria Park Baths (at the latter will be seen an installation for filtering the water used in the swimming baths).

SOCIAL FUNCTIONS.

The annual dinner will be held at the Midland Hotel, Manchester, on Thursday evening, June 11th, when the Mayor of Stockport, the Lord Mayor of Manchester, and other distinguished guests will be entertained by the institution.

In addition to the luncheon provided on Friday at the Kinder works, the corporation of Stockport will entertain the members at luncheon on Thursday, June 11, at the Town Hall Stockport.

The committee of the Manchester Engineers Club have kindly offered to elect the members attending the meeting as hon. members of the club during the three days of the meeting. Admission on presentation of programme card.)

PERCY GRIFFITH,
Secretary.

20 Victoria-street, S.W.

CONCRETE INSTITUTE.

The fifth annual general meeting of the institute will take place on Thursday, May 28th, at 4.30 p.m., and the fourth annual dinner will take place on the evening of the same day at 8 p.m., at the Connaught Rooms, Great Queen-street, W.C., Prof. Henry Adams presiding.

H. KEMPTON DYSON,
Secretary.

WEST RIDING OF YORKSHIRE HIGHWAY SURVEYORS' ASSOCIATION.

A general meeting will be held in the Grand Jury Room, Town Hall, Leeds, on Tuesday, May 26, 1914, at 3 p.m., to formulate the policy of the association and elect officers for the year.

If time permits, discussion will be invited on the Road Board's proposals *re* the "Classification of Roads."

All surveyors who are interested are cordially invited to attend.

A. GORDON KILNER,
Hon. Secretary.

Council Offices,
Wetherby.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

METROPOLITAN DISTRICT.

A visit will be paid to the Surbiton Urban District Council's new sewage disposal and refuse destructor works, Lower Marsh-lane, Surbiton, to-morrow (Saturday).

PROGRAMME.

- 2 p.m.—Meet at the works, when a description will be given by the engineer and surveyor, Mr. H. T. Mather, who, afterwards, with the works manager, Mr. C. A. Snook (member), will conduct the party over the works.
- 3.15 p.m.—Demonstration of the dissolved oxygen test by Dr. Rideal (past-president).
- 5 p.m.—Tea at the Red Lion Hotel, Tolworth, by kind invitation of the chairman of the council, Councillor Stephen Kavanagh, A.P.

J. FIELDHOUSE,
Hon. District Secretary.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

SENIOR DRAUGHTSMAN.—May 22nd. Wood Green Urban District Council. £100—£150 per annum.—Mr. W.P. Harding, clerk.

TEMPORARY ASSISTANT.—May 23rd. Bentley-with-Arksey Urban District Council. £2 10s. per week.—Mr. George Pye, clerk, 17 Priory-place, Lancaster.

CLERK.—May 23rd.—Committee for the Care of the Mentally Defective, Somerset. £130 per annum.—Mr. G. I. Simey, clerk to the county council, Sidney House, Boulevard, Weston-super-Mare.

SURVEYOR AND INSPECTOR OF NUISANCES.—May 23rd.—Bollington Urban District Council. £140 per annum.—Mr. Samuel Knight, clerk.

COUNTY SURVEYOR AND ARCHITECT.—May 25th.—Durham County Council. £800—£1,000 per annum.—Mr. Harold Jevons, clerk, Shire Hall, Durham.

WORKING HIGHWAY SURVEYOR.—May 25th.—Keighley Rural District Council. 30s. per week.—Mr. W. Bairstow, Bridge House, Steeton, near Keighley.

SURVEYOR'S ASSISTANT.—May 25th.—Altrincham Urban District Council. £75 per annum.—Mr. W. S. Stokoe, clerk.

CLERK OF WORKS.—May 25th.—Corporation of Eeoles. £3 per week.—Borough Engineer, Town Hall.

SANITARY SUB-OFFICERS.—May 25th.—Corporation of Dublin. £78 per annum.—Sir Charles A. Cameron, Municipal Buildings, Dublin.

CLERK OF WORKS.—May 25th.—Margate Town Council. £4 4s. per week.—Mr. E. Brooke, town clerk.

INSPECTOR OF NUISANCES.—May 26th.—Hoxne (Suffolk) Rural District Council. £45 per annum.—Mr. N. B. Garrard, clerk.

ARCHITECTURAL ASSISTANTS.—May 27th.—Essex County Council. £100 and £130 per annum.—Mr. I. H. Goold, clerk, Shire Hall, Chelmsford.

FOREMAN.—May 28th.—Grays Thurrock Urban District Council. 40s. per week.—Mr. A. C. James, surveyor, Grays.

SANITARY INSPECTOR.—May 28th.—Fowey Port Sanitary Authority. £60 per annum.—Mr. J. Stephens, clerk, Cross-lane, St. Austell.

QUANTITY SURVEYOR.—May 29th.—Corporation of Barrow-in-Furness.—Mr. L. Hewlett, town clerk.

SURVEYOR'S ASSISTANT.—May 29th.—Cannock Urban District Council. £2 2s. per week.—Mr. C. A. Loxton, clerk.

SENIOR DRAUGHTSMAN.—May 30th.—Lancashire County Council. £100—£120 per annum.—County Bridgemaster, County Offices, Preston.

SEWAGE FARM MANAGER.—June 1st.—Balby-with-Hexham Urban District Council.—Mr. George Gledhill, surveyor, Council Offices, Low-road, Balby, near Doncaster.

BRIDGE AND MAIN ROAD SURVEYOR.—June 1st.—County Council of Devon. £400 a year, with £200 a year for expenses.—Mr. F. Bailey, clerk, Castle of Exeter.

RESIDENT ENGINEER.—June 1st.—Chard Town Council. 3½ guineas per week.—Mr. J. A. Forward, town clerk.

SURVEYOR'S ASSISTANT.—June 3rd.—Bedwellty Urban District Council. £100—£150 per annum.—Mr. T. J. Thomas, clerk, High-street, Bargood.

COUNTY SURVEYOR.—June 4th.—Hertford County Council. £800 a year.—Mr. Charles E. Longmore, clerk, Clerk of the Peace Office, Hertford.

ENGINEER AND SURVEYOR.—June 8th.—Cheadle and Gatley Urban District Council. £250 per annum.—Mr. Arthur Briggs, clerk, Council Offices, Cheadle, Cheshire.

INSPECTOR OF ROADS.—June 9th.—Corporation of Aberdeen. £200 per annum.—Mr. W. Dyack, burgh surveyor, Townhouse.

SURVEYOR.—June 15th.—Board of Trustees for the Improvement of Calcutta. 600—800 rupees per month (rupee valued at 1s. 4d.). Chairman, Calcutta Improvement Trust.

CLERK OF WORKS.—Rivers Committee of the Manchester Corporation. £3 3s. per week.—Mr. Thomas Hudson, town clerk.

TEMPORARY ENGINEERING ASSISTANT AND GENERAL ASSISTANT.—Rhyl Urban District Council. 3½ guineas and 3 guineas per week.—Mr. Arthur A. Goodall, surveyor.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

SUNDERLAND.—June 23rd.—Designs for a secondary school for 600 scholars, for the Corporation of Sunderland. Premiums, £100, £50, and £25.—Mr. J. W. Moncur, borough engineer and surveyor, Town Hall.

MIDDLETON.—July 16th.—Designs for a town hall, the cost of which must not exceed £18,000. Premiums £100, £50, and £25.—Town Clerk.

LONDON.—September 7th.—Designs for elementary schools, for the London County Council.—Education Officer, Education Offices, Victoria-embankment, W.C.

BELPER.—Designs and estimates for the erection of a bridge over the River Derwent, for the Belper Rural District Council.—Mr. Robert C. Cordon, surveyor, Duffield, near Derby.

CHESTER.—Designs for working-class dwellings, for the Corporation of Chester. Premiums, £50, £25, and £10. Mr. Patrick Abercrombie, M.A., Liverpool University School of Civic Design, has been appointed assessor.—Mr. J. H. Dickson, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

DUBLIN.—May 23rd.—For alterations and additions to public baths and washhouses, for the corporation.—Mr. M. J. Buckley, borough surveyor, Castle-street.

ESSEX.—May 23rd.—June 16th.—For the erection of a school, for the Education Committee.—Mr. J. Gleave, Education Offices, County High School, Braintree.

WHITEHAVEN.—May 23rd.—For the supply of cast-iron spigot and socket pipes, bends, junctions, and valves, cutting trenches, and laying pipes for a water supply, for the rural district council.—Mr. George Boyd, 33 Queen-street, Whitehaven.

WITHERNSEA.—May 25th.—For the erection of a reinforced concrete sea wall, for the urban district council.—Mr. John B. Kirton, engineer.

ABERDARE.—May 25th.—For the erection of a refuse destructor, for the urban district council.—Mr. D. L. Griffiths, clerk.

DUBLIN.—May 25th.—For the erection of 113 cottages, blocks of flats, and eight-roomed houses, for the corporation.—City Architect, City Hall.

DEVON.—May 25th.—For the erection of a police station, for the Standing Joint Committee.—Mr. E. H. Harbottle, County Chambers, Exeter.

BIRMINGHAM.—May 25th.—For constructional works at generating station, for the corporation.—Electric Supply Department, 14 Dale-end.

HANTS.—May 25th.—For the erection of a teacher's house, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

BLACKBURN.—May 25th.—For the erection of public halls, for the corporation.—Town Clerk.

HORNCASTLE.—May 25th.—For the erection of a bridge, for the rural district council.—Mr. J. E. Chatterton, clerk.

NORTHAMPTON.—May 25th.—For the construction of a tunnel from Hollowell to Ravensthorpe, for the corporation.—Waterworks Engineer, Fish-street.

GRAVESEND.—May 25th.—For constructional works at electricity station, for the corporation.—Borough Surveyor.

CUCKFIELD.—May 26th.—For the erection of six cottages and other buildings, for the urban district council.—Mr. C. H. Waugh, clerk, Boltro-road, Haywards Heath.

WEST SUSSEX.—May 26th.—For alterations and additions to the Midhurst Grammar School, for the Joint Education Committee.—Mr. Haydn P. Roberts, county education architect, Thurloe House, High-street, Worthing.

WEST SUSSEX.—May 26th.—For alterations and improvements to the Shoreham council school, for the Joint Education Committee.—Mr. Haydn P. Roberts, county education architect, Thurloe House, High-street, Worthing.

SALOP.—May 26th.—For the rebuilding of a school, for the county council.—Mr. H. E. Wale, county Buildings, Shrewsbury.

WEST HAM.—May 26th.—For painting, cleansing, and repairing public buildings in the borough, and certain other institutions, for the corporation.—Mr. J. G. Morley, borough engineer.

NORFOLK.—May 26th.—June 3rd.—For the enlargement of a school and the erection of offices, for the Education Committee.—Mr. T. A. Cox, secretary, Shire Hall, Norwich.

MANCHESTER.—May 27th.—For additions to a sanatorium, for the Sanitary Committee.—City Architect, Town Hall.

STOCKPORT.—May 27th.—For additions to the hospital, for the corporation. Mr. J. Atkinson, borough surveyor.

HUDDERSFIELD.—May 27th.—For the erection of forty-eight workmen's dwellings, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor, 1 Peel-street.

EDINBURGH.—May 27th.—For additions to city hospital, for the corporation.—Mr. J. A. Williamson, architect, Public Works Office.

BARNSELEY.—May 27th.—For the erection of a sanatorium, for the corporation.—Mr. J. H. Taylor, borough surveyor, Manor House, Barnsley.

HAMMERSMITH.—May 27th.—For the construction of a urinal, for the borough council.—Mr. H. Mair, borough surveyor.

YEOVIL.—May 28th.—For the erection of workmen's houses, for the rural district council.—Messrs. Pether & Warren, Church-street, Yeovil.

QUEENSTOWN.—May 29th.—For the construction of a water supply, for the urban district council.—Mr. P. H. McCarthy, 39 Westmoreland-street, Dublin.

STAFFORD.—May 30th.—For alterations to the borough hall, for the corporation.—Mr. W. Plant, borough engineer and surveyor.

CAVAN.—May 30th.—For laying cast-iron pipes and valves, and the construction of filter beds at waterworks, for the urban district council.—Messrs. Swiney & Crossdaile, Avenue Chambers, Belfast.

CHARD.—June 1st.—For the construction of covered reservoir, well, tunnel, and the laying of 7-in., 5-in., 4-in., 3-in. and 2½-in. cast-iron water mains, valves, hydrants and other castings, for the corporation.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

NARBERTH.—June 1st.—For the erection of thirty houses, for the rural district council.—Mr. J. P. James, architect and surveyor, Frogmore, Tenby.

DOVER.—June 1st.—For the erection of twelve workmen's cottages, for the corporation.—Mr. W. C. Hawke, borough engineer.

ESSEX.—June 1st.—For the erection of a new bridge over the river Blackwater in ferro-concrete work on the Hennebique system, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

BRENTWOOD.—June 1st.—For the construction of underground conveniences, for the urban district council.—Mr. A. J. Meeson, surveyor.

CORNWALL.—June 2nd.—For widening a bridge, for the county council.—Mr. A. E. Brookes, county surveyor, Truro.

BRADFORD.—June 3rd.—For duplicating a pipe line in the Aire Valley in connection with the Nidd aqueduct, for the corporation.—Mr. James Watson, waterworks engineer, town hall.

HOVE.—June 3rd.—For the construction of an underground lavatory, for the corporation.—Mr. H. H. Scott, borough surveyor.

BOURNE.—June 3rd.—For the erection of a 16-bed isolation hospital, for the rural district council.—Mr. C. W. Bell, clerk.

SAXMUNDHAM.—June 3rd.—For providing and laying about 2½ miles of cast-iron water mains, with valves, hydrants and other fittings; also the construction of a reservoir and pumping station with machinery, filter plant, and incidental works, for the urban district council.—Mr. P. F. Mackenzie-Richards, engineer, 69 Victoria-street, Westminster, S.W.

SCARBOROUGH.—June 3rd.—For the execution of water supply works, for the rural district council.—Mr. J. W. Read, clerk.

SHEFFIELD.—June 4th.—For the extension of the town hall, for the corporation.—City Architect.

KINGSTON-UPON-THAMES.—June 6th.—For the erection of a urinal, for the corporation.—Mr. R. Hampton Lucas, borough surveyor.

MIDDLESBROUGH.—June 6th.—For the extension of a dispensary, for the corporation.—Mr. S. E. Burgess, borough engineer.

TEWKESBURY.—June 6th.—For the erection of twelve workmen's dwellings, for the corporation.—Mr. W. Ridler, borough surveyor.

BRIGHTON.—June 8th.—For additions to municipal offices, for the corporation.—Mr. T. Garrett architect, 34 Ship-street.

WAKEFIELD.—June 8th.—For the erection of conveniences, for the corporation.—Mr. J. P. Wakefield, city surveyor.

SALE.—June 13th.—For the erection of a school, for the Administrative Sub-Committee for Education.—Messrs. Hoy & Sisley, architects, 199 Deansgate, Manchester.

DEVON.—June 15th.—For the construction of a bridge over the river Yarty, for the county council.—Mr. W. P. Robinson, county surveyor, 22 Queen-street, Exeter.

ARUNDEL.—June 21st.—For the erection of ten cottages, for the corporation.—Mr. A. Holmes, town clerk.

Iron and Steel.

GLOUCESTER.—May 25th.—For the installation of pumping machinery, for the corporation.—Messrs. Fox, Moore, Bateman & Fox, 5 Victoria-street, Westminster, S.W.

CARDIFF.—May 28th.—For the supply of steel and cast-iron work and small feed tank, for the corporation.—Mr. A. Ellis, electric engineer and manager.

CAVAN.—May 30th.—For laying cast-iron pipes, and the construction of filter-beds at waterworks, for the urban district council.—Messrs. Swiney & Crossdaile, Avenue Chambers, Belfast.

CHARD.—June 1st.—For the supply of, approximately, 450 tons of 7-in., 5-in., 4-in., 3-in. and 2½-in.

cast-iron pipes, junctions, bends, tapers, and other castings; also for the supply of 7-in., 5-in., 4-in. and 3-in. sluice valves, fire hydrants, air valves, and surface boxes, for the corporation.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

BRADFORD.—June 3rd.—For the supply of 5100 tons of cast-iron pipes, 450 tons of special castings, and mild steel pipes, for the corporation.—Mr. James Watson, waterworks engineer, Town Hall.

FLEET (Hants).—June 4th.—For the supply and delivery of 2,700 yds. of 12-in. diameter cast-iron pipes, 1,900 yds. of 10-in., 2,050 yds. of 9-in., 1,060 yds. of 8-in., 2,400 yds. of 7-in., 900 yds. of 6-in., and pipes of smaller diameters, also bends, taper junctions, and other specials, for the urban district council.—Mr. T. J. Moss-Jlower, 25 Victoria-street, Westminster, and Carlton Chambers, Bristol.

MADRAS.—June 17th.—For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer, and Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

Roads.

KILDARE.—May 23rd.—For the supply of a 10-ton compound steam roller, sleeping, water carts, and a force pump, for the county council.—Mr. Thomas Langan, secretary, Courthouse, Naas.

DORKING.—May 23rd.—For the supply of 1,000 tons of tarred slag, for the urban district council.—Mr. W. A. Clegg, surveyor.

LANCASTER.—May 23rd.—For the execution of a highway improvement, for the rural district council.—Mr. W. Dixon, surveyor.

SCUNTHORPE.—May 25th.—For the supply of any quantity up to 500 tons of broken granite of approved quality, for the urban district council.—Mr. Herbert Heap, engineer and surveyor.

EXETER.—May 25th.—For paving a portion of Sidwell-street with creosoted wood blocks, for the corporation.—Mr. Thos. Moulding, city engineer and surveyor.

ROWLEY REGIS.—May 25th.—For work of road improvement, for the urban district council.—The Surveyor.

HARROGATE.—May 25th.—For private street works, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

COCKERMOUTH.—May 25th.—For the maintenance of highways, for the rural district council.—Mr. S. K. Gibson, highway surveyor.

BURGESS HILL.—May 25th.—For the supply of broken granite and fine granite for binding, for the urban district council.—The Surveyor.

HETTON.—May 26th.—For the supply of ordinary and tarred slag, for the urban district council.—Mr. John Harding, surveyor.

SHEPPEY.—May 26th.—For the supply of blue ragstone, for the rural district council.—Mr. John Copland, clerk, Sheerness.

DUNMOW.—May 26th.—For tar-painting 2,000 yds. of road, for the rural district council.—Mr. A. E. Floyd, clerk.

GATESHEAD.—May 26th.—For paving work, for the corporation.—Mr. N. P. Pattinson, borough engineer.

FAREHAM.—May 26th.—For steam rolling and scarifying, for the rural district council.—Mr. A. Luker, clerk.

TOTTENHAM.—May 26th.—For making up Boundary-road (remainder) and Clifton-gardens, for the urban district council.—Mr. W. H. Prescott, surveyor.

WEST HAM.—May 26th.—For making up part of Saville-road, part of Leonard-street, Eclipse-road, part of Cumberland-road, part of Chadwin-road, and part of Varley-road, for the corporation.—Borough Engineer.

PONTEFRAC.—May 26th.—For the supply of broken granite and broken dress or limestone, for the corporation.—Mr. John E. Pickford, borough surveyor.

STOWMARKET.—May 27th.—For the supply of 350 tons of best broken granite, for the urban district council.—Mr. P. C. G. Hayward, clerk.

WALTHAMSTOW.—May 27th.—For the supply of Trinidad asphalt macadam and Trinidad Lake bitumen, for the urban district council.—Mr. E. Morley, surveyor.

ROCHDALE.—May 27th.—For making up a street, for the corporation.—Borough Surveyor.

CANNOCK.—May 29th.—For road widening and improvement, for the urban district council.—Mr. R. Blanchard, engineer and surveyor.

CORNWALL.—May 30th.—For hauling materials and team labour, for the county council.—Assistant County Surveyor, Free Library, Bodmin.

LUTON.—May 30th.—For the supply of broken granite, for the corporation.—Borough Engineer.

BRENTFORD.—May 30th.—For the supply of 300 yds. of blue Guernsey or other approved granite, for the urban district council.—Mr. J. W. Croxford, surveyor.

MONMOUTHSHIRE.—May 30th.—For the supply of materials or haulage, for the county council.—Mr. W. Tanner, county surveyor, County Council Offices, Newport (Mon.).

BOULTON.—May 30th.—For the supply of 700 tons of slag rejections, for the urban district council.—Mr. W. J. Holbrook, clerk.

PONTYPRIDD.—June 1st.—For the execution of private street work, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor.

MALDON.—June 4th.—For the supply and delivery of broken granite and flints, also for steam rolling, for the corporation.—Mr. T. R. Swales, borough engineer.

BARNSTAPLE.—June 5th.—For the purchase of a 12-ton steam roller with scarifier.—Mr. E. Y. Saunders, borough surveyor.

ROMSEY.—June 6th.—For the hire of two 10-ton steam rollers, for the rural district council.—Mr. C. W. P. Dyson, district surveyor.

TANGIER.—June 8th.—For the construction of about 10 miles of road, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

SUTTON-IN-ASHFIELD.—June 8th.—For making up twelve streets, for the urban district council.—Mr. W. Burn, surveyor.

ILFORD.—June 9th.—For paving with granite setts, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

HORNSEY.—June 10th.—For making good a certain road, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

HASTINGS.—June 12th.—For steam rolling certain roads, for the rural district council.—Mr. D. Paine, district surveyor, Stonelynk Farm, Fairlight.

EPSOM.—June 16th.—For making up Leigh-road, School-road and Spencer-road, for the rural district council.—Mr. T. E. Ware, surveyor of highways, Waterloo-road, Epsom.

LEWES.—June 19th.—For road rolling and the supply of 600 tons of 2-in. broken granite and 600 tons of broken surface-picked flints, for the corporation.—Borough Surveyor.

LARNE.—June 25th.—For the construction of a new street, for the urban district council.—Mr. W. G. Younge, clerk.

ALCESTER.—For 2,000 gallons of crude tar, for the rural district council.—Mr. William Withers, Congleton R.S.O., Warwickshire.

Sanitary.

ECCLES.—May 23rd.—For the construction of outfall sewer, storm overflow manhole, junction manhole, screening and raking apparatus, detritus elevators, machinery, engines, penstocks, and circular storm-overflow sewer, for the corporation.—Mr. Thomas S. Picton, borough engineer.

DURSLEY.—May 23rd.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. G. P. Milnes, 7 Roweroft, Stroud.

LEEK.—May 25th.—For laying and jointing about 2,840 yds. of 9-in. and 6-in. stoneware pipe sewers, and constructing manholes, flushing chambers, engine house, pump well, liquefying tanks, bacteria beds, sludge beds, approach road, and other works, for the rural district council.—Messrs. Willcox & Raikes, 63 Temple-row, Birmingham.

DEUDRAETH.—May 25th.—For laying glazed stoneware and cast-iron socket-pipe sewers, and constructing manholes and other works, for the rural district council.—Mr. L. Lloyd Jones, Lloyds Bank Chambers, Carnarvon.

WAKEFIELD.—May 25th.—For the construction of a main outfall sewer, comprising 4,000 yds., or thereabouts, of pipe sewers, pumping station, and subsidiary branch sewers, comprising 5,800 yds., or thereabouts, of pipe sewers, for the corporation.—Mr. A. C. Allibone, town clerk.

WARBLINGTON.—May 25th.—For laying laterals or branch drains from the public sewers, and the connection of existing drains, with all necessary inspection chambers and other works, for the urban district council.—Mr. Arthur J. Martin, engineer, 7 Victoria-street, Westminster, S.W.

CWMAMMAN.—May 25th.—For the preparation of a sanitary scheme, for the urban district council.—Mr. W. Martin Knoble, clerk, Commercial Buildings, Glanamman.

CHESTER.—May 25th.—For sewer construction, for the rural district council.—Mr. C. J. F. Owen, 10 Batchelors-lane, Dee Banks, Chester.

DISLEY.—May 25th.—For laying pipe sewer and constructing manholes, for the rural district council.—Mr. C. S. Righton, surveyor.

BASFORD.—May 25th.—For providing and laying stoneware pipe sewers with Hassall's joints and manholes, for the rural district council.—Mr. S. Maylan, engineer and surveyor.

ST. HELENS.—May 25th.—For conversions to the water-carriage system, for the corporation.—Chief Inspector of Nuisances.

GREAT CROSBY.—May 26th.—For laying 600 yds. of pipe sewer, for the urban district council.—Mr. Joseph A. Wright, surveyor.

BLYTH AND CUCKNEY.—May 26th.—For scavenging work, for the rural district council.—Mr. A. E. Hewitt, inspector.

KIVETON PARK.—May 26th.—For the construction of sewers, for the rural district council.—Mr. F. Hewitt, engineer and surveyor.

FARNBOROUGH.—May 26th.—For the construction of sewers and storm-water drains, and making good a road, for the urban district council.—Mr. John E. Hargreaves, surveyor.

CHEPPING WYCOMBE.—May 28th.—For the supply and erection of steam engines, air compressors, air lifts, ejectors, and all necessary appurtenances in the extension of the sewage outfall works at Wycombe Marsh, for the corporation.—Mr. T. J. Rushbrooke, borough engineer and surveyor.

CANNOCK.—May 29th.—For works of sewerage extension, for the urban district council.—Mr. R. Blanchard, surveyor.

DEWSBURY.—May 30th.—For the construction of sewage disposal works, for the corporation.—Mr. Henry Dearden, borough engineer.

WARWICK.—June 1st.—For the construction of manholes, chambers, sedimentation and storm-water tanks, and other works, for the corporation.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

HUNSLET.—June 2nd.—For the extension and alteration of sewerage works, for the rural district council.—Messrs. C. H. Marriott, Son & Shaw, engineers, Church-street Chambers, Dewsbury.

HAYES.—June 13th.—For the construction of sewerage at Yeading, for the urban district council.—Mr. D. C. Fidler, engineer and surveyor.

MATLOCK.—June 22nd.—For the completion of the main sewerage, consisting of main outfall and subsidiary sewers of earthenware, steel and cast-iron pipes, with manholes, ventilation and flushing tanks, for the urban district council.—Messrs. J. Diggle & Son, engineers, 14 Victoria-street, Westminster, S.W.

Stores.

FRIERN BARNET.—May 28th.—For the supply of steam coal, engine slack, coke, hardcore, hoggin, gravel, broken Leicester granite, cartage, and general horse hire, for the urban district council.—Mr. E. J. Reynolds, engineer and surveyor.

LUTON.—May 30th.—For the supply of broken granite for the year ending June 30, 1915, for the corporation.—Borough Engineer.

CHURCH.—June 1st.—For the supply of road materials, sanitary pipes, gullies, manhole covers, lamphole covers, street grids, manhole step-irons, disinfecting powder, disinfecting fluid, brooms, pitch and creosote oil, for the urban district council.—Mr. J. B. Fallowfield, surveyor.

PAIGNTON.—June 5th.—For the supply of coal, coke, granite, lamp columns, gully gratings, oil, firewood, and other articles, for the urban district council.—The Surveyor.

Miscellaneous.

TYLDESLEY-WITH-SHAKERLEY.—May 25th.—For the supply of gas fuel, cast-iron pipes and special (gas and water) lead pipes, wrought-iron tubes and fittings, and gas meter, for the urban district council.—Mr. Hedley Hoy, gas engineer.

WARWICK.—June 1st.—For the supply of electric motors, centrifugal pumps, switchgear, automatic control apparatus, pipes, and valves, at the Longbridge pumping station, for the corporation.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

MADRAS.—June 1st.—For the supply of two petrol-driven motor fire engines, for the corporation.—Mr. James R. Coats, engineer.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

GRAVESEND.—For the supply of English hasalt, English basalt chippings, granite setts, scoria setts, and ragstone chippings, for the corporation.—Mr. F. T. Grant, borough surveyor:—

British Macadams, Limited, London.—Penmaenmawr, 12s. 11d. per ton; Penmaenmawr chippings, 12s. 11d. per ton.

Chittenden & Simmons, Maidstone.—Ragstone chippings, 11s. 1d. per ton; 4 in. by 4 in. setts.

Road Maintenance Company, London.—Clee Hill, 33s. 11d. per ton.

BEDWAS.—For the erection of new council offices and stores, for the urban district council.—Mr. A. S. V. Taylor, surveyor:—

R. W. Moon, Newport	£3,021
R. Jones, Caerphilly	2,975
W. Pugh, Bedwas	2,682
Hamilton & Millard, Caerphilly	2,548
W. H. Evans, Cardiff	2,529
I. F. Howells, Caerphilly	2,521
Williams Brothers, Bedwas	2,479
Davies & Lloyd, Sengenhydd	2,447
A. Thomas, Bedwas	2,431
Jones Brothers, Treharris	2,421
J. Williams, Abertridwr	2,399
J. Lewis & Sons, Caerphilly	2,397
E. James, Ystrad Mynach	2,286

BURTON-UPON-TRENT.—For the extension of the refuse destructor, Bond End, for the corporation.—Mr. George T. Lynam, borough engineer and surveyor:—
Manlove, Elliott & Co., Nottingham.

FEATHERSTONE. Accepted for the construction of sewerage and other works.—Mr. S. Chesney, engineer:—
Edwards & Co., Doncaster, £2,404.

GRIMSBY. For the construction of 2-ft. diameter sewer in Laceby-road.—Mr. H. Gilbert Whyatt, borough engineer and surveyor:—

Hewins & Goodhand, Grimsby	£495
Wilkinson & Houghton, Cleethorpes	480
J. H. Thompson & Sons, Limited, Grimsby	444
Swaby & Walsham, Grimsby	374
W. Kirton, Grimsby	366
Z. G. Yewdall, Witheringham	362
M. Holmes & Co., Grimsby	350
Taylor & Richardson, Grimsby	344

HAMMERSMITH.—For paving the carriageways of portions of Latimer-road, Bridge-avenue, and North Pole-road with creosoted deal blocks, for the borough council.—Mr. H. Mair, borough surveyor:—

	Latimer-road.	Bridge-avenue.	North Pole-road.
Aeme Flooring and Paving Company, Victoria Park	£8,237	£3,002	£976
G. Wimpey & Co., Hammersmith, W.	8,341	2,965	962
J. Mowlem & Co., Westminster, S.W.	8,151	2,860	972
A. N. Coles, Plymouth	8,135	2,658	971
Improved Wood Pavement Company, Queen Victoria-street, E.C.	7,798†	2,844	942†
W. Griffiths & Co., Bishops-gate, E.C.	8,120	2,752†	959

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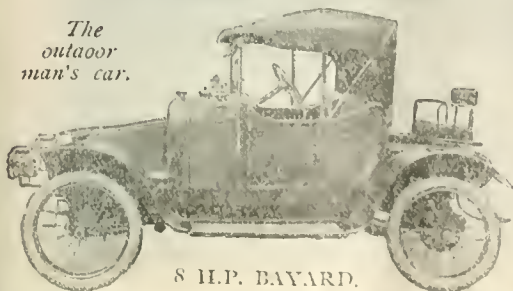
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8 h.p. Specification:—Four-cylinder Monobloc engine, 60 x 120 m.m., 3 Speeds and Reverse, Bevel Drive, Wire Wheels with 750 x 85 m.m. tyres, Hood, Screen, Hooter and five Lamps £237
With 3-seater "Sport" body ... £245

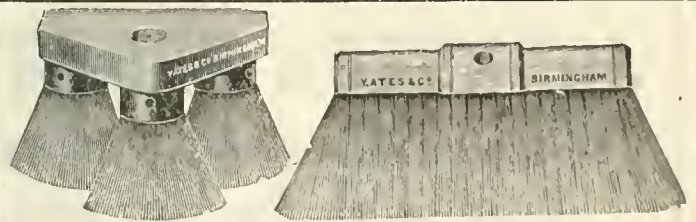
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Est. 1804.

ALL KINDS OF **BROOMS** BOTH FOR
TAR & SCAVE WORK
BASS, HAIR and WIRE.



ALSO SQUEEGEES.

HARPENDEN.—For making up part of Spencer-road, for the urban district council.—Mr. John H. Leverton, surveyor:—

G. Powdrill & Son, Luton	£526
H. Williams, St. Albans	503
W. Dearmer, St. Albans*	489
Surveyor's estimate, £528.	

HARROGATE.—For the rebuilding of the market hall, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor:—

Mason.—H. Dawson & Sons, Harrogate.
Joiner.—Stott & Alcock, Harrogate.
Engineer.—F. W. Rushworth & Sons, Harrogate.
Plumber.—R. Croft, Harrogate.
Slater.—Wright Brothers, Harrogate.
Painter.—J. Morley & Sons, Harrogate.

HARROGATE.—For the construction of sewerage and drainage, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor:—

9-in. Sewer in Hookstone road.—C. H. Dickinson, Harrogate,	£181.
12-in. Surface-water Drain.—E. Long, Harrogate,	£133.

HINDLEY.—Accepted for the construction of eight circular percolating filters, for the urban district council.—Mr. O. P. Abbott, surveyor:—

S. Cowburn & Sons, Hindley.

MACCLESFIELD.—For the reconstruction of a bridge, for the corporation.—Mr. S. C. Boggott, borough and water-works engineer:—

G. Roylance & Co., Limited, Macclesfield	£318
J. Riddle, New Ferry	291
G. Simpson & Son, Macclesfield	250
H. Berry & Sons, Macclesfield	214
J. Wellings, Macclesfield*	207

SOUTHALL-NORWOOD.—For widening of Norwood-road, for the urban district council.—Mr. R. Brown, surveyor:—

T. Adams & Son, Wood Green	£479
E. Young, Rugby	463
H. Farrow Brixton	424
J. Mowlem & Co., London	415
E. Free & Sons, Maidenhead	409
Clements, Knowling & Co., Brentford	397
H. Morecroft, Acton	393
A. & B. Hanson, Southall*	386
Engineer's estimate, £363.	

WANDSWORTH.—For the construction of drainage works at Streatham cemetery, for the borough council.—Mr. P. Dodd, borough engineer:—

J. Ford, £285.†

SWANSEA.—For the execution of private street works, for the corporation.—Mr. George Bell, borough surveyor, Swansea:—

Hill Brothers, Swansea	£554
F. Hayes, Liverpool	438
W. H. Owen, Seaforth and Swansea	423
E. E. L. Tucker, Swansea	405
R. Lacey, Swansea	395
Bennett Brothers, Swansea*	385

WAKEFIELD.—For building a boundary wall, for the corporation.—Mr. J. P. Wakeford, city surveyor:—

Wilson Brothers, Wakefield.

WARE.—For laying foul and surface-water sewers, and constructing manholes, for the urban district council.—

Mr. H. Fox Hill, surveyor:—	
W. Jackson & Co., Forest Gate	£231
H. & C. Hampton, Palmer's Green	195
F. Hitch & Co., Ware	186
Pilgrim & Sons, Whetstone*	173

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

MAY.

- 23.—Association of Managers of Sewage Disposal Works: Visit to Surbiton Sewage Works.
- 23.—Institution of Municipal and County Engineers: West Midland District Meeting at Birmingham; Mr. A. S. Parsons on "Bridge Construction."
- 24.—Institution of Civil Engineers (Students' Meeting): Mr. A. A. Hudson, k.c., on "Engineering Contracts," 8 p.m.
- 25.—Association of Consulting Engineers: Annual General Meeting, Caxton Hall, Westminster, 4.30 p.m.
- 26.—West Riding of Yorkshire Highway Surveyors' Association: Meeting at Leeds.
- 27.—Institution of Sanitary Engineers: Visit to Eton Rural District Council's sewage outfall works at Gerrard's Cross. Train from Marylebone, 2 p.m.
- 28.—Concrete Institute: Annual General Meeting, 4.30 p.m.; Annual Dinner, Connaught Rooms, 8 p.m.

JUNE.

- 5-6.—Institution of Municipal and County Engineers: Meeting in Dunfermline.
- 6.—Institution of Municipal and County Engineers: Meeting at Southend.
- 11-13.—Institution of Water Engineers: Summer Meeting at Stockport.
- 13.—Institution of Municipal Engineers: Western District Meeting at Tisbury. Mr. E. Plummer Davies on "Wiltshire Roads, Past and Present."
- 17.—Royal Institute of British Architects: Annual Dinner, Hotel Cecil.
- 24.—Institution of Sanitary Engineers: Visit to Luton sewage farm. Train from St. Pancras, 2.50 p.m.

JOHNSTON BROTHERS, 79 MARK LANE, LONDON, E.C.

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Some of JOHNSTON'S PATENT DOUBLE FURNACE BOILERS ready for Contract Work this season.

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

MAY 29, 1914.

No. 1,167.

Minutes of Proceedings.

Refuse Removal. The provision of means of access to premises, by which dustbins may be removed by the local authority's scavengers, is one of the most important elements of town planning. The system of collection from the street has the single advantage that a part of the cost of collection is represented by the exertions of individual householders, the loss of time being so small in each case that it is hardly felt. Against this solitary advantage we have to set some very serious objections to the system. In the first place it is not every household in which there is a person, or two persons together, capable of carrying out the dustbin without undue exertion and risk of physical injury. The chances of injury resulting from strain are very small indeed when each bin is lifted and carried by a muscular man who is constantly doing it, but they are considerable when each bin has to be carried out by whoever happens to be available—often women and children who are not fit for the job. A sick dustman can take a day off, but the widow who happens to be ill on dustbin days must drag it out somehow, or get a neighbour to do it. This brings us to the next point, that if the bins are taken out by a neighbour, or by someone who is not in the house at the proper time, they may have to remain longer than is desirable upon the public highway. This is also the case when the collection cannot be done at the same time on every occasion—and it is not easy to be very punctual in this work. Bins standing in the street are liable to be upset by foraging dogs, or the refuse may be pulled about by needy persons routing for more or less useful odds and ends. Stuff which the dustmen are not authorised to remove may be left to be scattered about until it mysteriously disappears, and, on windy days, loose papers are blown about the road.

One of the difficulties in the way of the system of fetching out the dustbins, or a matter of expense where that is done, is that the bins are so heavy that the men cannot remove them except very slowly and with frequent short rests. This difficulty is reduced by more frequent collection, or, better, by the system which we recently recommended—namely, the separate storage and collection of three or four classes of refuse, the weight of the garbage alone being relatively small and the bin of reduced size. At a recent meeting of the Lichfield City Council several councillors recommended that the fetching out system should be adopted instead of the putting out system, but this was not accepted by the council. The chairman of the Streets Committee said that some occupiers regarded it as a trespass for the scavengers to go on to their premises; but in such cases, it may be suggested, it would be quite feasible to allow these persons

to put out their bins, those of the other occupiers being taken out by the dustmen. We believe, then, that removal of the dustbins by the scavengers should be arranged for as far as possible; that, as regards areas now being built upon, suitable means to make this method easy and cheap should be adopted, and that the collection and disposal of house refuse could be made cheaper, more seemly, and more sanitary by arranging for the separate storage of distinct materials, this being done, if not generally, at least in those streets where the occupiers are willing.

An Important Leicestershire Case.

An action in the Leicester County Court, in which a farmer recovered £25 for the loss of a horse, has a not unimportant bearing upon a phase of the question of road repair. The defendants were the Leicestershire County Council, and it was charged against them that in the process of tar-grouting part of the highway from Hinckley to Burbage they had raised the surface of the road 3 in. above the level of a manhole cover belonging to the Hinckley Rural District Council, with the result that plaintiff's horse fell, and died from the injuries it sustained. Judge Moore Cann, who tried the action, delivered recently a considered judgment in which he held that the county council were guilty of negligence, and that this negligence was of the type known as misfeasance rather than non-feasance, for the reason that the local authority had done something to the road. The existence of the manhole, with its iron cover below the surface of the road, was admitted by the council's witnesses to be a danger, but they said that endeavours were made to minimise this danger, and that the surface of the road was sloped down to the manhole cover at a gradient of 1 in 12. It was contended that this slope was safe, and that it would be impossible to avoid the depression of which the manhole became the centre, because the road could not be repaired except by raising its surface, and that the manhole cover could not be raised without the concurrence of the Hinckley Rural District Council, which was not obtained, and which, as a matter of fact, was "stated to be non-obtainable." As to this latter ground of defence, the judge appears to have been somewhat incredulous—it certainly does seem to be strange that permission to raise the manhole cover should be "non-obtainable"—for he finds that the county council allowed the traffic to be resumed "without having used all reasonable endeavours to procure the Hinckley Rural District Council to raise the cover of the manhole to the new surface of the road, and the defendants were negligent in this respect." Briefly, he found that the county council were responsible for the

accident, because they raised the surface of the road to the extent they did above the level of the manhole cover, and allowed traffic on the roadway while the manhole remained as they left it. The lesson which the judgment carries would appear to be that mere measures of expediency in dealing with a manhole cover situated in a road undergoing repair have a particular danger of their own, and that where it is the question of a second authority being concerned it is imperative to obtain its consent to the works necessary before permitting the resumption of traffic upon the road. It is clearly a case where certain protective safeguards which ought to have been taken were, unfortunately, overlooked.

Summer Meetings.

Noteworthy among the meetings of the Institution of Municipal and County Engineers which are to be held after Whitsun are those at Dunfermline and Southend-on-Sea, in both of which towns there is likely to be a considerable gathering of members. Town planning bulks largely in the programme of the Scottish meeting, but the paper on the advantages of steam tractor haulage over team labour for road metal, which Mr. W. L. Gibson, the county road surveyor of the Western District of Perthshire, is to contribute to the proceedings, may be expected to elicit a discussion of some interest. That Mr. Gibson speaks with some authority on the subject with which he is to deal will be evident when it is stated that he is reputed to be the first county road surveyor in Scotland to adopt tractor haulage, and the account of his experience with this method of transportation, particularly as it will be accompanied by detailed statements of actual cost and comparative analyses, should be of the greatest value to his professional brethren.

It will not be the first visit of the institution to Southend, but the interval which has elapsed since the occasion on which the members last assembled there has been one of somewhat remarkable progress and development—to which the activities of the borough engineer, Mr. E. J. Elford, may be said to have contributed in no small degree—and many new and important works, several of which are in course of construction, will be thrown open to inspection. A week after Southend there will be a district meeting at Lytham, and on the same day the Wiltshire town of Tisbury will be visited by the Institution of Municipal Engineers. At Stockport the Institution of Water Engineers will hold its annual summer meeting from June 11th to 13th, and June 24th will witness the opening of the annual meeting and town planning, housing and road conference of the Institution of Municipal and County Engineers at Cheltenham, the full programme of which has already been given in our pages. In July the most important fixture is the annual congress and exhibition of the Royal Sanitary Institute, which takes place this year at Blackpool.

Highway Bridges in Birmingham.

The paper descriptive of recent highway bridges in Birmingham which was read by Mr. A. S. Parsons, ASSOC. M. INST. C. E., at the meeting of the West Midland District of the Institution of Municipal and County Engineers last Saturday, was a plain and unassuming record of important works successfully accomplished in the face of considerable difficulties. The total number of highway bridges within the city area is no fewer than 107, and of these 238 are maintainable by the corporation. It can easily be imagined, therefore, that extensive repairs and reconstructions are matters of constant occurrence. Thus, during the past year four highway bridges have been constructed, and Mr. Parsons' paper not only contains an interesting description of these works, but also an account of the general methods of design and construction adopted in the city engineer's office. The construc-

tion of the Aston Church-road bridge involved the demolition of the existing canal walls, the building of new waterway walls, and the paving of the invert with blue bricks in cement laid on concrete. This work had to be done within the space of eighty-six hours, which was the maximum time during which the company would allow the canal to remain empty. When the necessity of waiting for concrete and mortar to set and the restricted working area are taken into account, it will be seen that the most careful organisation and minute supervision were necessary to ensure success. In the case of the King's-road bridge, which was next dealt with by Mr. Parsons, a similar difficulty had to be met. Further, an agreement with the canal company necessitated an increased headroom, with a consequent steepening of the approaches. The other bridges described by Mr. Parsons were those in Forman's-road and Stratford-road. In the case of the latter, which carries the main road from Birmingham to Stratford-on-Avon over the river Cole, the opportunity was taken of straightening the river by constructing the new bridge midway between two old ones, and then turning the river under it. The paper concluded with some general notes giving particulars of the materials used in the bridge work supervised by the city engineer's department, and some account of the method of design employed for bridges of moderate span. It was received with great attention, and produced a very useful discussion. A full report of the meeting will be found in another column.

The discussion on Mr. Parsons' paper centred in the main around two points—namely, the absence of reinforced concrete in the bridges which had been described and inspected and the desirability from a public point of view of artistic and ornamental design. The first of these matters was raised by Mr. A. T. Davis, who presided in the absence of Mr. Stilgoe. He pointed out that by using this material bridges which were divided into two might have been constructed in a single span. With this view Professor Lee, of Birmingham University, agreed, and pointed out that by the adoption of ferro-concrete in one or two cases some headroom might have been saved and the necessity for excessively steep gradients avoided. Some other members expressed surprise that reinforced concrete had not been used, but the matter was ultimately explained by Mr. Gray, who stated that this construction had been tried on one bridge, but that traffic difficulties, coupled with the delay caused by allowing the time necessary for the work to settle before opening the bridge for traffic, had caused such an outlay that it had been decided to abandon the use of ferro-concrete for bridge work in the central portions of the city. The question of artistic treatment was raised by Professor Lee, who praised the finer sense of beauty displayed by the old-time bridge builders. In his reply Mr. Parsons agreed that bridges ought to be made as ornamental as possible—with the funds at disposal. It is only too true that architects and engineers, even when acting for a public authority, cannot give full expression to their own ideas and ideals because of considerations of economy which are forced upon them.

A Veteran Road Nuisance.

For some years past a traction engine domiciled near a town in one of the Home Counties has been a serious nuisance to the inhabitants of the district partly on account of the vibration caused by its passage along the roads and streets, but even more on account of the loud noise, amounting to a roar, which it makes whenever it is moving. The local council have been informed that the county council have no power to prevent heavy locomotives being used on the highways provided they do not exceed the legal weight, and on the off-chance that this notorious vehicle does contravene the regula-

tions in this respect it is to be weighed before the licence is renewed. One would have supposed that, apart from the question of nuisance, the engine might be considered as a vehicle which is always driven "to the common danger," since the noise which it makes is so great that a person who is near it cannot hear the approach of other vehicles. The combination of this deafening noise and of the effect which the engine has upon a lively horse certainly tends to accidents. It has been stated, though for the truth of this we do not vouch, that cyclists riding past the engine sometimes find that their lamps and pumps have been shaken off on to the road. As to the effects of this engine upon the roads, it will be realised that a vehicle of this description is necessarily more damaging to tarred surfaces and to the crusts of by-roads than are traction engines which are more firmly held together. It is a pity that in a case like this the various local authorities concerned do not act in concert and put an end to the activities of vehicles which, in common sense, ought not to be allowed on the roads: but, in justice to the road authorities immediately concerned, it must be pointed out that the local magistrates, as we understand, refused some time ago to countenance the suppression of the nuisance on the ground that it helped to provide a living for a number of workpeople. It is difficult to believe, however, that the industry in which this traction engine is used could not get along perfectly well, if not better, without it.

* * *

Sewer or Drain? The Committee stage of the Walsall Corporation Bill was made the occasion of the official opposition of the Local Government Board to Clause 69, which had been inserted to amend the definitions of "sewer" and "drain" as contained in section 4 of the Public Health Act, 1875. Our readers are sufficiently familiar with the difficulties—both practical and legal—which have arisen out of these definitions, and even more out of the provisions of section 19 of the amending Act of 1890 as to nuisances occurring in a "single private drain." Expert opinion is practically unanimous that some amendment of the law is urgently required, but unfortunately up to the present Parliament has not found time to deal with the matter, although more than one Bill has been presented to the House of Commons to clear up the question and to lay down a general principle. The opposition of the Local Government Board was not based upon the merits of the suggested clause, but upon the ground that the subject was not appropriate for legislation applicable only to particular districts, and especially where sewers and drains had already been constructed under the general law. We are bound to say that in our view there is much to be said for this contention, and it is a little unfortunate that the practice of Local Legislation Committees has not been uniform, inasmuch as clauses have been allowed in some Bills and disallowed in others. Once the principle of local legislation with regard to the matter has been admitted, it is difficult to see why a clause should be refused in any particular case. We are therefore able to congratulate the Walsall Corporation on obtaining their clause, but at the same time we hope that the granting of such clauses may not delay a much-needed and long-delayed amendment of the Public Health Acts.

* * *

Highways in Devonshire. The annual report of Mr. Frank J. Harris, the surveyor to the Holsworthy Rural District Council, is a courageous document which very frankly sets forth the administrative difficulties of the position which he occupies. In the first place, it must be remembered that the area of the district

is 84,820 acres, and that it contains 281 miles of roads, of which 44 miles are county main roads and the remainder district roads. Further, Mr. Harris's task is rendered all the more difficult by reason of the fact that the subsoil is generally of clay. Prior to 1907 it appears that the main roads were starved, and at the present time both these roads and the district roads are feeling the effect of modern traffic. For the entire superintendence of these roads Mr. Harris, who is allowed no travelling expenses, no assistant, neither clerical assistance nor office accommodation, and not even a foreman, is paid the beggarly annual salary of £140. Little wonder that he feels bound to draw the earnest attention of the council to the work of his department, and particularly to the probability of the county council themselves undertaking the maintenance of the main roads in the near future. It is not often that an annual report of this kind, which shows a good year's work accomplished under very discouraging circumstances, concludes by the writer asking his council for a testimonial to enable him to apply for a more lucrative and certain appointment: but there can be little doubt as to Mr. Harris's justification in taking such a course. We draw attention to the case of Holsworthy because we believe that it is only typical of what is going on in many other districts. If the local authorities cannot afford the due maintenance of the highways in their districts, it is high time that further Exchequer relief should be forthcoming.

* * *

What is a Chain? A correspondent who speaks with great authority on the subject has called our attention to a common error committed by surveyors and even the writers of textbooks in using the word "chain" to denote indiscriminately either a length of 66 ft. or one of 100 ft. He points out that the standard gauge in Trafalgar-square speaks of a 66-ft. *chain*, but of a 100-ft. *measure*. The confusion probably arises from the fact that a measuring *instrument* of either length (or, indeed, of any other length) may be correctly described as a chain, if it is actually made in that form. Gunter's chain, of length 66 ft., which is in general use among land surveyors, must be held responsible for giving the name "chain" to a measure of length, and the name link to the smaller unit—i.e., one-hundredth part of 66 ft. The convenience of measuring land in chains and links lies in the fact that the chain is an aliquot part of a mile, and that 10 square chains make up 1 acre. It should be carefully borne in mind, however, that when the term "chain" is used to denote a measure of length, it can only be so used with accuracy if the 66-ft. length is meant.

* * *

Middlesex and Motor Omnibuses. Among the opponents to clause 25 of the Middlesex County Council (Western Road and Improvements and Finance) Bill, under which the county council seek powers to levy a local charge of 3d. per vehicle per mile upon owners of motor omnibuses using the new Western Road, are the Roads Improvement Association. The council of that body have decided to carry their opposition, if necessary, to the House of Lords. The association are opposing the principle only; they make it clear that they are not concerned with the question whether motor omnibuses or any other form of traffic are sufficiently taxed, having regard to the benefits they derive from the public services. The association feel that the re-enactment of local tolls or local taxation in any form upon traffic for the use of particular highways would be an unjust and retrograde movement, and would prove a great inconvenience to and hardship upon the community at large. The association's view is that all taxation imposed on vehicles should be imposed direct by the State, and afterwards disbursed by the State, as at present.

Institution of Municipal and County Engineers.

WEST MIDLAND DISTRICT MEETING AT BIRMINGHAM.

The members of the West Midland District of the Institution of Municipal and County Engineers met at Birmingham on Saturday last. Starting at the Council House, they first proceeded on an inspection of a number of the City's highway bridges, and later assembled to discuss a paper prepared by Mr. A. S. Parsons, Assoc.M.INST.C.E., a member of the staff of the City Engineer, Mr. H. E. Stilgoe, M.INST.C.E., those present including Messrs. A. T. Davis (Shropshire), district chairman, presiding, A. D. Greatorex (West Bromwich) and J. Lobley (Hanley), past-presidents; W. E. Ballard (Birmingham), R. Blanchard (Cannock), W. A. H. Clarry (Sutton Coldfield), H. J. Coleby (Atherstone), F. C. Cook (Nuneaton), hon. district secretary, A. J. Dickinson (Redditch), S. Douglas (Kenilworth), J. Gammage (Dudley), J. S. King (Birmingham), Measham Lea (Karachi), G. W. Lacey (Oswestry), J. Moncur (Staffordshire), R. C. Moon (Nuneaton), A. S. Parsons (Birmingham), W. Plant (Stafford), members; R. Fletcher (Worcestershire), E. J. Goodacre (Shrewsbury), A. R. Gray (Birmingham), B. C. Hammond (Worcestershire), A. P. Howell, J. Perkins, W. C. Rubie, E. W. Turner, W. N. Thomas, N. G. Tomey (Birmingham), E. Willan (Bilston), associate-members; and T. S. Griffin (Wolverhampton), student.

A vote of thanks to Mr. Stilgoe for entertaining the members to tea was proposed by Mr. A. T. Davis, the district chairman, who expressed regret that, owing to indisposition, their host was unable to be with them that day. In his absence they wished to say how grateful they were to him for giving them facilities for meeting in that building for the business of the district and arranging for visits to the works of the City. As most of them were aware, Mr. Stilgoe had unfortunately been laid aside, they hoped temporarily, by illness, and was unable to be present with them. They wished him a speedy return to health.

The vote of thanks having been heartily accorded,

Mr. A. R. GRAY (Birmingham) promised to convey their very kind wishes to Mr. Stilgoe with their hopes for his speedy recovery. Mr. Stilgoe had wished, if possible, to attend the tea, if not the later meeting, but unfortunately he had not been able to be present.

At the ensuing business meeting Mr. A. T. Davis (Shrewsbury) was in the chair.

Mr. F. C. COOK (Nuneaton), honorary district secretary, said their first business was to elect a chairman of the district for the ensuing year. He would like to read a letter which he had received from Mr. Stilgoe regretting his inability to be with them:—

"I regret that I am prevented by a severe cold from attending the meeting of the Institution of Municipal and County Engineers to-day. I had looked forward to the meeting, but hope that the members will obtain all the information they require with regard to the bridges from my assistants, Mr. Gray and Mr. Parsons, who will be present."

RE-ELECTION OF DISTRICT CHAIRMAN.

Mr. A. D. GREATOREX (West Bromwich) proposed that Mr. A. T. Davis, county surveyor of Shropshire, be re-elected chairman of the district. At the last meeting of the Executive Committee it was agreed that Mr. Davis should be again nominated for the position of chairman of the West Midland District, and when that proposal was brought before a general meeting it was accepted. He had great pleasure in proposing that Mr. Davis be elected chairman of the district, and in doing so he would like to thank him for the very excellent way in which he had conducted the business of the district during the past year.

Mr. J. MONCUR (county surveyor of Staffordshire) seconded the re-election of Mr. Davis. He felt they could not choose a better chairman; certainly they could not have one who took a greater interest in the work of the district.

Mr. F. C. COOK (Nuneaton) said he wished to be allowed to express his appreciation of all Mr. Davis had done during the time he had been chairman of the district. On every occasion he had had to speak or to write to Mr. Davis upon the work of the district he had taken the fullest interest in the work, and he hoped Mr. Davis would allow himself to be re-elected.

The resolution was unanimously carried.

Mr. A. T. DAVIS, in acknowledgment, thanked the

members for their vote of continued confidence. He would, owing to his other engagements, have been glad to be relieved of the position. It was none of his seeking in the first place. When the system of district committees came into force they did him the honour of inviting him to be chairman of the West Midland District, which was part of the old Midland district of which he was honorary secretary for ten years. He had a great love for the institution, and anything he could do for it would be a pleasure to him.

The following paper was submitted to the meeting

RECENT HIGHWAY BRIDGES IN BIRMINGHAM.

By A. S. PARSONS, ASSOC.M.INST.C.E.,
Engineering Assistant to the City Engineer and Surveyor
of Birmingham.



[Mr. Parsons was born in Birmingham in 1884, and educated at King Edward VI. school. He has been successively pupil and assistant to the borough surveyor of Aston Manor (Mr. G. H. Jack), assistant to Mr. H. J. Hamp, borough surveyor of Swindon, deputy surveyor of Aston Manor, and engineering assistant to the city surveyor, Birmingham. During his fourteen years in the profession he has been engaged on tramway construction to the value of £250,000, the building of eleven bridges, a twenty-four-bed isolation hospital, an 8,000-kilowatt electric station, a highways depot, costing £8,000, a refuse destructor, main road reconstruction works, costing upwards of £30,000, and extensive sewerage and sewage disposal works. He is an associate-member of the Institution of Civil Engineers, a professional associate of the Surveyors' Institution, and a member of the Institution of Municipal and County Engineers.]

The city of Birmingham has an area of 43,601 acres, a population of 840,372, and for administrative purposes is entirely within the county of Warwickshire. It is served by four railway companies, owning within the city 55 miles of track (excluding sidings); five canal companies, owning 35 miles of canal; and it has also within its boundaries 62 miles of rivers and streams.

There are 101 highway bridges over canals, 105 over railways, and 201 over rivers and streams, and of the total of 407, 238 are maintained by the city of Birmingham. Owing to the early date of their construction, the bridges over canals are constantly needing attention, and during the past twelve years eighteen of these have been re-built or strengthened. Under the exigencies of increasing traffic and population, the provision of new, or the alteration of existing, bridges over rivers is called for, and within the same period sixteen cases have been dealt with.

During the past year there have been four highway bridges constructed, and the object of this paper is to give some account of each, and to indicate briefly the general methods of design and construction adopted in the city engineer's office. The four bridges referred to are: (1) Aston Church-road, (2) King's-road, (3) Forman's-road, (4) Stratford-road. There is one other bridge well in hand.

ASTON CHURCH-ROAD BRIDGE.

This bridge replaces the structure erected in 1842 by the Birmingham and Warwick Junction Canal

Company to carry the path leading from Washwood Heath to the parish church at Aston over their new canal. The canal was constructed on the east bank of the river Rea, the old bridge spanning both canal and river. There were three brick arches, two of 28-ft. span and one of 32-ft., and the width of roadway was 15 ft. between parapets. This width, although possibly quite adequate at the time, very quickly became insufficient, and the bridge was for many years considered to be one of the most inadequate in the city.

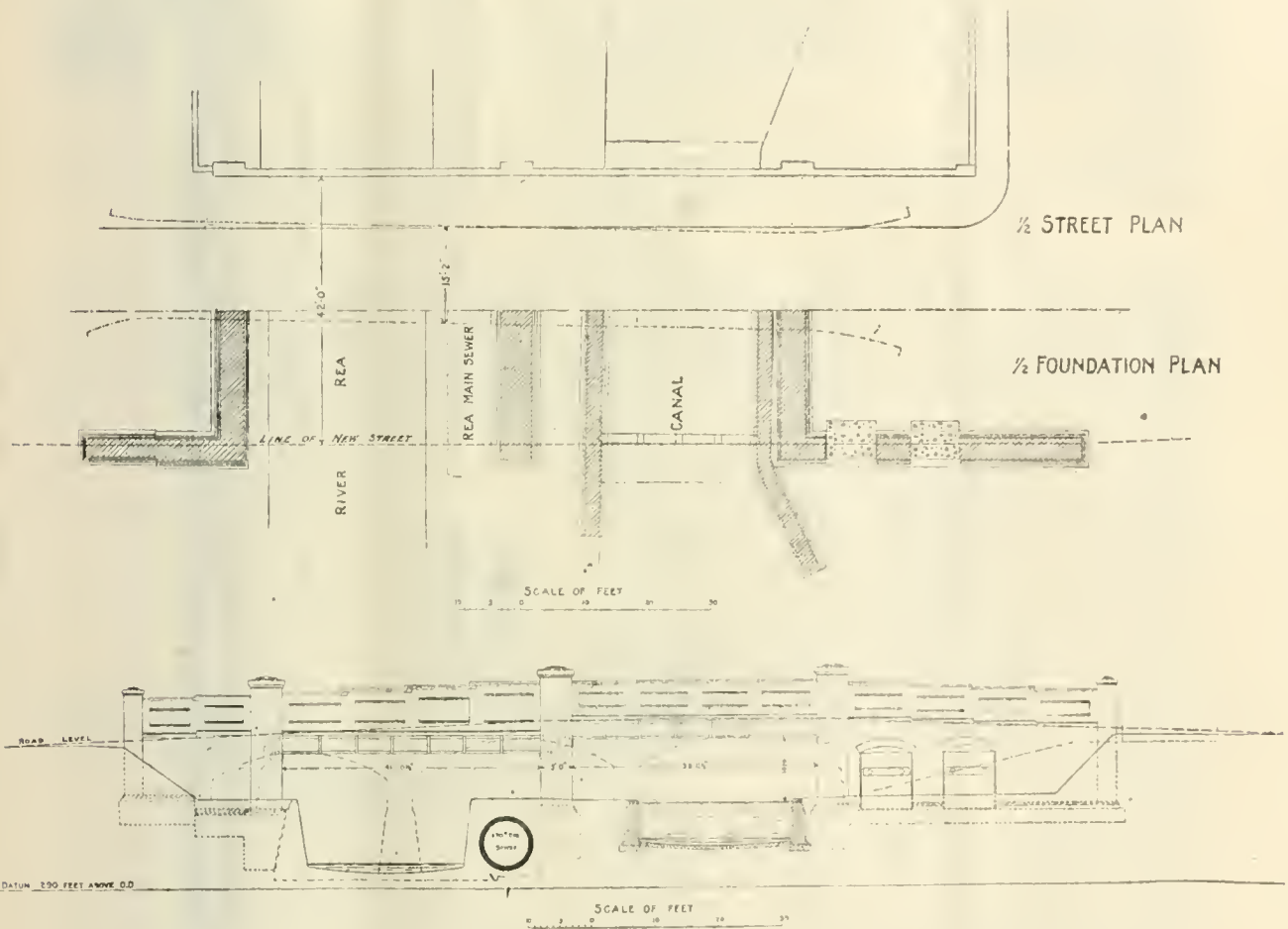
The reconstruction of this bridge was under consideration, and as the gas and electricity departments asked for accommodation on the bridge for a 36-in. main and a large number of cable ducts, a scheme was prepared for rebuilding.

The requirements for gas main and cables necessarily limited the design to some extent, as it was impossible to provide the accommodation asked for except by utilising the space under the footpaths; but it was further affected by the demands of the canal company, and also by the presence of the 7-ft. dia-

vantages. The plates from which it is made are a stock product and can be obtained at short notice, whereas delay sometimes occurs in the production of a rolled section owing to the particular number being out of stock, and the unwillingness of the manufacturer to put in rolls for a small order. Again the riveting is in a more accessible position, making the field work more speedy.

Cover plates can, of course, be used with either form, but to be economical must be properly riveted to the troughing and calculated to take their proportion of the stresses. The saving in total weight of flooring (neglecting asphalt and road formation) due to the elimination of concrete filling is about 68 per cent, which, by reducing the stress in the main girders, effects a saving in their weight also. In this particular case the weight of steelwork (girders and troughing) comes out at 56 lb. per foot super., a moderately low figure in relation to the spans and loading.

The obvious objection to the use of cover plates is the impossibility of painting the internal surfaces.



ASTON CHURCH-ROAD BRIDGE.

(Plate I., Figs. 1 and 2.)

meter Rea main sewer between the canal and river. The design adopted was the one shown in Plate 1. This provided a width of 42 ft. between parapets, and complied with all the conditions laid down by the parties affected.

The spans are, west 41 ft., east 39 ft., and they are composed each of two parapet and two main girders carrying trough flooring. On each span the parapet girders are level for the sake of external appearance, but the main girders on the west span are inclined at a slope of 1 in 25, that being the gradient of the roadway over them. This arrangement secures a nearly constant depth between road surface and steelwork, and, together with the special type of road troughing adopted, gives a minimum depth of concrete under the road formation, thus saving a large amount of dead weight. The additional height given by the kerb was utilised to obtain a deeper main girder, while the footpath troughing was kept hard down on the bottom angles to secure the maximum cross-sectional area for pipe and conduit laying.

Pressed troughing was used throughout for the flooring, that under the carriageway being fitted with cover plates. This type of trough, though theoretically less efficient than rolled troughing, has its practical ad-

This difficulty can be met, to a great extent, by coating with a non-rusting compound before assembly.

Val de Travers asphalt, $\frac{3}{4}$ in. thick, was laid on concrete floating over the whole of the steelwork, and the footpath trenches are drained to catchpits in the piers. Concrete was then brought up to the necessary camber and falls, and paved with 4-in. Enderby cubes jointed with $2\frac{1}{2}$ to 1 cement grout. All brickwork is built of Hamblett's brindled bricks in 2 to 1 cement mortar, and coped and capped with Pennant stone.

As the new east pier encroached to a small extent on the canal waterway, the canal company asked for the length of canal under the bridge to be reconstructed. This involved the demolition of the existing canal walls, the building of new waterway walls $3\frac{1}{2}$ bricks thick, and the paving of the invert with blue bricks in cement on 6-in. concrete. The time during which the company would allow the canal to remain empty of water was restricted to eighty-six hours, during which time the following work was done:—

- 72 cub. yds. of brickwork demolished.
- 300 cub. yds. of excavation taken out (mostly slurry).
- 22 cub. yds. of concrete placed.
- 45 cub. yds. of brickwork built.

145 super. yds. of concrete and blue brick invert laid.
 32 lin. yds. of 21-in. by 10-in. stone coping and cast-iron guards fixed.
 49 lin. ft. of 18-in. by 7-in. sill constructed, and two pairs stop-plank grooves built in.

When the necessity of waiting for concrete and mortar to set and the restricted working area are taken into account, it will be understood that careful organisation and minute supervision are essential to the successful completion of the work within the time limit. It is an advantage if a supply of quicker setting cement can be at hand for this class of work, but considerable care has to be exercised in this connection to ensure that rapidity of setting is not attained at the expense of soundness.

The order to commence work was given on July 1, 1913, and the bridge opened for traffic on February 18, 1914, the contractors being—

Steelwork: Messrs. Braithwaite & Kirk, West Bromwich.

Building Work: Messrs. John Wilson & Sons, Handsworth.

The estimated cost was £5,000, and the actual detailed costs were:—

Steel decking, girder and concrete screeding, 9s. 2d. per super. ft.

Asphalt, 6d. per super. ft.

Concrete, 7½ in. thick, and setts, 11s. 6d. per super. yd.

Foundations to ground level (total cost for bridge only), excluding wing walls, £315.

Canal work (total cost), £565.

KING'S-ROAD BRIDGE.

King's-road, Hay Mills, is a thoroughfare leading from Coventry-road to Tyseley Station, and was carried over the Warwick and Birmingham Canal by a single span brick arch bridge erected in 1792, giving a canal waterway of 14 ft., a headway above water level of 8 ft. 6 in., and a width between parapets of 13 ft. 6 in.

The reconstruction of Tyseley Station, its growing importance as the junction of the new North Warwickshire line with the old Great Western main line, and the rapid development of the adjoining district, forced on the late Yardley Rural District Council the necessity for rebuilding the bridge. The negotiations with the Canal Company were nearly completed when Yardley was absorbed by Birmingham.

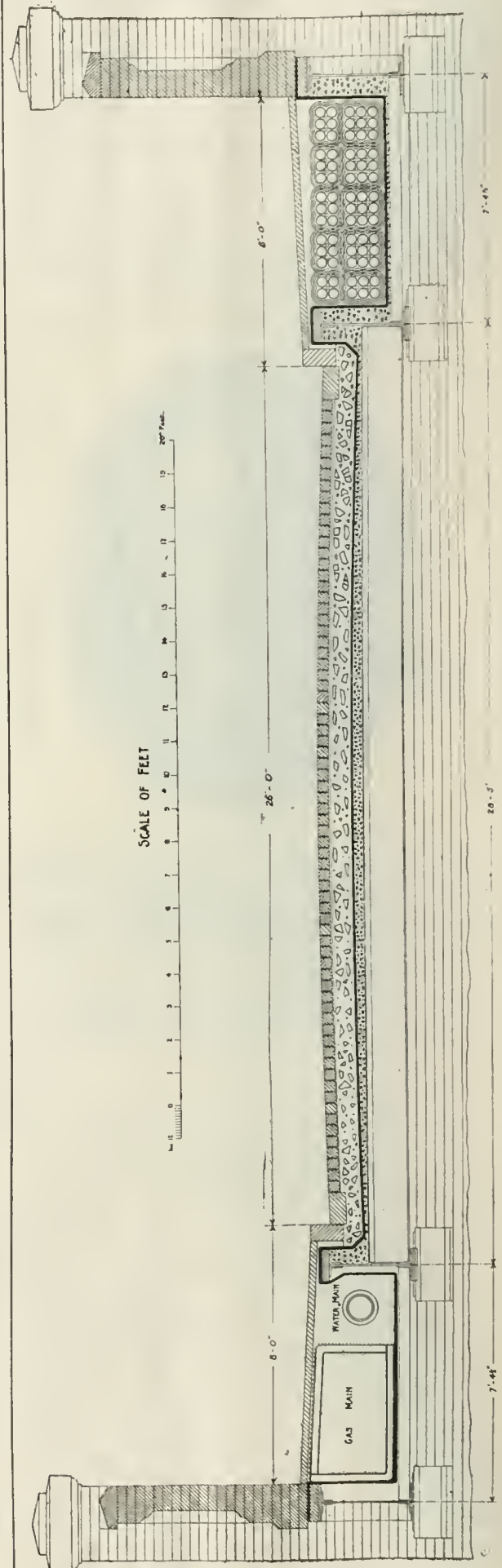
An agreement subsequently entered into with the company in respect of the new bridge provided for a canal waterway of 19 ft. wide, a towing path 8 ft. wide, a width of 28 ft. between abutments, a depth of water of 5 ft. 6 in., and a headway above water level of 10 ft. This increased headroom is typical of most cases of canal bridge reconstruction, and is frequently the sole reason for the perpetuation of steep approaches.

Unfortunately the existing gradient leading up to the old bridge on the north side was already 1 in 15 average, with 1 in 11 maximum, and after allowing for the increased headway it was found impossible to obtain any better gradient than 1 in 17 average, with 1 in 12½ maximum. The new bridge is a single span brick arch, five rings thick, 28 ft. span, 5 ft. rise, 22 ft. 3 in. radius, with its axis at an angle of 84 deg. 15 min. to the centre line of roadway; the abutments are 5 ft. 3 in. and 6 ft. 3 in. thick at the base, and 5 ft. 3 in. at the springing level.

The lowest level of excavation was 9 ft. 6 in. below water level, and as the time during which the canal could be empty was limited to the usual eighty-six hours, an attempt was made to construct the south-west abutment behind a cofferdam. This dam was of the usual type—two rows of 9-in. by 3-in. sheeting packed with clay puddle—and answered sufficiently well for all the excavation to be done behind it, but just as the ground was bottomed up for concrete an empty boat collided with the dam, and all attempts to make it watertight again failed. Subsequent investigations revealed the fact that the sheeting had not been driven to a sufficient depth, and pointed to the conclusion that a much better job would have been obtained by using 7-in. by 2-in. sheeting, which can be driven by hand much more easily, its displacement being roughly 50 per cent only of the larger size.

Under the agreement with the Canal Company the water should have been out of the canal early on Easter Monday morning, but owing to the failure of the Canal Company's stop planks, &c., a start could not be made on the work till 2 p.m. on Tuesday. During the next eighty-six hours the following work was done:—

96 cub. yds. brickwork demolished.
 240 cub. yds. excavation taken out.
 80 cub. yds. concrete placed.
 176 cub. yds. brickwork built.
 160 sup. yds. brick invert and concrete laid.

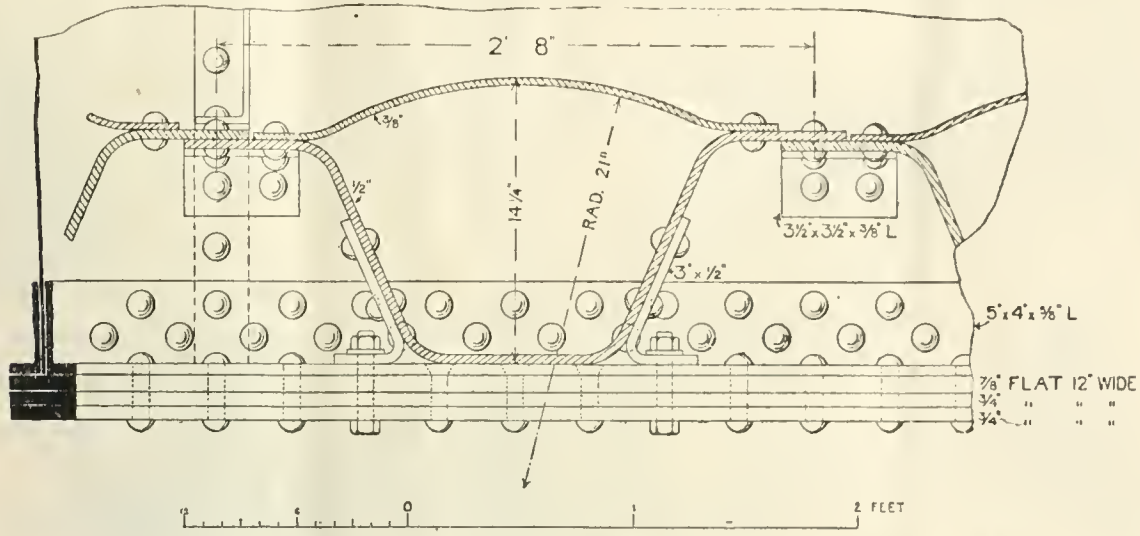


The waterway walling was 2 ft. 3 in. thick at the base, and stood on concrete 12 in. thick. A large portion of its length is curved in plan, and this was

ASTON CHURCH-ROAD BRIDGE: CROSS-SECTION.
 (Plate I, Fig. 3.)

built to the templates from which the iron guards to be fixed on the top had been cast. This method answered quite well, though some difficulty was experienced in fitting the guards on the walls, owing to warping and contraction in the castings. This

force to be left for short intervals, to set—still further reducing the time available for its completion. It was ultimately built up to the required level within the time, but at the expense of the face work, which became slightly out of plumb in small patches.



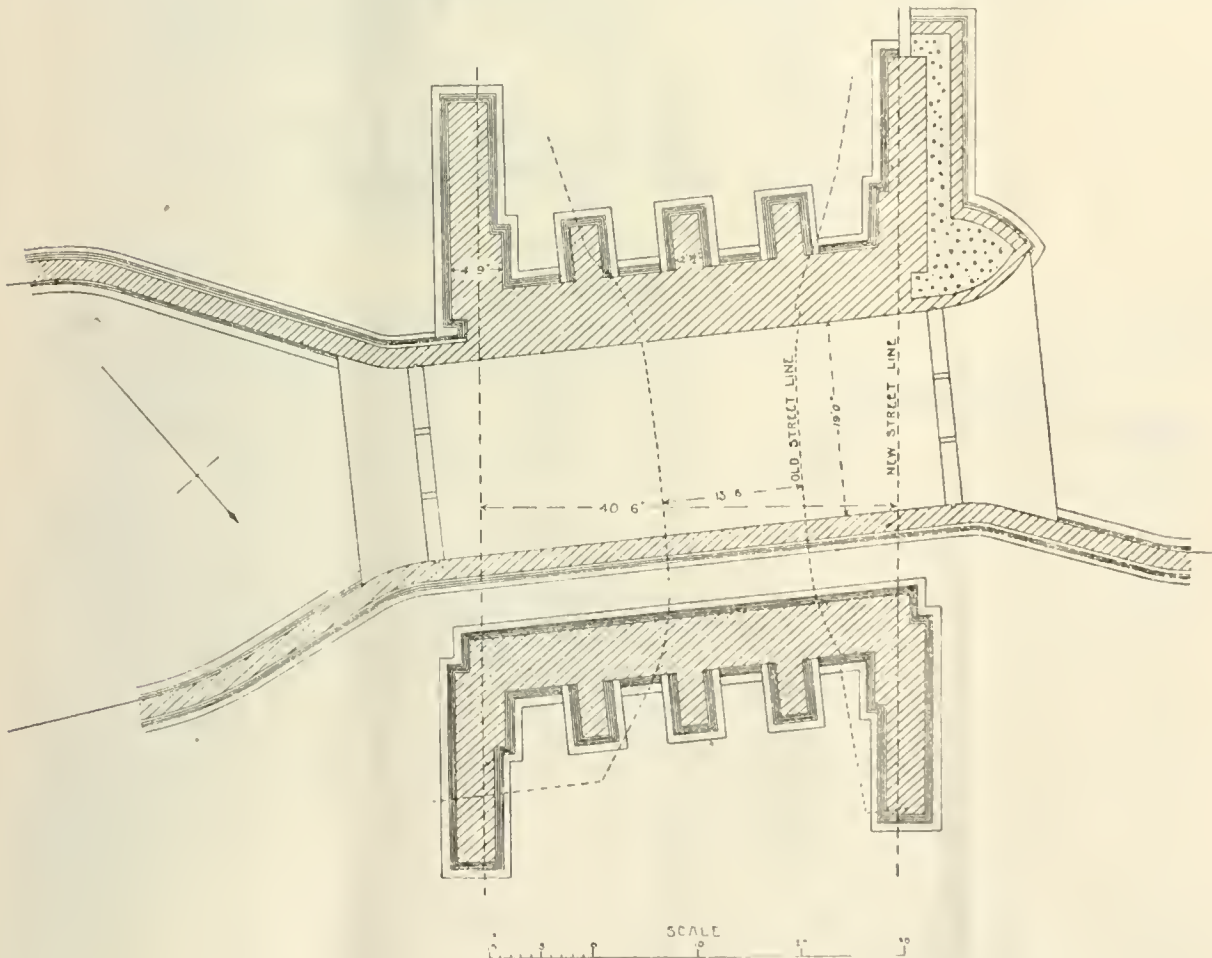
ASTON CHURCH-ROAD BRIDGE: DETAIL OF ROAD TROUGHING AND CONNECTIONS.

(Plate I., Fig. 4.)

would have been obviated had the templates been adjusted to the actual castings when delivered, but lack of time and space prevented this being done.

In building the south-west abutment the most troublesome feature was the slowness of setting of the mortar. Such a large mass of brickwork (46 ft.

When the canal had again been filled, the north-east abutment was constructed behind the shelter of the new waterway wall, which proved to be quite watertight, and the whole of the brickwork was then raised to springing level. Owing to delays at the quarry, the stone springers for the oblique arch were



KING'S-ROAD BRIDGE: PLAN.

(Plate II., Fig. 1.)

long, 6 ft. 3 in. thick, 8 ft. high) would, in the ordinary way, be taken up very slowly, but in this case it had to be built in forty-eight hours. Although every care was taken to keep the work as dry as possible, it rapidly became unstable and had per-

not delivered in time for use, and the arch sprung from cut blue brick skewbacks.

As it was imperative that traffic along the canal should not be interrupted during the turning of the new arch, the usual type of timber centering could

not be used; 7-in. by 4-in. rolled steel joists, 5 ft. apart, bent to radius and fitted with shoes, were employed, and covered with 3-in. laggings. It was anticipated that, owing to the lack of ties, there would be a tendency for the feet of these ribs to spread and bind against the brickwork, and to obviate this folding wedges were used at the back of the shoes to allow of their easy liberation. This the wedges did admirably.

Concrete haunching was placed on the arch, the crown waterproofed, and the road surface paved with 1-in. Enderby cubes on 6 in. of concrete.

All the blue pillar caps, copings, and bricks were supplied by Messrs. Hambletts.

The work was commenced on February 26, 1913, and the bridge opened for traffic in November, 1913. A great deal of delay was caused by strikes and delays in delivery of materials.

The estimated cost was £3,250, and actual detailed costs were:—

Arch and concrete haunching, 3s. 10d. per super. ft.

Concrete 6 in. thick, and setts, 11s. per super. yd.

Foundations (bridge only) to ground level, including wing walls, total £923.

Canal work, total £511.

The contractors were Messrs. Curall, Lewis & Martin, Limited, of Birmingham.

FORMAN'S-ROAD BRIDGE.

Forman's-road is an old highway leading from Sparkhill to Tyseley, and carries a good deal of east

3-in. sheeting driven into the gravel and packed with puddle. By closing the spaces between the ends of this dam and the river banks, first on one side and then on the other, the excavation and concreting were executed in two portions. Owing to the flooding previously mentioned, the dam was overflowed on several occasions and the work submerged.

The lowering of the river bed exposed the footings of the house on the south-west side of the river, and a low breast wall was built to support them. This was successfully carried out in short lengths without damage to the property. On the north-east bank a heavy retaining wall was erected to support the house and garden on that side.

Enderby setts, 4 in. by 4 in. by 1 in. on 6-in. concrete, are used as carriageway paving over the bridge.

All the facing bricks are Hambletts', the common bricks being from the Aldridge Brick Company. The stone caps, copings and skewbacks are Fishponds Pennant, and the contractors for the work were Messrs. J. Wilson & Sons.

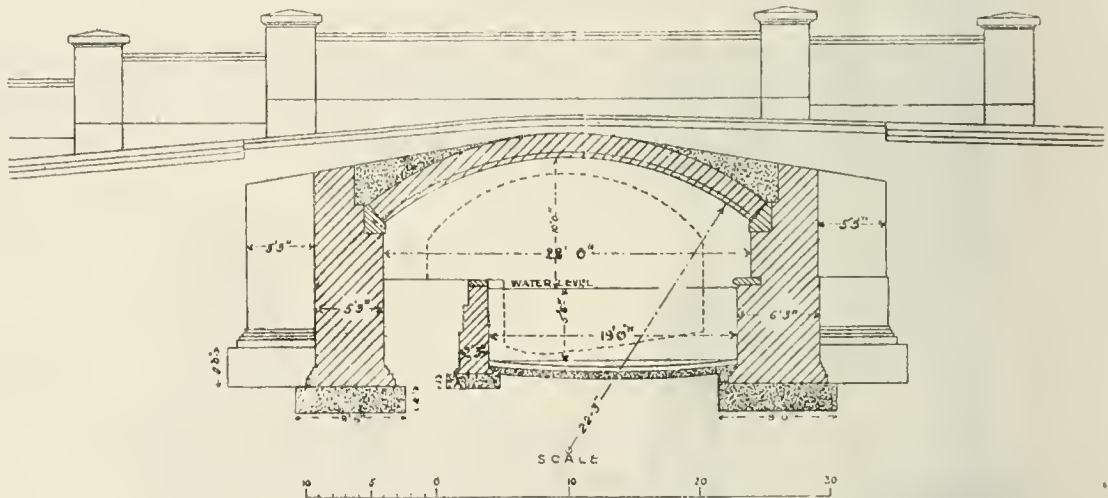
The construction of the bridge was commenced in February, 1913, and it was opened for traffic in November, 1913, the estimated cost being £3,000, and detailed actual costs—

Arch (including concrete), 2s. 10d. per super. foot.

Setts and concrete, 10s. per super. yard.

Foundations (bridge only), total cost £319.

The necessary making up of the 350 lin. yds. of approach roadway to the standard 42-ft. cross-section involved about 6,000 cub. yds. of filling and 350



KING'S-ROAD BRIDGE: SECTION.

(Plate 11, Fig. 2.)

and west traffic. The river Cole was crossed by a ford, which frequently was impassable for days together owing to the flooding to which the river is subject. This trouble is certain to be accentuated in the future, as the upper part of the valley of the Cole offers one of the most pleasant and eligible building areas within the city boundary, and it was therefore decided that a cross-sectional area of 260 sq. ft. of waterway was desirable. On taking into consideration the floor levels of the houses which existed on either side of the river it was found that two spans were necessary to give the required area.

The two arches are each of 20 ft. span, 13 ft. 6 in. radius, 4 ft. 6 in. rise, and four rings thick, their axis being at an angle of 79 deg. to the centre line of the roadway. The abutments are 3 ft. 9 in. thick, with counterforts, the centre pier 4 ft. 6 in. thick, and the width between parapets 42 ft.; the arches spring from Pennant stone springers, are backed up with concrete, waterproofed, and the centre spandrels drained by a 4-in. pipe discharging into the river.

In conformity with the general scheme of improvement for the river Cole, the bed of the river was lowered by about 2 ft. in the vicinity of the bridge, and is inverted with blast-furnace slag 8 in. thick, grouted with cement and slag chippings, and laid on concrete 6 in. thick. A temporary weir marks the termination of the deepening of the bed on the upstream side, its function being to prevent the washing down of the gravel from the upper to the lower levels.

For the purpose of carrying out that portion of the work which was below water level, a longitudinal cofferdam was put in, constructed of two rows of

lin. yds. of new sewers, with connections, the estimated cost being £3,250. The contractors were Messrs. Curall, Lewis & Martin, Limited.

STRATFORD-ROAD BRIDGE.

This bridge has replaced two old bridges carrying the main road from Birmingham to Stratford-on-Avon, over the river Cole; the old bridges were of brick, 31 ft. between parapets, and their arches gave a total effective waterway of 78 sq. ft. The more easterly of the two bridges spanned the original course of the river, and was a county bridge up to the time of the absorption of Yardley by Birmingham. It had been silted up for some years. The western bridge was over the overflow stream from a sword mill erected very many years ago and since demolished, and was constructed and maintained by the owner. Under increasing traffic this liability for maintenance became a serious one, and in 1912 the owner, in consideration of its assumption by the city corporation, surrendered a considerable amount of land in the vicinity for street improvement purposes. Owing to the silting up of the county bridge, this private bridge was compelled to take the whole of the river flow, and its insufficiency of aperture, together with the devious course of the river which led to it, gave rise to such severe flooding in times of storm as to seriously depreciate the value of the adjacent low-lying land.

The Birmingham Corporation Act of 1912 authorised the construction of tramways along this portion of Stratford-road, with the necessary street widenings, and the opportunity was embraced of straightening the river by constructing a new bridge midway between the old ones, and then turning the river under it.

This method enabled the whole of the new work to be done in comparatively dry ground.

The new bridge is 60 ft. between parapets, and has two brick arches, each 25-ft. span, 19-ft. 7-in. radius, five rings thick, which give a waterway area of 260 sq. ft. As Stratford-road is the main entrance to the city from a large and growing residential quarter, some attempt was made to give a definite architectural character to the new structure. To this end the brick sub-structure is surmounted by a Portland-stone balustrade, with three pillars on either side, the corner pillars carrying ornamental wrought-iron lamps. The concrete foundations are 4 ft. deep, the brick abutments 5 ft. 3 in. thick, with counterforts; the arches spring from grey Forest of Dean skewbacks, are backed

Portland stone balustrade and cornice, £3 0s. 3d. per foot-run.

Main pillars from underside cornice, £50 each.
Main pillars, 8s. 9d. per cub. ft.

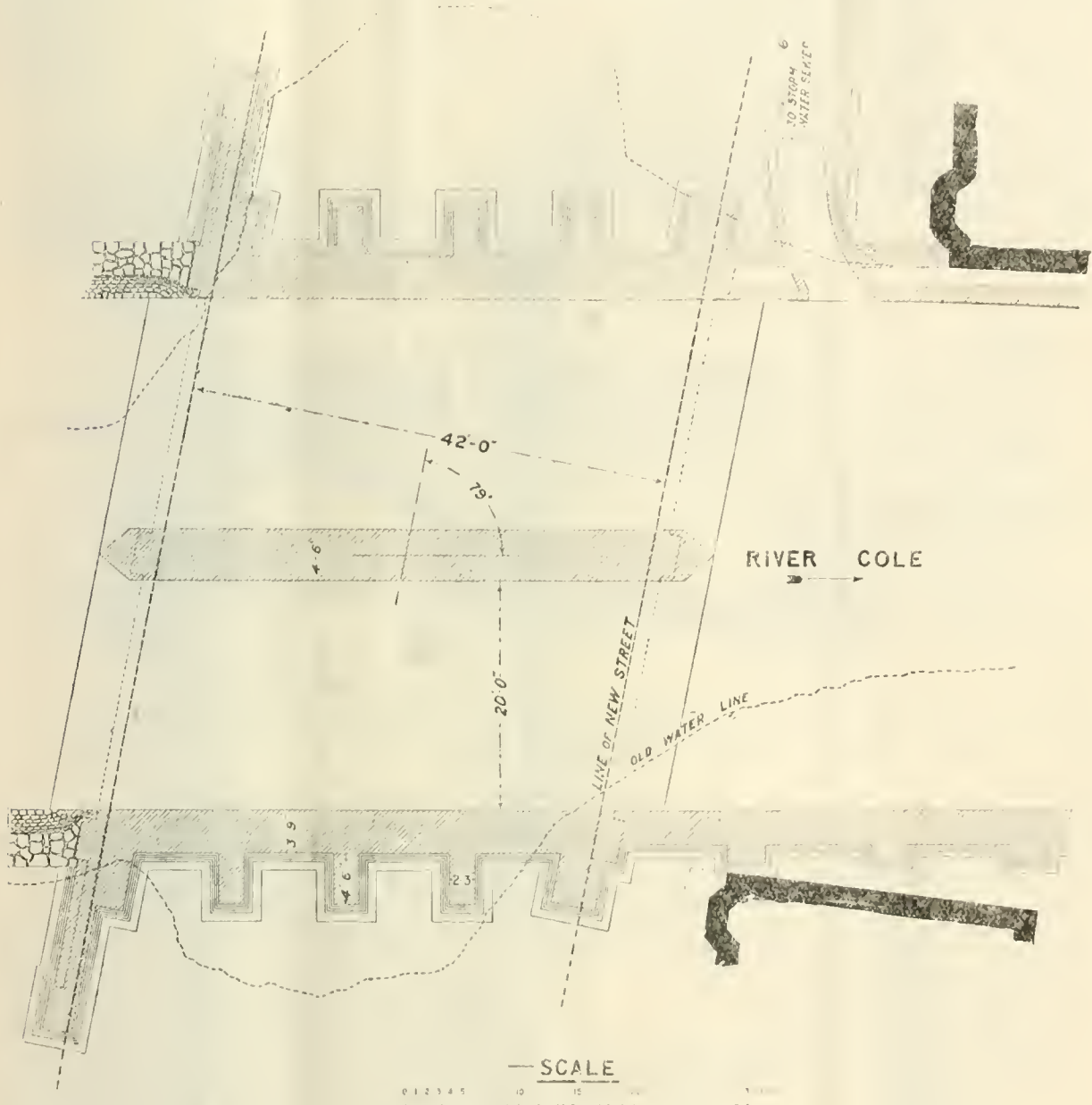
River invert on concrete, 6s. 9d. per sq. yd.

Slag walling, 15s. per cub. yd.

Completed channel, including excavation, 4s. 6d. per cub. yd.

Complete channel, standard section, £7 10s. per lin. yd.

The contractor for the work was Mr. A. Hopkins, of Birmingham. All the bricks were obtained from Messrs. Hadleys, of Brierley Hill; the grey Forest of Dean stone from the Bixhead No. 3 quarry of the United Stone Firms, Limited, and the Portland stone



FORMAN'S-ROAD BRIDGE: PLAN.

(Plate III., Fig. 1.)

up with concrete, and the crowns waterproofed and drained to catchpits. Creosoted deal paving on 9-in. concrete is used for the roadway paving, and a double line of tramway crosses the bridge.

On Plate 5 is shown a typical section through the river bed. The invert is constructed of blast furnace slag, 8 in. thick, jointed with cement grout and slag chippings, laid on 6-in. concrete, and has a dishing of 15 in. in 28 ft. The retaining walls are also of slag in cement mortar, and are built with a batter of 1 in 6.

The estimated costs were—

Bridge, £3,750.

River work, £2,700.

Detailed costs are—

Arch and concrete backing, 2s. 9d. per super. ft.
Concrete and wood paving, 15s. 3d. per super. yd.

is Whitbed, from the Easton quarries of Messrs. Barnes, Isle of Portland.

The work was commenced in July, 1913, and traffic first crossed the new bridge in March, 1914.

GENERAL NOTES.

In the following notes the author proposes to give particulars of material in general use in the bridge work supervised by the city engineer's department, followed by an indication of the method of design employed in bridges of moderate spans. He recognises that anything approaching an exhaustive treatment would expand the paper to an unlimited length, but hopes that the points mentioned may be interesting.

MATERIALS.

The concrete used is composed, by measure, of three parts of local sand (new red sandstone, Bunter

beds), four parts 2-in. cold-blast slag, and one part British standard (medium setting) Portland cement.

Each consignment of cement is tested before being used, and any sample not passing the specified tests is rejected. The department has a properly fitted test room for carrying out the necessary physical tests, and, what is equally important, an assistant who has been specially trained in this delicate work. There are not many rejections, the principal troubles in the samples thrown out being in regard to setting time. Rotary kiln cement is erratic in setting, though possibly its vagaries are due in a large degree to the insufficient time allowed for cooling in the storage bins during a busy season.

Where concrete is used next steelwork the slag is replaced by Harts Hill chippings, to obviate any risk of corrosion by the sulphur compounds.

The common bricks used are all Black Country brindles, carefully selected for soundness and thoroughness of burning. The blast-furnace slag used is specified to be cold-blast slag, free from cinders and porous lumps, and to be of a dark colour where used for facing. It is a difficult material, from the clerk of work's point of view, because of its infinite variations in quality; at its best it closely resembles Rowley ragstone, at its worst furnace clinker, and the price paid at the slag mound will not permit of much grading.

Cement mortar is exclusively used for brickwork,

effect of the live load, the margin being 15 per cent over the usual stress of 7½ tons for dead loads.

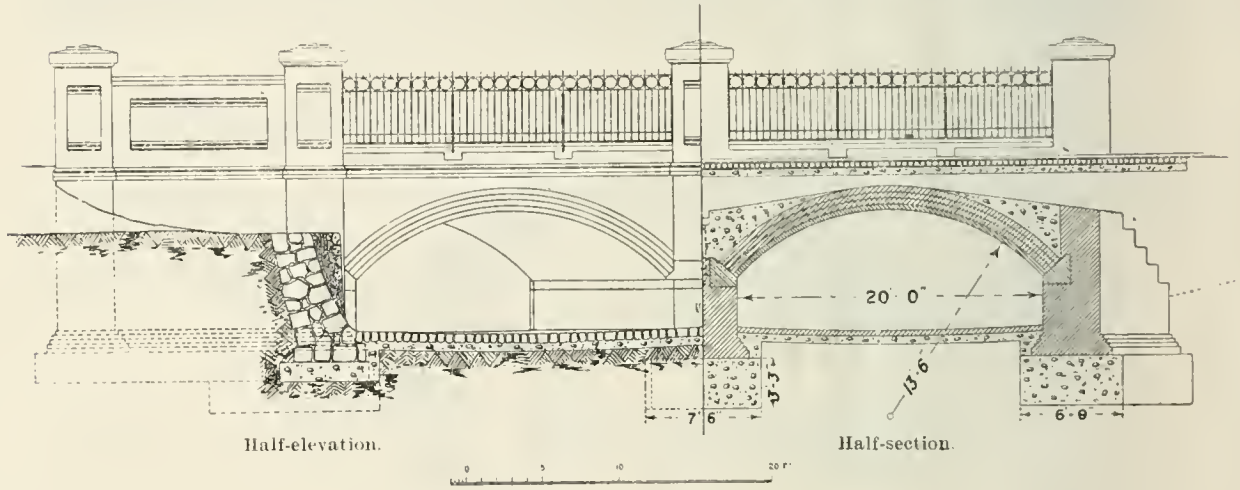
Bending moments and shearing forces on girders are obtained graphically from diagrams drawn with the load in several positions, the curve enveloping the various diagrams being that of an equivalent distributed load. To this curve is added the parabola due to the weight of the girder and the dead loads, and the maximum bending moment thus obtained, divided by the working stress, gives the required section modulus for the girder under consideration. From this modulus the maximum section of the girder is worked out in the usual way, having regard to the condition of flange width, total depth, &c., which the particular girder has to satisfy. The flange plates are then curtailed by means of the bending moment diagram. Machined bearing plates are provided under the principal girders, which are set on 10-lb sheet lead on stone pads.

The trial thickness of brick arches is determined by the formula—

$$T = \frac{3}{8} \sqrt{S}$$

where T = thickness at centre in feet,
S = span in feet.

A stress diagram is then drawn by Fuller's method, which gives the curve of equilibrium for the whole arch under any given loading at the first trial. This line should be enclosed by the middle third of the



FORMAN'S-ROAD BRIDGE.

(Plate III., Fig. 2.)

in the proportion of 1 part of cement to 2 parts sand. The extra cost of cement over lime is quite justified by the additional strength of the work.

METHOD OF DESIGN.

The maximum live load for bridges in Birmingham is now taken to be a traction engine drawing a boiler wagon, with the following axle loads:—

- Engine, front axle, 7½ tons.
- Engine, rear axle, 15 tons.
- Boiler wagon, front axle, 20 tons.
- Boiler wagon, rear axle, 20 tons.
- Wheel bases, 11 ft. 6 in.; track, 6 ft. 6 in.
- Front wheel of wagon to back wheel of engine, 14 ft. 6 in.

For trough decking each wheel load is taken as concentrated on two sections of troughing, and for arch work as distributed through a cone of 90 deg. apex angle. One cwt. per super. foot is taken as the maximum likely to occur from a crowd load, and is an ample provision.

In calculating the dimensions of the different parts of the structures, the following are taken as the maximum working stresses:—

- Mild steel:—
- 28-32 tons ultimate tensile strength, elongation 20 per cent in 8 in. { tension 6½ tons per sq. in.
- compression 6½ tons per sq. in.
- shear (webs) 3 tons per sq. in.
- shear (rivets) 5 tons per sq. in.
- bearing 8½ tons per sq. in.
- Concrete:—Compression 5 tons per sq. ft.
- Tension nil.
- Brindle bricks (2 to 1 cement mortar) Compression 10 tons per sq. ft.
- Pennant stone 40 tons per sq. ft.

Six and a-half tons per square inch is considered to be a sufficiently low working stress to allow for the

arch, but this condition cannot always be obtained under the conventional methods of load treatment.

The usual way of considering the wheel loads in the same track as being borne by a single parallel section of arch is not, in the author's opinion, a fair one. It is generally assumed that a concentrated load on a road surface is transmitted through the earth filling to the arch as a cone of pressure of 90 deg. apex angle, and it is only logical to think that the pressure is then distributed through the arch brickwork in the form of a truncated triangle with its base on the abutment. The width of the base of this triangle depends, of course, on the angle of distribution of stress in the brickwork, about which there is not, in the author's knowledge, a large amount of information available. That some such action does occur cannot be doubted, and for this reason a certain amount of latitude is allowable in the position of the thrust line, both within an arch and in an abutment.

It will be obvious that, as the distance of the load from the springing of the arch increases both vertically and horizontally, more abutment weight comes into play as a resisting force, until a point is reached where one may safely take the whole length of abutment as resisting overturning; but for arches of small span with little cover the angle of distribution of the stress is a vital factor in economical design.

The author has made this digression in hope that it will elicit the experience of members on the point.

Having found the magnitude and direction of the thrust of the loaded arch, the minimum section of abutment is ascertained by plotting the opposing forces and considering the position of the resultant on the base. Counterforts are considered to act as part of the abutment itself, their specific gravity being taken at a reduced figure in proportion to their size and spacing.

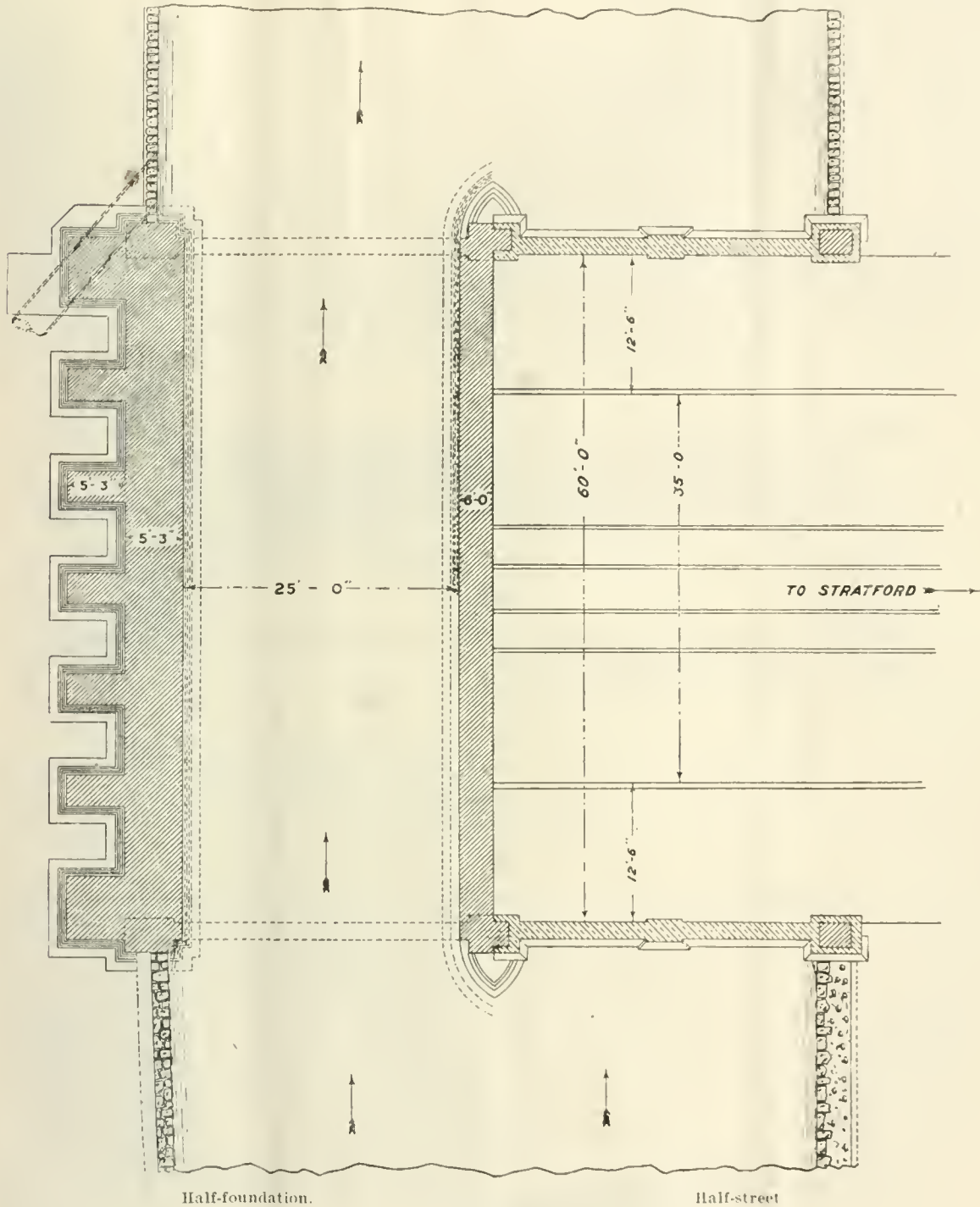
An average foundation pressure, without live load, in the bridges recently erected, is $1\frac{1}{2}$ tons per square foot, the soil being either compact river gravel or brick earth. As a general rule, for bridges of small spans on moderately good ground, the governing factors for thickness of abutments preclude high foundation pressures.

Retaining walls are assumed as having a maximum thickness of one-third their height, and are checked by Rebhahn's method, which, by taking into account

primary 8-in. footpath. Projecting footings and concrete are frequently omitted at the back of retaining walls, and an appreciable amount of excavation thus saved.

Weep holes are provided at the rate of one 2-in. pipe to about 4 sq. yds. of brickwork in ordinary ground.

While on the subject of retaining walls, the author would draw attention to the necessity of designing the spandril walls of bridge arches to resist the very heavy



— SCALE —
0 5 10 15 20 25 30 FT
STRATFORD-ROAD BRIDGE: PLAN.

(Plate IV., Fig. 1.)

the friction of the wedge of earth on the back of the wall, allows the use of a thinner section than Rankine's construction, and one much more in keeping with the apparent necessities of earth retention.

Where retaining walls support footpaths they are treated as surcharged, the crowd load being reduced to an equivalent weight of earth. It is found that if a retaining wall be surmounted by a brick parapet wall 6 ft. high, the additional weight is usually sufficient to counteract the effect of the crowd on an ordi-

horizontal thrust that comes on them in many cases. It is a simple point, but in the course of his periodic inspections of existing bridges he has been surprised to see the large proportion of cases in which the spandril walls are being slowly forced out in a lateral direction. The accompanying photograph illustrates a particularly bad case of this kind. At some date the parapet wall has been rebuilt, and the arch slightly widened. As the joint between the parapet and the arch is a fairly good one, the horizontal thrust has

had the effect of splitting off the added portion of the arch, and developing a crack some 4 in. wide.

SETTING OUT.

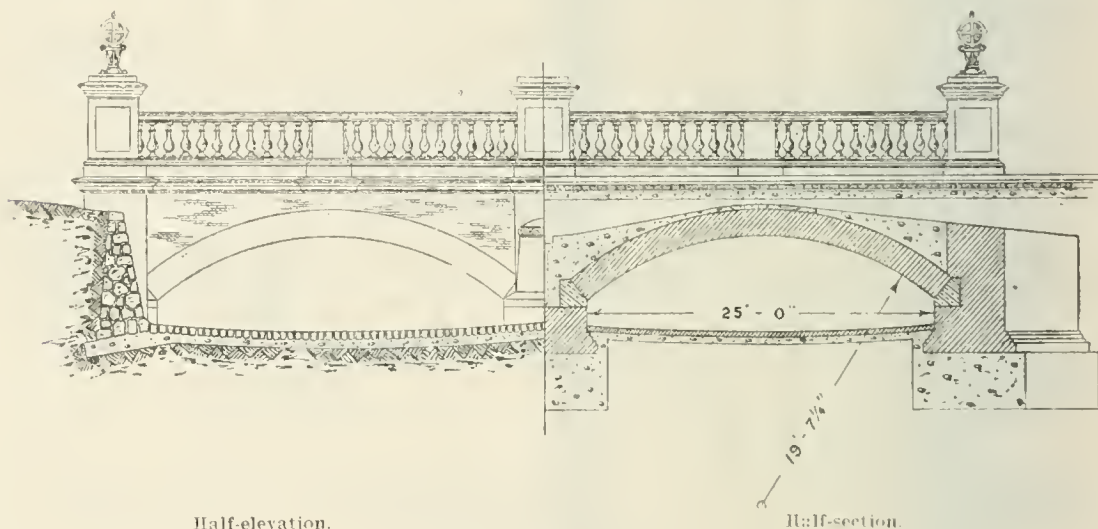
As the accuracy of design and setting out is entirely dependent on the original survey, this is always made with theodolite and steel tape, particular attention being paid to cross measurements between important points. Off-sets are quite useless for this class of work, and every point, except minor details, should have at least three measurements to it.

In setting out work centre and parapet lines are laid down with the theodolite, the points being marked on a nail head in a peg embedded in concrete. Such subsidiary lines as are necessary can then be obtained at any time, and checked from the permanent lines.

Levels are taken from the same bench mark as was used in the original sections, and a temporary bench mark set up in a convenient position out of reach of any possible influence from the new work. This mark is checked by an independent assistant, and all levels are given from it if possible. If it is fixed at an even foot there is less risk of error in hurried calculations.

Before the top level of foundation concrete is decided, the contractor has to deliver on the site a truck or boat load of the bricks to be used. A brickwork gauge is then worked out, allowing $\frac{1}{2}$ -in. joints, and the finished concrete level adjusted so as to avoid

and substituting a very weak concrete—a 20 to 1 concrete. Of course, it would take a very large amount of concrete, and he wanted to reduce the cost as much as possible, consistent with the obtaining of the desired relief. No doubt the bridges able to carry the traffic of past days were not sufficient to carry modern traffic with ponderous traction engines weighing 16 or 17 tons, and drawing heavy loads. No doubt, as Mr. Parsons had said, there were numerous cases of bridges giving way from the heavy horizontal thrust that came on the spandril walls of the arches. In the case of the bridge he had mentioned, he did not want to put tie rods in, or anything of that sort. He thought he should secure a good result in the way he proposed. It would be very interesting if Mr. Parsons would say how he dealt with this fracture. He had been very much interested in visiting these bridges, although they had visited them under unpropitious circumstances. There was one matter which struck him in connection with some of these bridges. They were divided into two spans, when some of them would have dealt with them in one span. He would have done it with ferro-concrete. Of course, they were not all in favour of ferro-concrete, but he thought ferro-concrete had come to stay. He had obtained some very good results with ferro-concrete bridges in Shropshire. He had found it a most excellent material. He had had bridges with a similar arch to this, and he had



Half-elevation.

Half-section.

STRATFORD-ROAD BRIDGE.

(Plate IV., Fig. 2.)

split courses under springers, padstones, &c. Brickwork is levelled every few courses with the instrument to ensure the different parts of the structure rising equally.

The course lines for arches are carefully marked on the laggings, points being obtained through which to draw the lines by means of a flexible lath marked off to gauge and laid at right angles to the courses. This method is the most practicable one for oblique arches, as it is impossible to use a string line for the purpose owing to the curvature of the drum.

In conclusion, the author would thank Mr. H. E. Stilgoe, the city engineer, for his permission to write this paper and to use the drawings.

DISCUSSION OF MR. PARSONS' PAPER.

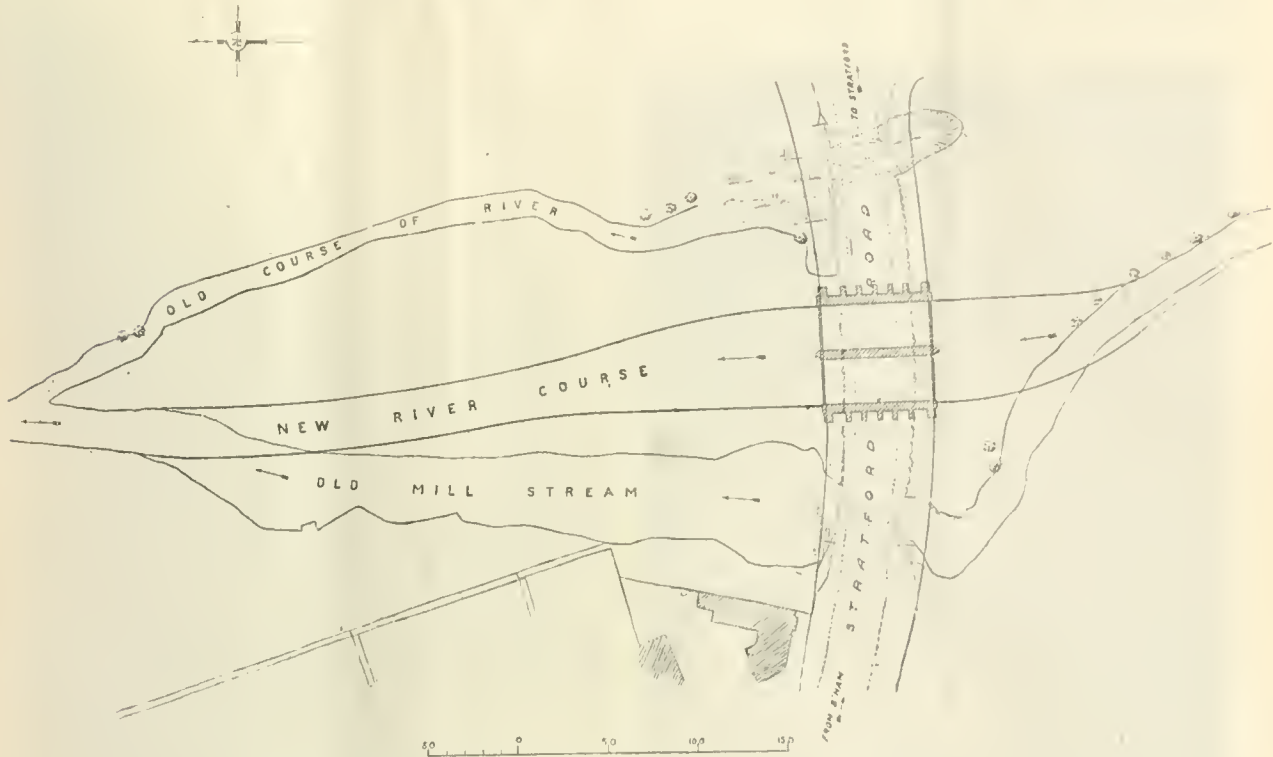
The CHAIRMAN (Mr. A. T. Davis) proposed a vote of thanks to Mr. Parsons for preparing such an admirable paper. He would especially commend it because the author had given prices. They all knew how valuable that practice was. If they were putting up a simple balustrade—it might not be in connection with a bridge at all—they could turn to this paper and find the cost at so much per lineal foot. He would like to ask Mr. Parsons how he dealt with the fracture illustrated by a photograph in the paper. He believed he understood Mr. Parsons to say that the bridge had been repaired. He asked the question because he had got a bridge spanning the river Severn, with a series of arches which were fractured in a very similar manner. It might really be a photograph of the particular arch of the Severn Bridge; therefore they could understand his interest in that matter. He had not yet made up his mind as to the method by which he should repair that bridge. He had thought of taking out the filling,

strengthened those bridges with a ring of ferro-concrete. If the width between the parapet was sufficient to carry the traffic, and the sectional area of the archway was sufficient to carry the water—and in many instances the archway was 50 per cent more than was necessary—they could curtail the capacity of the bridge by adding a ring of ferro-concrete inside the structure, and have the work done while the bridge continued to carry the traffic of the district. The ring of ferro-concrete acted as a tie, and held it together in the same way as tie rods would hold it. He would ask them to pass a very hearty vote of thanks to Mr. Parsons for his very valuable paper.

Prof. LEE (Birmingham University) said he must thank the institution for giving him the privilege of attending the meeting and hearing this very valuable paper. He did not know that there was much one could say about it, because so many details were given, and all the difficulties which one might have suggested seemed to have been overcome by the details given in the paper. He did think that perhaps a little more courage might have been shown in one or two cases, and a little headroom saved, and some of those terrible slopes of 1 in 12 obviated by using ferro-concrete construction. A rather theoretical question was raised by Mr. Parsons when he suggested that, in dealing with the loading of arches, the loads might be supposed to be distributed over a larger area than was very frequently done. He was inclined to agree with Mr. Parsons in that respect. It was true if they examined a good many arches the stress appeared to be very great, if they limited the loads to a foot width of the arch. Therefore there was something to be said for Mr. Parsons' suggestion. It became an important point as to how this question could be expressed quantitatively. He

was aware of some experiments made in America a few years ago, the results of which were given in the "Proceedings" of the American Society of Civil Engineers, but he was not sure that they had any data which allowed them to say that those results were correct. Nevertheless, he thought these suggestions were on the right lines. It was necessary and desirable that a considerable number of experiments should be made in future to find some definite data, so that they might find the actual stress and strains on

with Prof. Lee as to the artistic beauty of bridges. At the present time he was carrying out the widening of a mediæval bridge, one-half of which was in his own county and the other in Derbyshire. His friend, the county surveyor of Derby, got out a scheme for executing the work in ferro-concrete, at an estimated cost of £2,000. He (the speaker) felt sure, however, that his committee would not agree to embark on a structure of that kind, and he succeeded in persuading them to abandon the idea of using ferro-concrete, and to retain the present



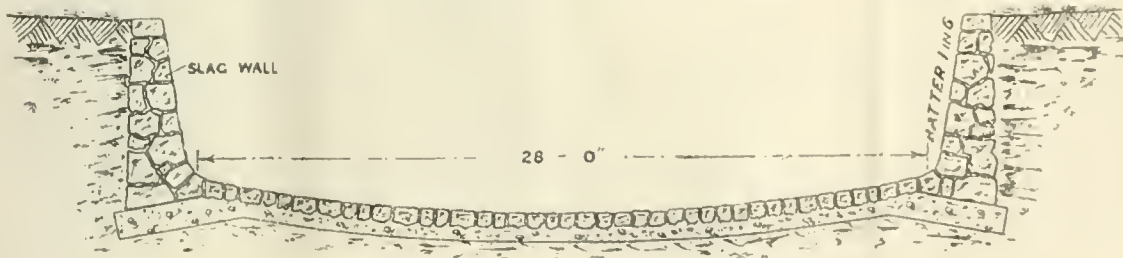
STRATFORD-ROAD BRIDGE: GENERAL PLAN.

(Plate IV., Fig. 3.)

arches. At the University they were attempting something in that direction. They were making experimental arches. Mr. Crowther had been carrying out some researches in that direction, and they would be published in the near future. It was important in the designing of arches to know what was a sufficient limit. They did want data upon this matter, and if any of the members who were interested could give them information in this respect it would be useful to engineers the world over. Concluding his observations, Prof. Lee said that bridges were things which came before the notice of people day after day and year after year, and he would suggest that so

character of the bridge, although the expenditure amounted to £5,000 instead of £2,000. He was glad he was able to do that, for it would have been a mistake to adopt ferro-concrete. To a large extent Mr. Horton's object was to avoid risk of difficulty with foundations, by adopting the cantilever principle in effecting the improvement, but he was sure that when the work was completed Mr. Horton would recognise that the right thing had been done.

Mr. W. PLANT (Stafford) said that, as a firm believer in ferro-concrete, he would like to ask why the Birmingham Corporation had given that system such a wide berth. He had certainly heard of failures, but



INVERTING OF RIVER: TYPICAL CROSS-SECTION.

(Plate V.)

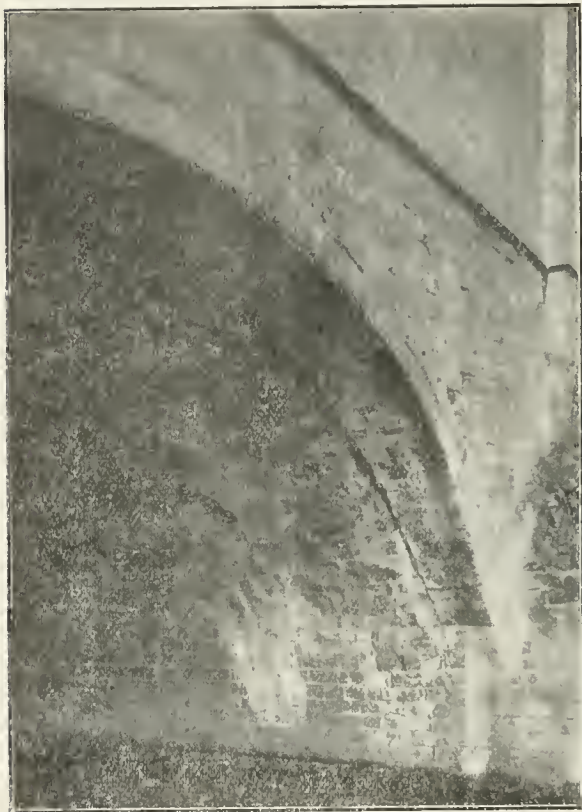
far as possible they should always be made things of beauty. The bridges they had seen that afternoon would doubtless fulfil their functions properly, but in the case of the King's-road structure it might have been an improvement from an artistic point of view if the parapet had been somewhat more ornamental. It was important, he thought, that they should persuade their local authorities to be a little more lavish in such matters. The old-time bridge builders had a finer sense of beauty than we had to-day, and he should be glad to see more attention paid to their teachings than was the case at present.

Mr. J. MONCOUR (Staffordshire) said he was at one

of these, he believed, were due to faulty workmanship or design. He thought the system might have been used with advantage in some of the bridges they had seen that day. Slag, he noticed, entered into the composition of the concrete which had been used. Good concrete could, of course, be made with slag, but there was an element of risk. He would like to know whether, in addition to the traction engine and boiler wagon which were regarded as the maximum live load for bridges in Birmingham, any allowance was made for the load of people. In the case of a bridge which he had before the Local Government Board some time ago, that authority insisted upon an allowance of that

kind. It struck him as being somewhat harsh. The cone of pressure of 90 deg. seemed to him to be rather a large angle. It was common, he thought, to take an angle of 70 deg., but he supposed it depended to some extent on the nature of the finished material.

Mr. MEASHAM LEA (Karachi, India) said the attempt which had been made to beautify the Stratford-road bridge had been very successful, and he congratulated the designers of the structure on the effect. The difficulties in connection with the Aston Church-road bridge had also been met most successfully; but, looking at the cross-section, it seemed to him that the main girder was rather heavy. He had been par-



EFFECT OF HORIZONTAL THRUST.

ticularly interested in the setting out of brick arches as described in the paper, and it reminded him of the difficulties he had experienced in India in connection with the erection of a skew bridge, for he had not a man on his staff who had ever seen a skew arch, or believed, when the method of construction was explained to him, that it would stand when built. He even went to the length of preparing a model showing the courses, but that was not sufficient to convince them, though eventually the work was carried out in a most successful manner.

Mr. J. LOBLEY (Hanley) said he could not help being struck with the courage of Mr. Stülgoe and his colleagues in building brick arch bridges at the present day. A great deal depended on the locality, but if anyone attempted to build a brick-arch bridge in his district it was unlikely that he would live to build another. In his part of the country, where the undermining was such a serious matter, they were continually having to raise the bridges. One had been raised as many as fifteen times. Six other bridges had been raised four or five times, and one, in which he put in a new superstructure only four or five years ago, would shortly require to be dealt with.

At this point of the proceedings Mr. A. T. Davis announced that he was obliged to leave, and Mr. A. D. Greatorex took the chair in his place.

Mr. D. G. BEVAN (Birmingham) said he thought the question of the distribution of load was going to be a vital factor, especially in ferro-concrete. In a district where he was previously engaged good bricks were very scarce, and all the abutments were built in solid mass concrete, and the concrete so bonded together in its length with old steel rails that the whole abutment was available to resist the thrust. That resulted in a great saving in the cost of the abutments, the figure being 16s. per cub. yd. as against 30s. to 35s. for brickwork. Mr. Parsons gave the working stresses at 6½ tons in steel for compression and tension. Of course, that was practically fixed by the

Local Government Board; but it was rather a hard and arbitrary rule, and he did not see why they should be bound to it when they could go up to 7½ tons. The permissible figure depended on the difference between the live and dead load. Again, the Board did not say anything about joints; one could do practically what one liked with a joint. The troughing at Aston Church-road Bridge was new to him, and he could not say that he liked it. It seemed to him that it would get damaged in the pressing. Personally, he preferred the rolled troughing that one could fill in with concrete, and cover in every space open to the atmosphere.

Mr. H. J. COLEBY (Atherstone) said he had also noticed that slag had been made use of for concrete, and that where concrete was used next to steelwork the slag was replaced by Hartshill chippings to obviate any risk of corrosion by the sulphur compounds. So there was a risk of sulphur compounds even although cold-blast slag was specified, and it was surely also risky to use it for the concrete. He would like to know whether any tests were made of the slag before it was used. Were any crushing tests carried out and did they wash the slag before mixing it into the concrete? He remembered a large building—a technical institute—in which the floors of the basement were laid with concrete composed of clinker—not cold-blast furnace slag—and the expansion of the material forced out the walls of the building. Therefore, he thought the use of slag in connection with such important work as bridge building was rather risky. Mr. Parsons' experience with a cofferdam which had been employed in connection with the construction of a bridge abutment was similar to one of his own. The dam he was concerned with also turned out a failure, and for the same reason as given in the paper—a boat collided with it, and so damaged the puddle that it was impossible to repair it.

Mr. W. E. BALLARD (Birmingham) expressed surprise that neither Mr. Parsons nor the corporation had gone in for reinforced concrete, especially in the King's-road bridge. The depth of the girders of the Aston Church-road bridge struck one as being rather small. He would like to know whether any deflection had been worked out on those, or whether they had tested the deflection since the erection, and they might, perhaps, have had a little more information as to the practice of putting the arch in lime mortar.

Mr. A. R. GRAY (Birmingham), referring to the remarks of Mr. Davis as to the point of using only one reinforced arch instead of two brick arches on the Stratford-road bridge, stated that they had tried reinforced concrete on one bridge. They did one half first, maintaining the traffic on the other half during the operations, but then they had to wait for several months to allow the work to settle before they could make a start with the other section, the result being that it was a solid year before they got the bridge right. The bridge was on the main line of traffic, and the town was up in arms at the delay, and they had accordingly abandoned the use of reinforced concrete for bridge work in the central portions of the city. As to the shifting of the spandril walls, he did not think due regard was paid to that point. In many bridges they had taken down, they had found only a 9-in. or 14-in. wall, and no allowance for outward thrust consequent upon the heavy traffic of the present day. In one bridge built about ten years ago—a skew arch bridge—he tried to prevent that movement by building brick toothings to project 4½ in. above the line of the arch, and building the spandril walls into them. He had since been watching that bridge, and what they had done seemed to prevent that outward thrust.

Mr. MONCUR asked what proportion of the cost of these bridges was borne by the canal companies.

Mr. PARSONS, in reply, said the preparation of the paper had given him a great deal of pleasure, and he had been amply repaid for his efforts by the fact that so many had thought it worth while to attend the meeting and take part in the discussion. Mr. Davis had asked how they had repaired the fracture in the bridge which had failed. They first of all put under the bridge some ordinary wooden ribs; they then stripped all the fittings off the arch, and carefully washed out, with water under pressure, all the cracks and cut out all the brickwork that was useless. About a square yard of brickwork was absolutely perished. Then on the centre ribs they put grooved and tongued boarding, which they wedged up tightly to the brickwork. Cement grouting was applied, and tie rods having been fixed, the centering was stripped off, quite a solid job being made of the repair. As the road was to be, or might be, widened, they did not consider it

necessary to take down any part of the arch, but he believed the repair was quite satisfactory. A concrete wall was built up on the inside of the parapet walls, converting them into retaining walls to make them the proper thickness. The opinion had been expressed that they might have had one arch instead of two in some cases, but they were bound down in nearly every instance by step levels. They had raised the road as far as they could. Prof. Lee's remarks on the distribution of stress were particularly welcome, and he was glad to know that this matter was being threshed out, and would await the results with interest. He agreed with him that they ought to make these bridges as ornamental as possible, but they had been instructed not to spend more money than they could help on the work. One reason why the parapets were not panelled on the inside was that would-be suicides had found them convenient for their purpose, while small boys also found it easy to climb up by means of them. As to slag, that was a very difficult material to work with, but they had a clerk of works on the ground the whole of the time, and he had to approve every load of slag before it was unloaded—and their clerks knew good slag when they saw it. They had a good deal of trouble, but they insisted on really good, dense, heavy slag, and although possibly a little sulphur or free lime might sometimes be present in it, briquettes made of the slag had shown no signs of blowing or expansion. As to the distribution of load and live load, the Local Government Board asked them, in the case of the Aston Church-road Bridge, to provide for a live load on the footpath as well as a distributed load, and although they had done that it seemed a question whether there was a real necessity for it. The canal company made no contribution to the cost of the bridges; on the other hand, they compelled them to spend a great deal more on them than they would otherwise do. Mr. Loble had admired their courage in building brick arches. It was not a question of courage, however; they thought it the safest thing to do. In a mining district, of course, brick bridges were unsuitable. He quite agreed with Mr. Bevan that they ought, as a profession, to be allowed to design their bridges without being restricted to a figure of 6½ tons. It certainly could not be applied to every case, and if they could prove the accuracy of their calculations they should be allowed to design their structures accordingly. He did not think the troughing was strained in the pressing, that operation being done while the material was hot. The question of painting and corrosion was an important one. They had painted the troughs inside with a special mixture of tar, tallow and quicklime. That seemed very suitable, for it set into a hard cake, and he was hopeful that it would prevent any corrosion. In the matter of the failure of the dam, that was not due to the disturbance of the puddle, but to the fact that the toe was knocked right in. If the puddle only had been damaged it could have been made watertight again. With regard to Mr. Gray's remarks, his own view was that the parapet walls should be designed as retaining walls, and of adequate thickness to resist any thrust.

Mr. A. D. GREATORIX (West Bromwich) was elected vice-chairman of the district, and the meeting then closed.

Clacton's New Pavilion.—A new pier approach pavilion at Clacton was formally opened on Wednesday. The completion of the scheme is a tribute to the surveyor, Mr. D. J. Bowe. The lowest price submitted by any contractor was £15,000. Mr. Bowe undertook to do the work for £11,500, and when it is finished he will be well within his estimate. The total cost of the improvements, including cliff bath pavilions, designed to accommodate eighty people, as yet uncompleted, will be about £20,000.

Housing Reformer's Death.—Alderman William Thompson, the well-known housing reformer, died suddenly on the 20th inst., we regret to state. Chairman of the National Housing Reform Council and, since 1900, a member of the Executive Committee of the International Housing Congress—of which he was president one year—Alderman Thompson established for himself a world-wide reputation as an authority on the subject which he practically made his life's work. He was vice-president of the Co-partnership Tenants' Housing Council, and a member of the council of the Garden Cities Association, and it is asserted that much of the Town Planning Act was due to his advice.

INSTITUTION OF MUNICIPAL ENGINEERS.

VISIT TO GENERAL ELECTRIC COMPANY'S WORKS.

A visit was paid on Thursday of last week to the works of the General Electric Company at Witton, Birmingham. Among those who attended were Messrs. H. Boot, president of the institution, H. C. Adams, vice-president of the institution, Frank Richards (Bridgnorth), Ernest Trevor (Bridgnorth), J. R. Evans (Swadlincote), C. W. Denny (Redditch), H. E. Gilkes (Birmingham), W. J. Powell (Birmingham), T. W. Ellett (Smethwick) and B. Wyand, secretary of the institution. The party arrived at the Witton works at 2 o'clock, and were taken round by Messrs. A. F. Morgan and E. P. Hollis, who explained clearly and interestingly the works being carried out in the various departments. These comprised the engineering works, small motor, switchboard and switchgear departments, foundry, test-house and conduit works, and it is not too much to say that the works are among the best-equipped in the country, and that the employees (who number some 3,000) work under the best of conditions.

At the tea which followed the visit, Dr. Railing, a director of the company, who is in sole charge of the Witton works, took the chair, and in welcoming the members gave a brief but interesting sketch of the progress of his company from its inception. The president, in response, dwelt upon his many years of pleasant association with Dr. Railing, and requested him to convey to his co-directors the thanks of the institution for the kindness shown to its members. A vote of thanks to the gentlemen who had made such able "guides" closed the day's proceedings.

Surbiton's Motor Fire Engine.—A motor fire engine, supplied to the Surbiton, Surrey, Fire Brigade by Messrs. Dennis Bros., was officially tested last week by the chief engineer to the Metropolitan Water Board, Mr. J. W. Restler. The results were most successful, the engine proving to be fully up to, and even beyond, the guarantee of the makers.

Windsor Bridge to be Rebuilt.—The Albert Bridge at Windsor is to be rebuilt by the Berkshire and Buckinghamshire County Councils, certain defects having developed in it. The new structure will be a two-span bridge in place of the existing single span. The Thames Conservators have asked that a clear width of waterway of not less than 80 ft. should be provided under each arch.

East Ham Fire Station and Firemen's Dwellings.—These buildings, an illustrated description of which was given in THE SURVEYOR of March 14, 1913, were formally opened yesterday afternoon by the mayor, Alderman O. R. Anstead, J.P. Since the scheme was initiated motor engines have come into use in East Ham, and the accommodation for stables, harness-room, and corn store provided for in the plans of the borough engineer, Mr. J. Birch, has been utilised as engineers' repairs shops and store-rooms. Apart from this the work has been carried out as originally designed.

Local Authorities and Housing.—The President of the Local Government Board was asked in the House of Commons on Monday whether he had lately called upon local authorities to supply him with detailed information concerning housing in their respective areas; whether he was aware that in many districts medical officers of health, sanitary inspectors, clerks, and other officials were already working at high pressure endeavouring to carry out the requirements of the Housing, Town Planning, &c., Act, and other recent enactments, and whether, in the event of local authorities employing additional assistance to obtain this further information without undue delay, he would see that the cost was not placed on the rates. In reply Mr. Herbert Samuel said that sec. 17 of the Housing, Town Planning, &c., Act, 1901, contemplated that the necessary expenditure should be borne by the authority. Much of the remaining information now required to be transmitted to the Local Government Board was either readily available or would usually be obtained in ordinary course in the exercise of their duties under the Housing Acts and Public Health Act, if those duties were properly performed. In the circumstances, as at present advised, he saw no reason for asking the Treasury to sanction a special grant for this purpose.

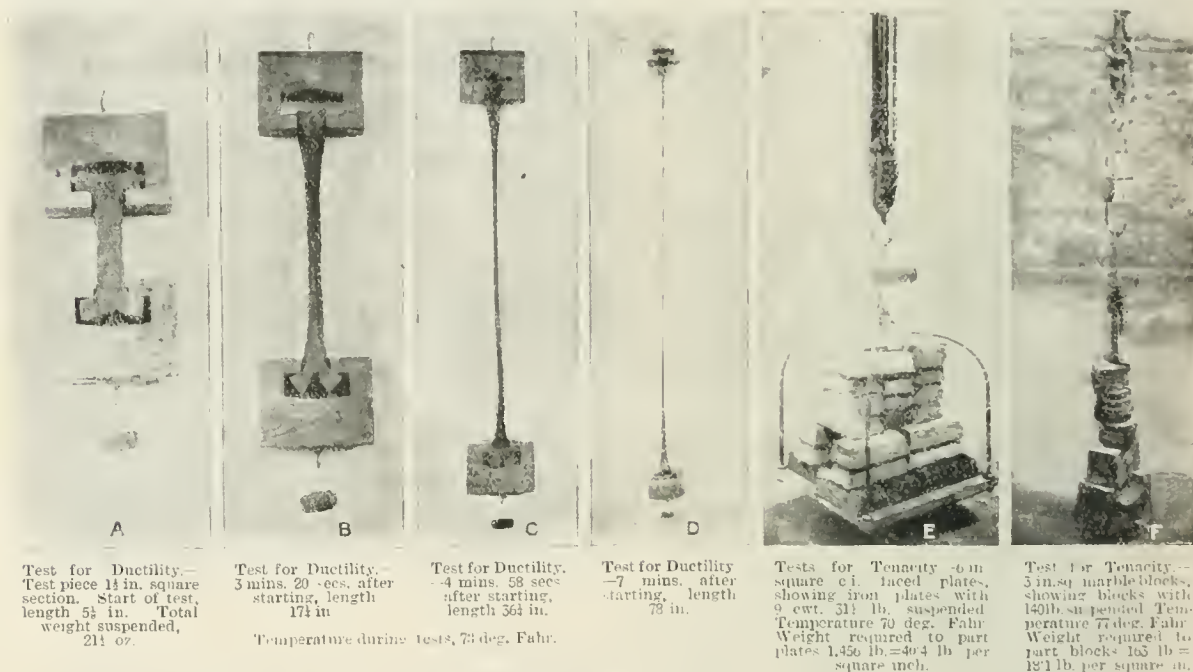
GASWORKS TAR AND ROAD-BINDING MATERIAL.

The competition between natural asphaltic and bituminous materials and those road binders which can be produced from gasworks tar seems likely to result in considerable advances being made in the preparation of materials of the latter class. By the use of mixtures of refined coal-tar and coal-tar pitch it is possible, of course, to produce materials of varying consistencies, in the useful part of the range between pitch used alone and tar used alone, the Road Board specifications for No. 1 and No. 2 tars being a case in point; but it does not follow that the resulting mixture, obtained by the usual means, will have to the full the useful qualities of a similar material prepared beforehand, and having, in the bulk, the same consistency throughout.

The two questions that await answers are: First, can tar and pitch, or heavier and lighter tar preparations, be so mingled that they will possess qualities approximating to those of natural bitumens; and, secondly, if such mixtures, made on the spot, cannot

works tar, and its properties as regards ductility and tenacity may be judged from the accompanying illustrations and the notes thereunder. At a temperature of 77 deg. Fahr. the tenacity between two plates was 18.1 lb. per square inch, or well over the full atmospheric pressure; and at 70 deg. Fahr. the tenacity, measured in a similar way was over 40 lb. per square inch. The ductility tests are sufficiently explained by the illustrations, which are reproduced from photographs.

In the course of remarks made as "an extempore interpolation" in his presidential address, Mr. Glover showed a piece of road crust which had been grouted with his material, and he said that it had taken a man some hours to cut out the sample with a good chisel and hammer, owing to the tenacity of the binding material. The binder was just soft enough to work to the top, so that no stones appeared on the surface. The tenacity test, as described above, is not one which has been generally applied to bituminous materials, and the results of ordinary viscosity and penetration tests of "Macgrout," which will no doubt be made, will enable surveyors to classify the material as a road binder.



Test for Ductility.—
Test piece 14 in. square
section. Start of test,
length 5 1/2 in. Total
weight suspended,
21 1/2 oz.

Test for Ductility.—
3 mins. 20 secs. after
starting, length
17 1/2 in.

Test for Ductility.—
4 mins. 58 secs.
after starting,
length 36 1/2 in.

Test for Ductility
—7 mins. after
starting, length
78 in.

Tests for Tenacity—6 in.
square cast-iron plate,
showing iron plates with
9 cwt. 3 1/2 lb. suspended.
Temperature 70 deg. Fahr.
Weight required to part
plates 1,450 lb. = 40.4 lb. per
square inch.

Test for Tenacity.—
5 in. sq. marble blocks,
showing blocks with
140 lb. suspended. Tem-
perature 77 deg. Fahr.
Weight required to
part blocks 183 lb. =
18.1 lb. per square in.

TESTS OF "MACGROUT."

[Reproduced by courtesy of "Journal of Gas Lighting."]

have those properties, is it possible to prepare from gasworks tar a material which will have those qualities? Chemists may have something to say on this point, and in the meantime one must be ready to consider the significance of any fact bearing upon the matter.

The value of special methods for producing from coal-tar a tenacious and ductile material having as nearly as possible the average of the range of qualities desired in a road binder depends partly, but not wholly, upon the nearness of the resemblance between that material and the best natural bituminous binders; not wholly, for so long as the special material is better than a mixture made on the spot, it is desirable that it should be produced. Further, there may be an advantage, practically, in producing a material of nearly the average of useful consistencies and softening points, instead of leaving a relatively large gap between the desired consistency and that of any of the component parts of the mixed material. A sufficient range of materials can in any case be produced, so that the highway engineer may prepare a binder of exactly the desired properties for a particular case.

THE ROAD BINDER OF THE BRITISH GASLIGHT COMPANY, NORWICH.

At the annual meeting of the Southern District Association of Gas Engineers and Managers, the new president, Mr. Thomas Glover, who is manager of the British Gaslight Company, Norwich, described the road binder produced at his gasworks, and intended to compete with natural bituminous materials as a binder for road crusts. This material, which is called "Macgrout," is prepared from gas-

It may, however, be pointed out that the tenacity exhibited in the tests of "Macgrout" is very high, if we compare it with those found in the case of certain materials tested by Major W. W. Crosby (see THE SURVEYOR, November 17, 1911, p. 588). At a temperature of 77 deg. Fahr., the highest recorded tenacity was about 31 oz. per square inch, between circular glass plates of about 5 sq. in. area, about 5 grammes of material being used in each case; and the next highest was about 24 oz. per square inch. The plates used to test "Macgrout" were of cast-iron faced for the 70 deg. Fahr. test, and marble blocks for the 77 deg. Fahr. test. The conditions were not therefore the same, except as regards temperature; but, apart from comparisons of this kind, it is obvious that the tenacity of the Norwich material is very high.

London Guildhall Improvements. In 1911 the City of London Corporation passed an important scheme submitted by the City surveyor, Mr. Sydney Perks, for the rebuilding of large portions of the Guildhall, at a total estimated expenditure of £130,000. For financial reasons the matter was adjourned, but certain portions of the proposed works have now become so urgent that the City Lands Committee has brought up a report recommending that section "C" of the scheme be at once put into operation, with a view to providing adequate accommodation for the transaction of the business of the corporation, and improving the unsatisfactory conditions associated with the stores and workshops at present housed in various parts of the basement. The new works will involve an expenditure of £30,000.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC. M. INST. C. E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 21, Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

397. Testing Cement. Explain in detail, giving sketches where necessary, how a sample of cement would be tested in practice. (B. W., *Tadcaster*.)

398. Road Construction. Should the stones in a macadam road be all of one gauge, or are varying sizes preferable? Give reasons. (Junior.)

399. Fireproof Construction. What fireproof preparations can be used for protecting timber, and what independent coverings may be applied for the same purpose? (S.A., 1905.)

400. Structures.—What is meant by a redundant member in a truss, and why are such members introduced? Sketch two simple trusses, each having at least one redundant member. (L.C.E.)

401. Specific Gravity.—A bullet of lead, whose specific gravity is 11.4, weighs 1.09 oz. in air and 1 oz. in olive oil. Find the specific gravity of the olive oil.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

393. Surveying.—In carrying out a large survey (by triangulation) describe in full detail how you would use the centre of a tower or shaft as a station on the ground without actually setting up the theodolite inside. Give proofs of any formulæ involved. (T. W. P., *Bexhill-on-Sea*.)

The angles of the triangle we are investigating are $A B C$, C being the centre of the tower. (Fig. 1.) We have set up our instrument at A and B , and read the angles $C A B$, $C B A$, and require the angle



FIG. 1.

$A C B$. As we are unable to use the point C , we have to find another point C' at which we can set up the instrument and read $\angle A C' B$. Having done this we proceed to find the value of $\angle A C B$.

We now by the methods described below obtain the following:—

Length $C C'$ (by calculation)
 \angle 's $A C' C$, $B C' C$ (by instrument)
 \angle 's $C' A C$, $C' B C$ (by calculation)

To find $\angle A C B$.

Produce $C C'$ to D .

$\angle A C D = \angle A C C' + \angle C' A C$. (Ext. ang. Int. & opp.)
 $\angle B C D = \angle B C' C + \angle C' B C$. (do.)

$\therefore \angle A C D - \angle B C D = (\angle A C C' + \angle C' A C) - (\angle B C' C + \angle C' B C)$

$\therefore \angle A C B = \angle A C C' + \angle C' A C - \angle B C' C - \angle C' B C$
 $= \angle A C' B + \angle C' A C - \angle C' B C$

We read $\angle A C' B$, and calculated \angle 's $C' A C$, $C' B C$ and so we get the value of $\angle A C B$.

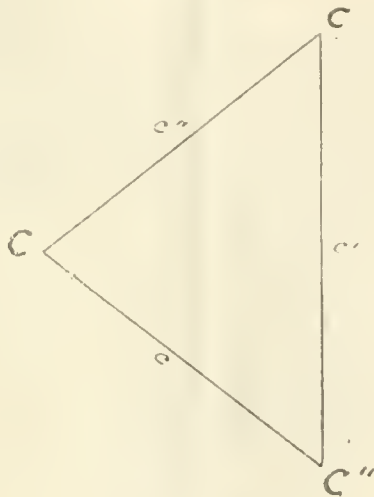


FIG. 2.

To find $C' C$.

Take another point C'' where we can set up the instrument and see points C and C' and also accurately measure $C' C''$. Read $\angle C C' C''$, measure distance $C' C''$, and read $\angle C' C'' C$.

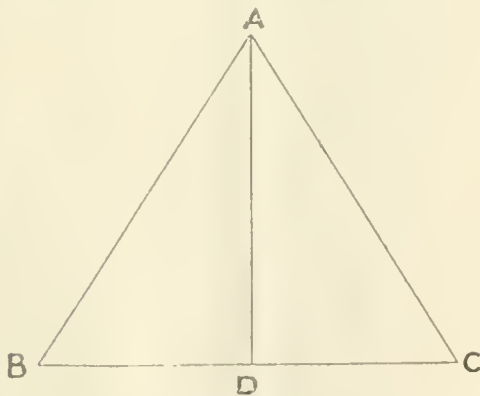


FIG. 3.

We now have in the triangle $C' C C''$ one side and the two base angles so we can calculate the length $C C'$.

$$C = 180 - C' - C''$$

We want c .

$$c = \frac{C' C'' \sin C''}{\sin C} \quad (\text{for proof})$$

$$= \frac{C' C'' \sin C''}{\sin C} \quad (\text{see below})$$

$$\log c = \log C' C'' + \log \sin C'' - \log \sin C$$

We measured c and C'' and calculated the value of C , so we get c' which is the length $C C'$.

To find \angle 's $C' A C$, $C' B C$. (Fig. 1).

In the triangle $C' A C$ we know one side $C C'$ and $\angle A C' C$, we must calculate $C A$.

In the triangle $A B C$ we have the side $A B$ and the base angles $A B C$, $B A C$.

∴ log b = log c + log sin C - log sin A.
 log a = log c + log sin C' - log sin A.
 we therefore have the lengths a and b which are A C, B C.
 Proceeding to find ∠'s C A C', C' B C
 In the triangle A C C' we know C' C, A C and ∠ A C' C,
 we want C' A C.

$$\frac{\sin A}{\sin C'} = \frac{a}{c'}$$

$$\therefore \log \sin A = \log a + \log \sin C' - \log c'$$

Similarly

$$\log \sin B = \log b + \log \sin C' - \log c'$$

Thus we have the angles A & B or ∠'s C' A C, C' B C.

To prove that the sides of a triangle are proportional to the sines of the opposite angles. (See Fig. 3.)

$$\begin{aligned} AD &= AB \sin B. \\ AD &= AC \sin C. \\ AB \sin B &= AC \sin C. \\ c \sin B &= b \sin C. \end{aligned}$$

$$\frac{c}{b} = \frac{\sin C}{\sin B}$$

$$\text{Similarly } \frac{a}{b} = \frac{\sin A}{\sin B} \text{ \& } \frac{a}{c} = \frac{\sin A}{\sin C}$$

$$\text{or } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad (\text{J. U. S.})$$

NOTES.

With reference to question (394) as to the examination of building plans, a correspondent sends us the following form, in use in his office:—

SURVEYOR'S NOTES ON DEPOSITED PLANS.

By-Laws.	Nature of Requirements.	Remarks.
B.I.S.A. 1888.	Is the building line in compliance with the Act . . .	
11	Is the site covered with concrete . . .	
12	Has site been previously excavated . . .	
17	Are the footings satisfactory	
18	Is concrete provided to footings . . .	
19	Are damp courses horizontal and vertical provided . . .	
21	Are thickness of external and cross walls sufficient	
21	Do any storeys exceed 16 or 14 times thickness of walls	
24	Does any cross wall support a superincumbent external wall . . .	
25	Are openings in storey of external wall greater than one-half and if so are there sufficient piers . . .	
26	Are any windows within 6 ft. of windows of adjacent building . . .	
27	Are parapets provided to external wall over 30 ft. high and within 15 ft. of another building . . .	
28	Are parapets provided to party walls over 30 ft. and are they corbelled out at eaves . . .	
30	Are there any openings in party walls . . .	
31	Are there any recesses with backs less than 9 in. thick or within 13½ in. of a return wall . . .	
42	Are kitchen chimney backs in party walls less than 9 in. thick for 9 ft. high . . .	
44	Do chimney shafts extend 3 ft. above roof . . .	
45	Do chimoe shafts exceed in height six times least thickness . . .	
53	Are roofs covered with incombustible material . . .	
54	Is there sufficiency of air space in front of building	
55	Is there sufficiency of air space at rear of building . . .	
58	Are windows in rooms one-tenth of floor area . . .	
59	Are rafters, purlins and roof battens of sufficient size . . .	
60	Are joists, trimmers and trimming joists, floor beams and floor boards of sufficient size . . .	
62	If a public building, are floors of lobbies, corridors, passages, landings and stairs fire resisting . . .	
64	Are rooms of sufficient height for habitation . . .	
66	Is part of open space paved	
69	Is lowest storey capable of drainage . . .	
71 to 75	Are bye-laws as to drains complied with	
..	Is there separate R.W. drainage . . .	
76	Are W.Cs. against external walls . . .	
77	Are W.Cs. provided with windows and ventilators . . .	

Other remarks.

CORRESPONDENCE.

Sir, though I would persuade, I'll not constrain;
 Each man's opinion freely is his own
 Concerning anything, or anybody.

—MASSINGER: "The Fatal Dowry," Act. ii., 2

ROAD TERMINOLOGY.

To the Editor of THE SURVEYOR.

SIR, While with "Engineer" to the extent that it would be better, were it possible, to classify materials according to their origin, I fail to see any reason for alarm if materials are all classed "bitumen" when they are certainly very similar in appearance and behaviour.

I should like to inform "Engineer" that certain petroleum residuums have been known in the road-making world as "bitumen" for many, many years—often referred to as "fat" on account of their fluxing value. When he says that asphalt and bituminous macadam is correctly described as "bitumen-grouted macadam" he is quite original, and apparently desires to assist the Standardisation Committee rather than to criticise them. He mentions in his letter of May 1st "a road grouted with natural bitumen." Does he know of any areas? I know of none throughout the United Kingdom. Perhaps he means "grouted with an asphalt mixture, or matrix, made from a natural bitumen"? In the same letter he says: "The natural material itself should never be mixed or laid in connection with any coal-tar product, as the latter destroys the good properties of the bitumen." Perhaps he means more than proportionately lessens the good properties; otherwise it would place the natural article in a false light, as it would seem paradoxical that articles that have "failed terribly" should overpower and utterly destroy a material that has proved to be tough, weather-resisting and imperishable. He refers to Mr. Sutherland as an authority on "bitumen." He may be so; but I have never heard of his having been consulted on road-making matters.

Is the damage "Engineer" fears to "manufacturers and others who for many years have sold only the genuine natural product" prospective or retrospective? Have they sold only the "genuine natural product," and have they sold it for road making? "Engineer" forgets that the heading under which he writes is "Road Terminology." Probably his informers are more conversant with bitumen for other uses, which are many. Anyhow, my hat is off to "Engineer" for his faith in the accuracy of his information, and I hope it has not led him to criticise those who may possess intimate and impartial knowledge equal to that of his informers.

Although I am entitled to query "Engineer's" statements on account of my years of intimacy with bitumen and asphalt for footway and carriageway purposes, I hold no brief for the vendors of petroleum by-products; they are quite capable of supporting the claims of the materials they wish to exploit.

I prefer not to disclose my identity; otherwise I also may be accused of having an "axe to grind." Perhaps I have.—Yours, &c.,

NOT SO DUSTY.

May 21, 1914.

THE LATE ALDERMAN THOMPSON AND HOUSING REFORM.

To the Editor of THE SURVEYOR.

SIR,—All Housing Reformers are mourning the loss of Alderman Thompson, whose tragically sudden death has come as a great shock to his many friends and co-workers. Only last week he attended a meeting of the Executive Committee of the National Land and Home League at the House of Commons, and in a forcible and eloquent speech moved the following resolution:—

"That this league earnestly requests the Government to consider the possibility of including in their proposals for land and housing reform the giving of a grant in aid of those housing schemes carried out by local authorities to meet the needs of certain classes, men and women, who cannot under any probable scheme of increased wages pay an economic rent, especially in rural districts, and in connection with the rehousing of those dispossessed by closing orders and clearance schemes; and the league suggests that efforts should be made to give effect to such proposed grant in connection with the consideration of the Unionist Housing Bill, which has three times passed its second reading in the House of Commons, and might be modified in such a way as to secure common agreement."

A couple of hours before the news reached me of

The Surveyor

And Municipal and County Engineer.

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Alderman Thompson's death, I received a long letter from him asking me to help him to get together a committee of Members of Parliament, who, though belonging to different political parties, would work together in order to forward the housing policy embodied in the above resolution. Alderman Thompson asked me to send copies of the resolution to the editors of the principal daily papers and the weekly Press, and this I now do, hoping that you may be able to find space in your columns for it.

It behoves those of us who had the privilege of being associated with Alderman Thompson to see that the work to which he devoted his life is carried on with unflinching determination.—Yours, &c.,

MARJORY PEASE,
Hon. Secretary,
National Land and Home League.

Queen Anne's Chambers, S.W.
May 21, 1914.

Housing Schemes in Ireland.—On Monday, in the House of Commons, the Chief Secretary was asked if he was aware that petitions had been presented to Parliament from municipal bodies all over Ireland asking for legislation to provide financial aid to assist municipal authorities in carrying out housing schemes for the working classes in cities and towns in Ireland, and whether it was the intention of the Government to introduce such legislation at an early date. Mr. Birrell, in reply, said he was aware that petitions of the nature indicated in the question had been presented to Parliament by various municipal bodies in Ireland, but he could make no statement as to intended legislation on the subject.

Cottage Building in Rural Areas.—The President of the Local Government Board was asked in the House of Commons last week if it was still the intention of the Government to meet the deficiency of cottages in rural areas by undertaking the building of them by a Government Department on a large scale; if so, when they propose to start, and in what localities; and how they proposed to find the money for the scheme. Mr. Herbert Samuel, in replying, pointed out that legislation would be necessary to enable the building of cottages in rural areas to be undertaken by the State, and he was not at present in a position to say when such legislation would be introduced.

MIDLAND ASSOCIATION OF LOCAL GOVERNMENT OFFICERS.

VISIT TO CLEE HILL GRANITE QUARRIES.

On Saturday, the 16th inst., the members of the Midland Association of Local Government Officers had a very interesting visit when they journeyed to the Clee Hill Granite Company, Limited, Clee Hill, near Ludlow, Salop, to see the working of these large quarries.

The party took train from Birmingham to Kidderminster, being met there by Mr. R. Lee Roberts, J.P., the chairman and managing director of the Clee Hill Quarries, and were conveyed by motors to the Cather-ton Quarries, where an inspection was made, the members being shown the great crushing plant, the various blasting operations, the breaking of the stone to different sizes, and the aerial ropeway which carries the granite to the railway station, some 2½ miles away.

The granite from these quarries is of a very high standard, and is widely known for its hard-wearing qualities and resistance to atmospheric conditions. At Doddington, after lunch, the president, Mr. Henry E. Stilgoe, M.INST.C.E., city engineer and surveyor, Birmingham, proposed the toast of the Clee Hill Granite Company, Limited, and in doing so thanked Mr. R. Lee Roberts for his kindness and welcome to the members.

Mr. R. Lee Roberts, in proposing the toast of the M.A.L.G.O. (coupled with the name of the secretary, Mr. Frank E. Bennett, Council House, Birmingham), stated it gave him great pleasure to have the Midland Association visit their works.

Mr. Bennett, in responding, stated that the National Association, to which the M.A.L.G.O. was affiliated, had a membership of nearly 40,000; it was one of the aims of each association to visit works of interest, and he was sure that the visit to the Clee Hill quarries had more than fulfilled this condition.

The party, on the conclusion of lunch, motored on to Ludlow, where they inspected the old castle and ruins and the church. They were afterwards entertained to tea in the council chamber at Ludlow.

A vote of thanks was accorded to the staff of the Clee Hill Granite Company, Limited, for the trouble they had taken to make the day so instructive and enjoyable. Mr. R. Lee Roberts, Mr. T. Roberts and Mr. S. Sharpe briefly replied.

CONCRETE PIPES.

PROPOSED STANDARD SPECIFICATION.

In the House of Commons on Monday Mr. Grant asked the President of the Local Government Board if, in the public interest, he would consider the desirability of the publication of a standard specification for concrete pipes for strength, porosity and density, so that local authorities, when asking for tenders, might be able to state clearly the quality of pipes they require, and that all manufacturers of concrete pipes might have a fair opportunity of tendering.

Mr. Herbert Samuel said he did not think it would be advisable for the Local Government Board to issue a standard form of specification, but he would bring the hon. Member's question to the notice of the Engineering Standards Committee, who were a body supported by the leading technical institutions, and were engaged in drawing up standard specifications of all kinds of materials used in the execution of public works.

Mr. Grant asked the President of the Local Government Board if, in most cases, concrete pipes of the manufacture of Messrs. John Ellis & Co. were specified in public contracts by most of the borough and municipal engineers and surveyors, whereas no special make of iron, steel or earthenware pipes was specified when calling for tenders; whether any of the Local Government Board inspectors suggest to borough and council engineers and surveyors the use of concrete pipes of the manufacture of John Ellis & Co., of Leicester, and, if so, for what reason.

Mr. Samuel said the terms of the contracts of local authorities scarcely ever came before the Local Government Board, and the board had no information as to whether the practice referred to in the first part of the question was a common one. With regard to the last sentence, the engineering inspectors not only did not make any such suggestions, but in any cases where it did come to their notice that a special manufacturer was mentioned they objected to it.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

HOUSING OF THE WORKING CLASSES: PREMISES OUT OF REPAIR: INJURY TO TENANT'S DAUGHTER: LANDLORD'S LIABILITY.—An interesting point under the Housing and Town Planning Act, 1909, was decided in *Ryall v. Kidwell & Son* (Court of Appeal, April 28th). This was an action by the infant daughter of the tenant of a house to which secs. 14 and 15 of the Act applied, who had been injured owing to the premises not being reasonably fit for human habitation. Sec. 14 of the Act, it will be remembered, provides that in any contract made for letting for habitation a house to which the Act applies, there shall be implied a condition that the house is at the commencement of the holding in all respects reasonably fit for human habitation. By sec. 15, subsec. 1, sec. 14 shall, where applicable, take effect as if the condition applied in that section included an undertaking that the house shall, during the holding, be kept by the landlord in all respects reasonably fit for human habitation. By subsecs. 3, 4 and 5, if it appears to the local authority that the implied undertaking is not complied with, they may require the landlord to execute such works as they shall specify as necessary. The landlord may thereupon close the house for human habitation, otherwise the authority may do the necessary work, and recover the expense from the landlord as therein provided. By subsec. 6 the landlord may appeal to the Local Government Board; by subsec. 9 any remedy given by the section for non-compliance with the undertaking implied by virtue of the section shall be in addition to, and not in derogation of, any other remedy available to the tenant against the landlord either at common law or otherwise. It was held by the Court of Appeal (affirming the Divisional Court) that the action was not maintainable, the effect of the sections being to import into the contract for the tenancy an implied undertaking to the tenant only that the house should, during the tenancy, be in all respects fit for human habitation. The plaintiff being a stranger to the contract had no right of action.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as nouns de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

OPEN SPACE: RECREATION GROUND.— "Roy" writes: There is an open space in the centre of this village, about half an acre in extent, and known as "The Square." The lord of the manor has up to date taken up the tolls from standings, &c. The surface of the square had become very rough and uneven; being on an incline it washes badly. The parish council took the matter in hand and appealed to his lordship to put it in repair; he, however, declined, but offered to relinquish his manorial right. They next appealed to the rural district council to take it over; the rural district council replied that it must first be put in order and maintained for twelve months (this has now been done by voluntary subscriptions), after which they would take it over. The parish council, however, are not sure of their position, as wheeled vehicles have a right to pass across where and when they like. Will you kindly give me a reply to the following query: The lord of the manor having offered to relinquish his right, can the parish council accept the same and make a rate for its maintenance? The site is rectangular in shape, bounded on the north by the churchyard, on the east and west by cottages, and on the south by a highway, from which vehicles can travel to houses, and land on the north-west corner. If they are able the parish council would like to convert it into a recreation ground.

It would appear that the land is subject to public rights of way, and if such is the case it would be necessary to get these rights extinguished under secs. 84 to 92 of the Highway Act, 1835. This having been done, an order of the county council must be obtained investing the parish council with the powers of the Open Spaces Act, 1906. They would then be in a position to accept a conveyance of the

land for the purpose of an open space from the lord of the manor (or other persons having power to sell same). By sec. 17 (e) the expenses of the parish council incurred in the execution of this Act may be defrayed according to the Local Government Act, 1894.

PUBLIC HEALTH ACTS AMENDMENT ACT, 1907, SEC. 39: (CLOSED ACCOMMODATION. "R. O." writes: A block of twenty-three houses are now served by twelve privies. My council want water-closets to be adopted. The privies are not dilapidated, but owing to their distance from the houses and existing drains it would be better, and probably no more expensive, to build new water-closets in preference to converting them. We have offered the owner a contribution of 20 per cent of the cost of building twenty-three new water-closets. (1) Is such an arrangement legal? If it is not accepted what would be our legal position in regard to expenditure if we were to serve a notice on him to (2) provide twenty-three water-closets in place of the privies, (3) provide twelve water-closets in place of the privies, (4) provide eleven water-closets in addition to the privies? The owner is in agreement with us on all points except the provision of a water-closet to each house, which he considers unreasonable. (5) Are there any decisions on this?

The effect of subsections (3) and (4) of this section (so far as material to this case) appears to be as follows: (a) Where there are a sufficient water supply and sewer, an owner may be required (apart from any question as to the sufficiency of the existing accommodation) to convert a privy into a water-closet, half the cost to be borne by the owner, and half by the local authority; (b) where the accommodation is insufficient, and cannot be made sufficient by alteration, and there are a sufficient water supply and sewer, an owner can be required to provide such number of water-closets as the circumstances of the case may render necessary, at his own expense. Assuming that this section is in force in the district, and that there are a sufficient water supply and sewer, the following courses appear to be open to the council: (1) The conversion of the twelve privies into water-closets, at the cost of the council and the owner in equal shares; or (2) if the council are satisfied that the existing accommodation is not sufficient, and that it cannot be made sufficient by altering the privies into water-closets, the provision, at the owner's expense, of such number of water-closets as the circumstances of the case render necessary. I think the question of the sufficiency of the existing accommodation, and also the question of the number of closets necessary, would be for the council to determine, subject to an appeal to the Local Government Board. See *Boyle v. Sherborne Local Board* (46 J.P., 675). If the existing accommodation is not sufficient, and twenty-three water-closets are necessary, I do not think the council would be justified in contributing to the cost thereof.

RURAL DISTRICT: SPECIAL EXPENSES. "Jackson" writes: Please advise whether it is legal for a rural district council to employ a man who is casually employed by them for disinfecting to take water-meter readings, and water pressures in water mains under their control, and charge the cost for doing that work as special expenses on the contributory places within which the work is done?

Under sec. 229 of the Public Health Act, 1875, expenses of disinfection are general expenses, and expenses of maintaining necessary works for the purpose of water supply, if and so far as they are not defrayed out of water rates or rents, are special expenses, chargeable on the contributory places. "Workmen employed at waterworks may properly be paid out of the special expenses rate" (Lumley's "Public Health Acts," 7th edition, page 521); and I presume the same would apply to a man employed to take meter readings and water pressures. I do not think the fact of the same man being casually employed for disinfection would prevent the council from charging as special expenses the amounts paid him for work in connection with the water supply.

PRIVATE STREET WORKS: SEWERING. "W. L. E." writes: A portion of an estate has been laid out for building purposes, and several plots have been sold to various owners, who now desire the urban district council to construct a sewer in one of the roads. It is thought that the land is not sufficiently developed at present to make up the road under the Private Street Works Act, 1892. Will you kindly advise me if the council can construct the sewer as desired by the several owners under the Private Street Works Act, 1892, and leave the making up of the road until the land is further built upon?

Yes. Sec. 6 (1) provides that the urban authority may resolve to do any one or more of the works therein specified, of which sewerage is one.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Brighton T.C. (May 20th. Mr. Edgar Dudley).—£1,600 for the purchase of land in Dyke-road for the purpose of a recreation ground, and £1,925 for the purchase of Castle-street Yard depot.—It was stated that it was proposed to pay £900 per acre for the land intended for a recreation ground. The period asked for was fifty years in respect of both loans. With regard to the depot, the town clerk, Mr. Hugo Talbot, said the yard was now in the occupation of the council on a lease, determinable on six months' notice, and containing a clause with the option of purchase, at a rent of £50 per annum. The inspector stated that two applications must be made—one for the land and the other for the purchase—as they would not get longer than fifteen years for the buildings at the yard.

Coventry T.C. (May 15th. Major J. Stewart).—£3,700 for the purpose of a park at Poleshill; £1,200 for the widening of Park-side (a highway connecting London-road with Birmingham-road); and £15,400 for extension of the public baths, Priory-street.—It was stated that the population was increasing at a high rate, and was now 120,000. The local debt was nearly £2,000,000, which the inspector remarked was rather high, seeing that the rateable value was under £500,000. The city treasurer (Mr. H. Lord): But we have the gas, water, electric light and trams. The inspector: What will you do when some of these properties are scrapped? I am told there will not be a tramway in the country in ten years' time.

Darlaston U.D.C. (May 14th. Major J. Stewart).—£525 for the purchase of land at Rough Hay for a recreation ground.—It was stated that the purchase price was £500, or about £50 per acre. It was feared that the council might be shut off from making improvements if there was any delay.

Hornsea U.D.C. (May 21st. Mr. M. K. North).—£1,700 for street improvements.—The surveyor, Mr. W. E. Warburton, explained that part of the money had been already expended. The condition of the streets, he added, was bad in places.

Leeds T.C. (May 20th. Mr. T. C. Ekin).—£212,000, of which amount £200,000 would be spent in extensions of the existing generating station in Whitehall-road, including land, buildings, and plant. The remaining £12,000 was for the purchase of land in South Accommodation-road, which the corporation proposed to use for the purposes of a coal store.—It was explained that it was proposed to demolish the buildings forming the older portion of the generating station purchased in 1898, and the corporation proposed to discontinue the 640 kilo sets at present standing in the building. The total cost of new plant was estimated at £108,950, with an additional £9,000 for contingencies.

Manchester T.C. (May 21st. Mr. W. O. E. Meade-King).—£13,100 for the erection of baths at Barlow-road, Levenshulme, and for £3,770 for the provision of public wash-houses adjoining the Leaf-street baths, Hulme.—Mr. J. Holden, chairman of the Baths Committee, said that he was so satisfied with the way in which Manchester people patronised the baths and wash-houses that he was prepared to extend the facilities as much as possible.

Margate T.C. (May 12th. Mr. M. K. North).—£1,800 for the purchase of land known as Rolfe's Yard, for the purposes of a town yard. The borough surveyor, Mr. E. A. Berg, stated that the new depot would be midway between two existing depots, and would provide storage for several thousands of yards of stone. On an average they used 4,000 yds. of stone in a year. The means of access to this proposed depot were ideal, the site was central, it was on the same level as the harbour, and only about ½ mile from the sea front.

Nottingham T.C. (May 13th. Major J. Stewart).—£1,600 for the improvement of Bulwell-street.—It was stated that the original scheme consisted of the widening of the east side of Main-street also. The total cost of the complete scheme was estimated at £3,500, but having regard to so large a sum being involved it had been decided that the work should be carried out gradually. The Improvement Committee proposed to prescribe an improved street line on the east side of Main-street.

Plymouth T.C. (May 20th. Mr. F. O. Stanford).—£700 for works of sewerage at the rear of Julian-

street and Oakfield-terrace-road.—The town clerk (Mr. J. H. Ellis) said the period of repayment asked for was seven years. The owners being responsible in the ordinary way they would have put the expenditure upon them and treated it as a revenue matter. But the owners had appealed to them to spread payment over that term of years. The borough surveyor (Mr. J. Paton) said there were about eighty-eight houses over the area, and they were owned chiefly by working-class people who resided there.

Romford U.D.C. (May 14th. Mr. F. H. Tulloch).—£1,974 for the improvement of Hornchurch-road, Old Church-road, and Balgores-lane.—The acting surveyor, Mr. H. T. Ridge, explained the plans of the proposed improvements.

Torquay T.C. (May 21st. Mr. F. O. Stanford).—£665 for the widening of Walnut-road railway bridge.

The borough surveyor, Mr. H. A. Garrett, stated that the ward of Chelston was cut off from the whole borough of Torquay by the Great Western Railway, and the existing roadway between parapet walls was only 20 ft. wide, out of which there was a small, narrow footpath about 3 ft. wide, leaving the carriage road 17 ft. only. It was proposed to widen the road to 30 ft., and provide a footpath of 5 ft.

APPLICATIONS FOR LOANS.

Biddulph U.D.C.—£100 for the Station-road improvement.

Birmingham T.C.—£150,000 for electricity mains.

Chailey R.D.C.—£1,300 for drainage works.

Church U.D.C.—£1,630 for the reconstruction of Dill Hall-lane.

Cleethorpes U.D.C.—£10,000 for the enlargement of the electricity undertaking.

Crompton U.D.C.—£350 for sewerage work.

Kent C.C.—£600 for the technical institute and special subjects' classroom at Ashford, £325 for the enlargement of St. Peter's school, Broadstairs, and £2,600 for the enlargement of the special subjects school at Foot's Cray.

Mansfield T.C.—£2,850 in respect of street improvements.

Newquay U.D.C.—£2,200 for a drainage scheme.

Todmorden T.C.—£460 for a hockey field and tennis courts.

LOANS SANCTIONED.

Barnstaple T.C.—£400 for the purchase of a steam fire engine.

Bedwas and Machen U.D.C.—£1,900 for municipal offices, £186 for a caretaker's house and stores, and £80 for a fire station.

Bognor U.D.C.—£60 for underground lavatories.

Dover T.C.—£300 for the provision of tennis courts.

Exeter T.C.—Purchase of land in Claremont-road, £325 (eighty years); erection of workmen's dwellings in Princess-gardens and Claremont-road, £7,765 (sixty years); street works, sewerage, water supply, and fencing in Bartholomew-street, Blackboy-road, Princess-gardens, and Claremont-road, £2,157 (twenty years).

Hackney B.C.—£15,750 for electricity plant.

Hemsworth R.D.C.—£1,218 for sewage works extension.

Huddersfield T.C.—£21,500 for the electricity undertaking.

Ilford U.D.C.—£27,500 for main road improvement.

Lewisham B.C.—£21,023 for wood paving works.

Luton T.C.—£7,500 for the extension of the sewage disposal works.

Margate T.C.—£16,000 for a new road and promenade extensions.

Rowley U.D.C.—£750 for the improvement of Powke-lane, Blackheath.

Whitefield U.D.C.—£13,131 for a housing scheme, and £1,116 for street, sewerage, and water supply works.

Yarmouth T.C.—£5,391 for repaving works, and £1,173 for repairing Caister-road.

FORTHCOMING INQUIRIES.

	JUNE.	£
2.—Bournemouth.	For the provision of public conveniences (Mr. W. O. E. Meade-King)	1,911
2.—Ramsbottom.	For street and depot purposes (Mr. R. H. Bicknell)	1,710

2.— Yarmouth. For river protection works (Mr. A. G. Drury)	£ 1,300
3.— Birkenhead. For road improvement (Mr. M. K. North)	1,350
3.— Clitheroe. For road widening and the provision of a recreation ground (Mr. R. H. Bicknell)	1,000
3.— Croydon. For works of road widening (Mr. Edgar Dudley)	14,354
3.— Lowestoft. For the purposes of a recreation ground and town hall extension (Mr. F. H. Tulloch)	4,750
3.— Winchester. For paving works (Mr. W. O. E. Meade-King)	1,516
1.— Erpingham. For private street works (Mr. F. H. Tulloch)	275
4.— Hoylake. For laying out a recreation ground (Mr. M. K. North)	2,500
4.— Penrith. For the gas undertaking (Mr. R. H. Bicknell)	7,000
4.— Southampton. For the provision of a branch library (Mr. W. O. E. Meade-King)	3,080
4.— West Ham. For the electricity undertaking (Mr. H. R. Hooper)	3,706
5.— Oswestry. For works of water supply (Mr. M. K. North)	900
5.— Westbury. For the purposes of a depot (Mr. W. O. E. Meade-King)	400
TOWN PLANNING.	
16.— Edmonton. (Mr. Thomas Adams)	—
23.— Neston. (Mr. George L. Pepler)	—

ROAD MAINTENANCE IN STAFFORDSHIRE.*

By JAMES MONCUR, ASSOC. M. INST. C.E.,
County Surveyor.

It is not only the increase in ordinary pleasure cars that is becoming so serious a matter from a traffic and road maintenance point of view, but in a manufacturing county such as this it is the increase of heavy motors and light locomotives conveying merchandise that is really seriously deteriorating the road surface, and in places taking the very heart out of some of the roads. I have reiterated time after time that it is the foundations that carry the traffic, and it is obvious that foundations put in fifteen or twenty years ago, although capable of carrying the traffic then, are unfit in many instances for the changed traffic of the present day. If this traffic continues to increase in volume and weight of load carried, it would be economical to hold our hands for a time to see to what extent it is likely to increase and thereby arrive at the maximum traffic that is likely to use those roads, and build them accordingly. Such a policy of standing entirely still is, of course, practically impossible, and it is therefore obvious that to strengthen the roads and at the same time keep the traffic going will entail a certain amount of wasteful expenditure. It will be well in future to keep this fact in view, and when opportunity occurs increase the strength of the foundations, even although it is only on comparatively short lengths. A good deal of thought and judgment will require to be exercised so as to avoid wasteful expenditure by putting in stronger foundations than the future traffic might warrant. In such a county as this the normal vagaries of traffic are very considerable, due for example to the opening of new mines or the closing down of worked-out ones, and there is the risk in the latter case of having roads left stronger than is required after the mine traffic is gone; but this cannot well be avoided.

Apart altogether from the question of strengthening the roads, I am strongly of opinion that everything possible should be done to improve the standard and character of all roads. This would undoubtedly have the tendency of inducing the traffic to adopt a greater variety of routes, and the cost of future maintenance will, I am certain, be largely governed and kept within reasonable bounds in proportion to the extent that traffic is diverted from a few through or trunk roads and induced to use more or less all roads. In the case of touring cars a few extra miles in a day's

* Extracts from annual report for year ended March 31st last.

journey would never be considered, provided the road was good.

WIDENING CARRIAGEWAYS.

Modern traffic has made it imperatively necessary to increase the widths of the metal beds on many of the main roads, not only because of the larger and faster traffic they have to carry, but also to enable horse-drawn vehicles to pass the fast-moving traffic with greater safety. The total amount expended in this way during the year has been £1,315 13s. 2d., towards which the Road Board have contributed £937. In the majority of roads the sides, as a rule, are much weaker than the centre, which is inimical to best construction, and increased cost of maintenance is the result. The haunches or sides act as abutments to the road, and it is therefore all-important that the margin of strength should rather be over than under. This work has, therefore, the further advantage of contributing indirectly to maintenance, but, nevertheless, there is an increased area to maintain.

Mr. Moncur makes a reference in his report to the reconstruction of part of the Lichfield and Sudbury road, near Sudbury Station, a work which was in hand for two years. The upper metal crust was stripped off and a hand-set foundation of 9-in. slag put in, the upper crust being formed with the old macadam with the addition of new, so as to form a wearing surface of 6 in. after consolidation. In order to fill up the voids the large material in the foundation was well packed and keyed up with smaller material, and consolidated with a 12½-ton steam roller before the surface metal was applied, and similarly consolidated. Notwithstanding this, however, slight depressions have formed. These, Mr. Moncur thinks, can only be accounted for by the fact that, no matter how well the road may be built and the rolling done, a certain amount of unequal settlement takes place under ordinary traffic until the foundation has got its proper bearing and the surface coating has formed into a solid and homogeneous mass. "It also," he adds, "confirms the opinion I expressed in my first annual report that, no matter how well the steam roller may do its work, it is the ordinary traffic that puts the finishing touches to the surface, but, unfortunately, in the present instance, the traffic has done something more, and found out the unequal bearing strength of the foundations. The moral seems to me to suggest that in the reconstruction of roads, and especially heavy trafficked ones, it would be advisable to defer the application of the top finishing coat of granite until the expiry of several months after the road has been built. If my contention is right regarding the movement of the foundation and upper crust of an ordinary macadam road, it appears to me that where tar-macadam or bituminous binding is used on a new foundation it is doubly necessary to defer the application of the finishing coat for a time, for if movement does take place in such cases the damage done is much more serious. If the bituminous joints are once broken the whole surface will go to ruin."

Coast Sand Dunes, Sand Spits and Sand Wastes.

By Gerald O. Case. 5s. nett. London: St. Bride's Press, 24 Bride-lane, E.C.—This work is a treatise on the advantages of the proper utilisation of inblown sand, so as to turn it into a protection against coast erosion, instead of being, as too often at present, an active agent in such erosion and in the laying waste of fertile land. The author draws many of his examples from Scotland. He points out the work that has been done on the Continent in turning sand wastes into pine forests. The book gives an able and systematic treatment of its subject.—*Scotsman*.

The Surveyors' Institution and Road Engineering.

In the forty-sixth annual report of the council, presented at the annual general meeting of the Surveyors' Institution on Monday evening, it is stated that the council have for some time recognised the importance of greater scientific study being given to the construction of arterial and other roads. The change in the traffic passing along roads, and its ever-increasing weight and speed, clearly indicate that road engineers and surveyors of the future will have to be far more fully and scientifically equipped than was necessary in the past. Apart from pupilage in a practising surveyor's office, little or no provision is made for the more advanced training now required, and the council have therefore thought it desirable to bring this need to the notice of the universities, who have done so much to advance the scientific side of professional knowledge in other directions.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Brighton £14,000, Kent £30,000, Swansea £6,000, Wilts; housing and town planning—Bentley £23,800, St. Helens £15,000; refuse collection and disposal—Cleethorpes; roads and materials—Heris, Hull, Lewisham, Portsmouth £200,100; sewerage and sewage disposal—Nantwich £16,750, Truro £24,300; water, gas and electricity—Carlisle £59,250.—Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS

Aberdeen T.C.—The tender of Mr. Alexander Hall, at £170, has been accepted for building the new shelter at the Beach.

Arbroath T.C.—The building of the proposed public baths, towards which Mr. Andrew Carnegie has given £7,000, is to be proceeded with. The total estimated cost is £7,600.

Brierfield (Lancs) U.D.C.—It is proposed to build a new school for 342 scholars, at an estimated cost of £5,292.

Brighton T.C.—It has been agreed to erect an elementary school for 700 scholars at Patcham, at a cost of about £14,000.

Cambridge T.C.—A scheme has been approved for the extension of the municipal buildings, at an estimated cost of £4,500.

Cheshire C.C.—Arrangements have been entered into between the county council and the county boroughs of Chester, Birkenhead, Wallasey, Stockport and Stoke-on-Trent for the provision of a joint sanatorium containing 150 beds, but with the administrative block so constructed as to allow of possible expansion to a total of 240, the number originally estimated as likely to be required in the future.

Deptford B.C.—A scheme for slipper baths, estimated to cost £1,500, has been adopted.

Kent C.C.—It is intended to proceed with the scheme for the erection of new headquarters for the county police at Maidstone, at an estimated cost of £30,000.

Morecambe T.C.—The borough surveyor, Mr. F. W. Hipwood, has received instructions to prepare a plan and estimate for a tramway shed.

Richmond (Surrey) T.C.—Plans are to be prepared for a bathing shed on the river bank with a view to their being considered by the council, and meanwhile a temporary structure is to be erected in order to judge its effect on the amenities of the district.

Swansea T.C.—A scheme is under consideration for the extension of the police buildings at an estimated cost of £6,000.

Wilts C.C.—Subject to the approval of the Local Government Board, it has been decided to purchase land at Trowbridge and Salisbury for the erection of hospitals for the treatment of advanced cases of tuberculosis, and to erect on such sites suitable hospital blocks, each containing twelve beds, at an estimated cost of £1,500 each.

HOUSING AND TOWN PLANNING.

Bentley (Yorks) U.D.C.—The surveyor, Mr. R. G. Whitley, has prepared the plans of a housing scheme which is estimated to cost £23,800.

Branston R.D.C.—The council have referred to the Housing Committee a letter that has been received from the Kesteven County Council, advising the district council to proceed at once to remedy the insanitary conditions of the old houses at Waddington, and to present a scheme to the council for providing a sufficient number of new houses for the working classes in that district. If the district council failed to do so, the county council would be compelled to exercise its powers under the Housing of the Working Classes Act.

Hendon U.D.C.—Official sanction has been given to the council's proposed housing scheme at Child's Hill.

Inverness T.C.—The council have under consideration a scheme for the erection of municipal dwellings. At a meeting of the Housing Committee last week it was decided to make a start in the matter,

and the sanitary inspector was instructed to draw up a draft report of a scheme to embrace the whole of the slum property known as Davis-square.

Selby U.D.C.—A sum of £9,100 is to be borrowed for the erection of thirty-nine workmen's dwellings in Fairfax-avenue.

St. Helens T.C.—It is proposed to proceed with a series of housing schemes at an estimated cost of £15,000.

Tandragee R.D.C.—A tender has been accepted for building eight labourers' cottages, at £165 per cottage. This exceeds the sum allowed by the Local Government Board, and their sanction will have to be obtained to the increase.

PARKS AND OPEN SPACES.

St. Annes-on-Sea U.D.C.—A London firm are providing gardening designs for the laying out of 12 acres forming Ashton Park, recently presented to the town. It is proposed to make it an attractive outdoor sports centre. The new ornamental gardens and waterfalls on the promenade are now completed.

Tamworth T.C.—The scheme of the borough surveyor, Mr. F. E. G. Bradshaw, for developing the pleasure grounds has been adopted, and the Local Government Board is to be asked to sanction a loan for the work.

Walton-on-Thames U.D.C.—It has been decided to purchase for £1,170 a site for a recreation ground.

REFUSE COLLECTION AND DISPOSAL.

Chard T.C.—By eight votes to five the council have rejected a motion to advertise for tenders for scavenging and watering, and determined to continue to do these works by direct labour.

Cleethorpes U.D.C.—It has been decided to proceed with the scheme for the erection of a refuse destructor, at an estimated cost of £3,000.

ROADS AND MATERIALS.

Bath R.D.C.—Application has been made to the county council for a grant of £250 towards the cost of asphaltting the footpaths of London-road, £40 for the new Warminster-road, and £25, the cost of tar-spraying the road on Claverton Down.

Buckie T.C.—An improvement of the Cunningholes road, including sewerage, is to be carried out at an estimated cost of £1,684.

Gannock U.D.C.—It is announced that the county council have consented to make a contribution of £250 towards the scheme for widening the Stafford main road in the council's district.

Gavan C.C.—The county surveyor, Mr. O'Reilly, has made a number of recommendations, which have been referred to the Roads Committee. They include the appointment of a mechanic to take charge of the road machinery; the gaol yard at Gavan to be used as a machinery repair and store yard, and the gaol itself as a workshop for the repair of road machinery; the purchase of three steam rollers, three scarifiers, two watering-carts, and stores to keep machinery in repair; wages of engine-drivers to be progressive by 1s. per week per annum to 30s. maximum; and various improvements in the matter of road maintenance.

East Riding C.C.—It was decided at the recent council meeting to grant £1,200 for the purchase of a steam tractor, a petrol motor lorry, a pitch-grout mixer, and a sand dryer in the direct maintenance of main roads. The Road Board's offer of a £1,300 loan free of interest, repayable in three years, was accepted. A further sum of £710 was granted for the purchase of a site at Leeming Bar, and the erection of buildings as a depot for the storage of motor vehicles used in connection with the direct maintenance of the main roads.

Edinburgh T.C.—A conference is to be held between representatives of this council and the Leith Town Council on the subject of the proposed widening of Eastern-road and the paving of Lochend-road.

Exeter T.C.—The borough surveyor, Mr. T. Moulding, has been authorised to spend £800 on tar-spraying.—A tender at £3,293 has been accepted for the wood paving of Sidwell-street.

Herts C.C.—An expenditure of £1,475 is to be incurred in bringing the secondary roads in the rural districts to a higher standard of efficiency.

Holworthy U.D.C.—The council have adopted the estimates of the surveyor, Mr. F. Vanstone, for the execution of several improvements to the approaches of the town.

Hull T.C.—Two schemes for widening the thoroughfare between the Paragon Station-square and Prospect-street are engaging the attention of the council. One scheme, which is estimated to cost over £100,000, provides a street, 70 ft. wide, from the south end of Brook-street to the junction of Beverley-road and Spring Bank; the other scheme provides a street running from Mill-street, in Brook-street, to Beverley-road, at a cost of about £90,000. The estimate for widening Brook-street is £72,000.

Kingston (Surrey) T.C.—Particulars of dangerous corners in the borough have been prepared by Mr. R. H. Clucas, the surveyor, and are to be forwarded to the Surrey County Council with the comment that the suggested basis of the Road Board and county contributions towards any improvements of such corners are considered to be quite inadequate to effect the objects in view.

Lewisham B.C.—New road works estimated to cost £3,317 have been approved by the council.

Loftus U.D.C.—A preliminary scheme is being prepared for a proposed new road between West Loftus and Carlin How.

Marylebone B.C.—The tender of the Trinidad Lake Asphalt Paving Company, Limited, has been accepted for bituminous paving in Abbey-road and St. John's Wood-road, at 11s. 2d. per yard super., to include free maintenance for a period of eight years, the contractors to maintain the paving for a further two years following this period at the price of 9d. per square yard per annum. It has also been agreed to accept the tender of the Highways Construction, Limited, for Grove End-road at 6s. 6d. per yard super., to include free maintenance for a period of five years from the date of completion, subject to the road being left by the contractors at the end of that period to the satisfaction of the borough surveyor.

Portsmouth T.C.—An intimation has been received from the county council of their willingness to approach the Road Board with respect to the proposed new road out of Portsmouth, but that they (the county council) cannot pledge themselves to make a contribution towards the cost. The estimated cost of the scheme is £200,100.

Richmond (Surrey) T.C.—The views of the council with respect to the proposed arterial road have been duly submitted to the Local Government Board. They are summarised in a statement made at the council meeting by Alderman Simpson, who said that at the conference one of the things that most of them wanted to know was who was to pay for the arterial roads, and what assistance might be expected from the Government, or whether they were going to do all the work themselves. They did not get any satisfactory answer from any member of the Local Government Board or anyone connected with the Road Board; all that they could say was that it was not necessary to consider the question of cost at the present time. With regard to the proposed road through Richmond, the council were of opinion that it was an entirely wrong line. It would cross the river near the sewage works, then cross the railway, cut through Kew-road near the Wesleyan church, and then run across the Old Deer Park. The council were of opinion that a road was not required in that position.

Selby U.D.C.—Property is to be purchased for over £3,000 in order to construct a road leading from Gowthorpe-street to Flaxley-road.

Wandsworth B.C.—At a cost of £6,000, High-street, Putney, is to be improved by the widening of the bridge which carries the roadway over the London and South-Western Railway.

SEWERAGE AND SEWAGE DISPOSAL.

Bacup T.C.—The borough surveyor, Mr. W. H. Elee, has prepared a sewerage scheme.

Basingstoke T.C.—A grant of £235 has been made by the county council towards the cost of a new surface-water drain in Brook-street.

Cottingham U.D.C.—The Hull-road sewer is to be repaired for a distance of 1,130 yds., at an estimated cost of £2,900.

Darlington T.C.—The Local Government Board having intimated that they were prepared to issue a Provisional Order granting an extension of the borough and constituting Darlington a county borough, subject to certain requirements being carried out, the council have resolved to convert all privies into water-closets. It was stated that something like 1,500 closets had been dealt with, and that 1,267 remained to be dealt with. When these were cleared out of the way the council proposed to act with respect to the remainder of the conveniences under the Public Health Amendment Act, 1907, which meant that the public authority would have to pay half the cost.

Epsom U.D.C.—A scheme has been adopted for the extension of the sewage disposal works, at an estimated cost of £8,197.

Leicester T.C.—It was announced at the council meeting on Tuesday that the Local Government Board had refused to sanction the storm-water scheme as at present proposed. The Local Government Board had made suggestions, one being that the council should consider the advisability of formulating a scheme for the construction of further purification works on the Soar Valley side. The Sewage Works Committee recommended the council to authorise them to take measures for the preparation by the borough engineer and surveyor, Mr. E. George Mawbey, M.INST.C.E., of plans and estimates of an amended scheme to meet the Local Government Board suggestions, and this was agreed to by the council.

Nantwich U.D.C.—Approval has been given to the amended plans for the extension of the sewage works, at an estimated cost of £16,790.

Truro T.C.—It has been agreed to carry out a sewage disposal scheme, at an estimated cost of £24,300.

WATER, GAS, AND ELECTRICITY.

Audley U.D.C.—Consideration is being given to a scheme for the extension of the gasworks, at an estimated cost of £3,000.

Bexhill T.C.—A nett profit of £1,817 was earned by the electric light undertaking last year.

Brynmawr U.D.C.—The surveyor, Mr. J. J. Quirk, reported last week that the trial hole at Rhos Meredith had not yet been sunk to its proper depth; at present it was about 15 ft. deep. Progress had been slow, owing to the quantity of water to be dealt with and to the hole having to be sunk in the solid rock. The yield of water was approximately 5,700 gallons per twenty-four hours. He had also measured the water discharging into the dingle a little further on and found that the yield was 4,800 gallons per twenty-four hours. The council therefore were sure of 10,500 gallons of water per day. It was found that the water increased as they went lower with the trial hole.

Burton T.C.—The basin of the reservoir at Kilmundy has been concreted and improved to facilitate the delivery of filtered water to the inhabitants. To protect the water from contamination, a 6-ft. wall has been built round the area, and other measures have been taken to safeguard it. The reservoir has capacity for over 300,000 gallons, or fully a day's supply, and is situated a mile north-east of the town, 200 ft. above the sea level.

Carlisle R.D.C.—The engineer, Mr. J. Graham, has prepared a scheme for supplying the whole of the district with water, at an estimated cost of £59,250, and it has been submitted to the various parishes for their consideration.

Falkirk T.C.—A scheme has been approved for the purchase of new electricity plant at a cost of £5,750.

Fulham B.C.—The Electricity and Lighting Committee report that there are about 100 public street lamps at the present time which are on the lines of the council's mains, and which can be converted from gas to electric lighting without involving extension of cable. The cost of the conversion is estimated as follows: To laying services to 100 posts, £191; 100 conversion sets, consisting of switches, frogs altering, and wiring lanterns, and proportion of saving charges, £80; total, £271.

Isle of Wight R.D.C.—A conference is to be held with the Arreton Parochial Committee on the subject of a proposed water supply scheme for that district, prepared by Messrs. Collins & Merwood, which is estimated to cost £1,900.

Kilmarnock T.C.—The council have voted an honorarium of £100 to the electricity manager in recog-

dition of services in connection with the promotion of the Electric Extension Order, and at the same time increased his salary by £100 per annum.

Redditch U.D.C.—It has been decided to adopt the scheme recommended by Messrs. Handcock & Dykes, London, for the extension of the electricity undertaking, and to apply to the Local Government Board for sanction for a loan of £18,000 for the purpose.

Shrewsbury T.C.—For the protection of the water supply it has been decided to purchase, for £1,120, a field adjoining the conduit head.

Southwell R.D.C.—The council have decided to give consideration to a representation from the Local Government Board with respect to the insufficiency of the water supply in the villages of Oxtou, Epperstone, Lowdham, and Gunthorpe.

Thakeham R.D.C.—Pumping operations having proved satisfactory, the council have instructed Messrs. Tulloch & Haworth, engineers, to prepare plans of the proposed water supply scheme for Storrington. The estimated cost is £5,172.

Thetford T.C.—An agreement has been signed with the gas company for public lighting on the following terms—viz.: All-night incandescent lamps £1 12s., incandescent lamps £2 11s. 6d., ordinary gas lamps £2 11s. 6d.

MISCELLANEOUS.

Dundee T.C.—The Police Committee recommend the acceptance of the tender of Leyland Motors, Limited, at £965, for the supply of a new motor fire engine.

Exeter T.C.—A surplus of £1,724 from the working of the tramway undertaking last year, after paying sinking fund and interest, has been carried to the reserve and renewals account, which will then stand at £7,835.

Kingston (Surrey) T.C.—Mr. R. H. Lucas, the surveyor, was on Tuesday asked to report at the next meeting as to the provision of an open-air swimming bath.

PERSONAL.

Mr. J. Parry Humphreys has been appointed borough surveyor of Flint.

Mr. A. Lupton, surveyor to the Knaresborough Rural District Council, has been granted an increase of salary.

Mr. H. A. Butterfield, engineering assistant at Batley, has been appointed chief assistant to the borough engineer of Keighley.

Mr. A. W. Smith, assistant surveyor of Abertillery, has been appointed district surveyor to the Monmouthshire County Council.

Mr. J. C. Matthew, of the Exmouth surveyor's department, has been appointed surveyor to the Sidmouth Urban District Council.

Mr. P. H. McCarthy has been appointed surveyor to the Bray Urban District Council at a salary of £150 and 2½ per cent on all schemes.

Mr. D. P. Boath, of Glasgow, assistant surveyor in the Eastern District of Dumbartonshire, has been appointed burgh surveyor of Denny.

Mr. Sydney Perks, surveyor of the City of London, has in the Royal Academy a water-colour drawing of a building on the Tower Bridge approach.

Mr. Urban A. Smith, county surveyor of Hertfordshire, resigned, has been appointed consulting engineer and surveyor to the county council, at a salary of £500 per annum.

Mr. Reginald Brown, M.I.N.S.T.C.E., of Old Queenstreet, Westminster, has been called in by the Cudworth Urban District Council to inspect the district and report upon the scheme of sewage disposal prepared by the surveyor, Mr. W. T. Lynam.

Mr. Wallace E. Riche, secretary to the Roads Improvement Association, has been appointed to represent that body at the town planning and road conference of the Institution of Municipal and County Engineers at Cheltenham next month.

Mr. E. G. Owen, assistant in the office of Mr. Harry Riding, engineer and surveyor to the Burley-in-Wharfedale Urban District Council, has received a similar appointment under the Ilkworth Urban

District Council. Mr. Owen served his articles under Mr. Riding.

Mr. George E. Bond, J.R., of Rochester, immediate past-president of the Society of Architects, died, we regret to state, on the 20th inst. Mr. Bond commenced practice in the city of Rochester upwards of thirty years ago, and some of the principal buildings in the district, including the town hall and municipal buildings, technical institute, and free library, were erected from his designs. He was architect to a number of public bodies, and had an extensive and varied practice in the county of Kent. He joined the Society of Architects in 1888, and for many years served on the council, and was president for four years in succession. The funeral took place on Saturday last at St. Margaret's Cemetery, Rochester.

Mr. E. George Mawbey, borough engineer and surveyor of Leicester, was on Tuesday voted an honorarium of £500 by the town council in respect of special services in connection with the construction of the tramways. It will be recalled that about twelve years ago Mr. Mawbey was paid £500 for designing the tramway scheme and preparing the Parliamentary work. Alderman Flint, who moved that Mr. Mawbey receive an honorarium of £500, stated that the track construction had involved a tremendous amount of extra work. The permanent way was made for £17,000 less than the Parliamentary estimate for the contract price. The capital expenditure for the tramways work, carried out under the direction of Mr. Mawbey, was something like £550,000. The borough engineer had ungrudgingly given his services to the Tramways Committee whenever they were required. Mr. Mawbey, it may be added, holds the office of chief engineer to the electrical departments as well as for the designing and carrying out the permanent way. His salary for some years has been £1,250.

Mr. Joshua Cartwright, M.I.N.S.T.C.E., one of the original members and a past-president of the Institution of Municipal and County Engineers, entered upon the eightieth year of his age on Saturday last, the 23rd inst., and his numerous friends in the profession will be glad to know that he is still in harness and actively



MR. JOSHUA CARTWRIGHT, M.I.N.S.T.C.E.

engaged in consulting work. Born at Stalybridge in 1835, Mr. Cartwright was one of the early band of students that attended the old Quay-street School, Manchester, the pioneer of Owens College, now Victoria University, Manchester. He entered the service of the Dukinfield Local Board as an assistant in the surveyor's department in 1862, and two years later was appointed surveyor to the board. During the fourteen years he occupied the latter post he carried out extensive main drainage and street works, and upon the waterworks becoming the property of the board was appointed engineer for the undertaking. He went to Bury in 1877 as first engineer and surveyor

after the incorporation of the borough, and held that office until 1900, when he resigned in order to take up private practice, being retained by the corporation as consulting engineer for a term of years. At this juncture the waterworks undertaking of the Bury Corporation was transferred to the Bury and District Joint Water Board, and he became engineer to that authority. For the Bury Corporation Mr. Cartwright designed and constructed Clough Bottom reservoir, and for the Joint Board Ogdon reservoir, and Scout Moor high-level reservoirs. Mr. Cartwright will have the sympathy of all to whom he is known in the bereavement which he has suffered this week, his younger son, Mr. Philip Cartwright, passing away on Monday at the early age of forty. Mr. Philip Cartwright had assisted his father for some years in his professional undertakings, and had personally a wide grasp of engineering knowledge. He was held in high esteem by all who had business associations with him, and his death is generally regretted.

Highway Maintenance in the West Riding.—It was reported at a recent meeting of the West Riding County Council that the average outlay for the maintenance of main roads (including the nett cost to the county council of tar-spraying and tar-binding) last year as compared with the previous year was £303 17s. per mile for "claimed" roads, against £313 19s. 2d. per mile in the previous year, and £317 for unclaimed urban roads and £132 for unclaimed rural roads, against £319 and £124 respectively. As compared with last year's estimates there were savings effected on the highways account of £13,551, and on the bridges account of £5,024.

FOR OTHER ADVERTISEMENTS

See End of Paper.

RURAL DISTRICT COUNCIL OF YSTRADGYNLAIS.

APPOINTMENT OF CLERK OF THE WORKS.

Applications are invited for the position of Clerk of the Works in connection with the construction of the New Sewerage and Sewage Disposal Scheme for the Parish of Ystradgynlais.

The salary offered is £3 3s. a week, and the works will take about 18 months to complete.

Applications, stating age, full particulars of experience, accompanied by not more than three recent testimonials, must be sent to the undersigned on or before Saturday, the 6th June, endorsed "Clerk of the Works."

Canvassing, directly or indirectly, will be a disqualification.

A. JESTYN JEFFREYS,

Solicitor and Clerk to the Council.

Queen Chambers,

Neath.

(1,654)

WYCOMBE RURAL DISTRICT COUNCIL. PRINCES RISBOROUGH SEWAGE DISPOSAL.

The above Council are prepared to receive Tenders from responsible Contractors for the construction of sewage disposal and purification works at Princes Risborough.

Plans and Specification may be inspected, and Bill of Quantities obtained, at the office of the undersigned on payment of a deposit of two guineas, which will be returned on receipt of a *bona-fide* Tender.

The Council's Engineer or his representative will be in attendance at the Sewage Outfall Works, Princes Risborough, between the hours of 3 p.m. and 5 p.m. on Wednesday, 3rd prox., to explain the scheme to intending Contractors.

Sealed Tenders, endorsed "Princes Risborough Sewerage," to be delivered at my offices not later than 12 noon on Saturday, the 13th day of June, 1914.

The Council does not bind itself to accept the lowest or any Tender.

B. L. REYNOLDS,

Clerk to the Council.

12 Easton-street,

High Wycombe.

May 27, 1914.

(1,655)

FOR SALE OR HIRE—4 Capital Second-hand Tank Wagons for use on road. Spring mounted on 4 wheels; cylindrical tanks 400 gallons capacity. Photo. sent.—Bateman, Engineer, Woking.

(1,653)

MANCHESTER CORPORATION SEWAGE WORKS, WITHINGTON.

INSTALLATION OF EMSCHER TANKS.

There has just been completed at the Withington works of the Manchester Corporation an installation of Emscher sewage disposal tanks, the first plant of the kind in this country. The works, which have been carried out by Mr. O. J. Wilkinson, A.S.O.C.M.I.N.S.T.C.E.E., consulting engineer, of Manchester, for the Manchester Corporation Rivers Committee, comprise grit chambers, Venturi meter, Emscher tanks, and sludge-drying beds. The plant has been specially designed, on strictly scientific lines, with a view to dealing with a daily flow of sewage equal to 750,000 gallons.

The installation is self-contained, and has been planned in such a manner that careful records and observations can be taken from time to time as to the capability and efficiency of the plant. The grit chambers are intended to eliminate the mineral solids in suspension which cannot be digested in the tanks, and the rate of flow passing through the tank will be recorded by the Venturi meter erected between the grit chambers and the inlet to the tanks.

The Emscher tank comprises two sludge digestion chambers, each 27 ft. diameter and 17 ft. 4 in. deep, underlying a sedimentation chamber of two hours' capacity. The sludge chambers have capacity for six months sludge, and the arrangement is such that when the sludge has remained in the tanks for a sufficient length of time to ensure complete digestion it can be drawn off by means of the water pressure in the tanks through a cast-iron pipe while the pipe is in operation. Provision has also been made for breaking up the sludge in the tank by means of compressed air in the event of clogging taking place. A feature of the design is the arrangement for collecting gases given off by the decomposition of the sludge. These gases will be analysed from time to time, the volume given off measured, &c.

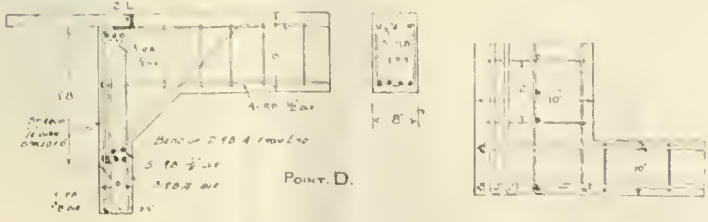
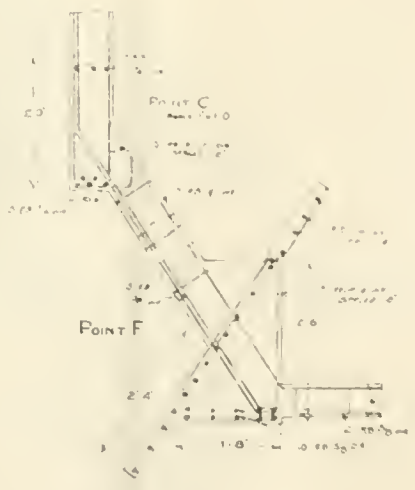
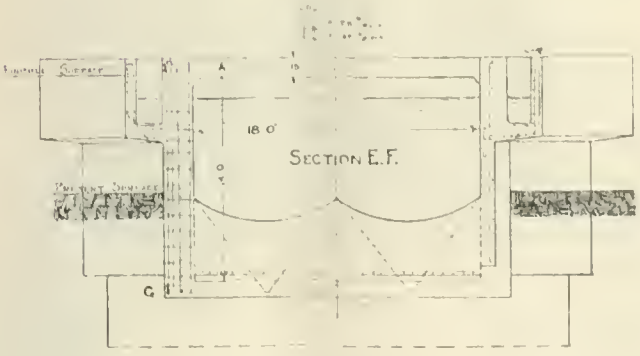
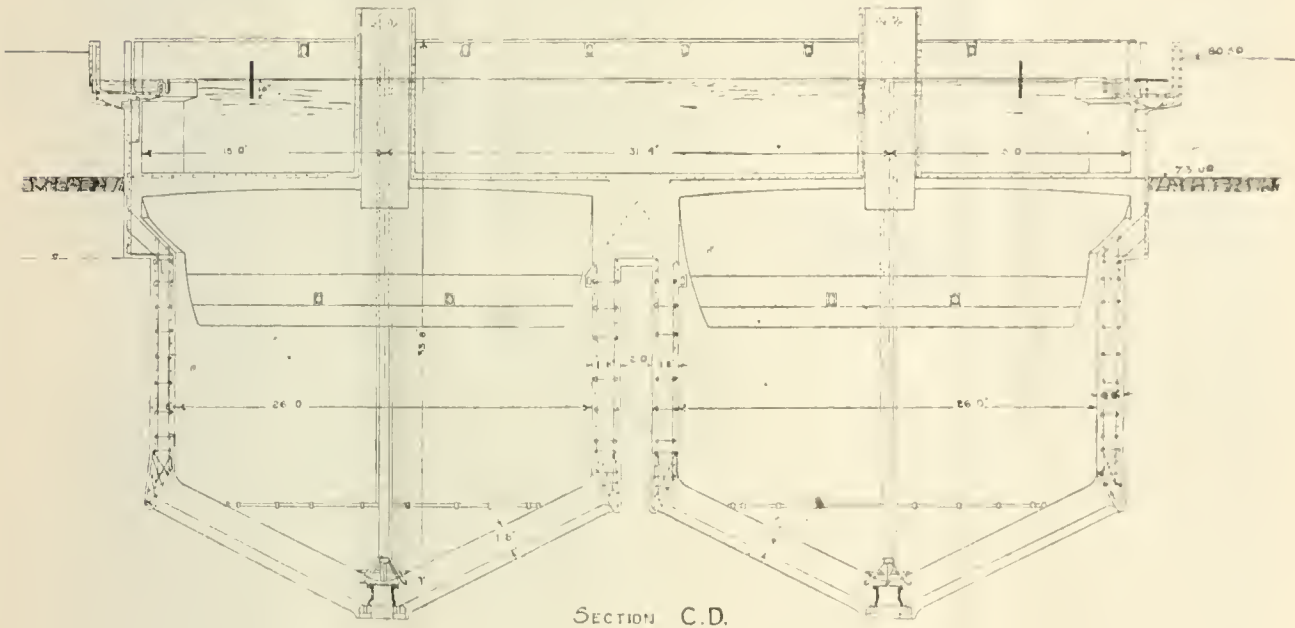
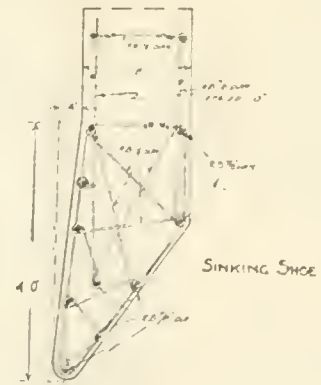
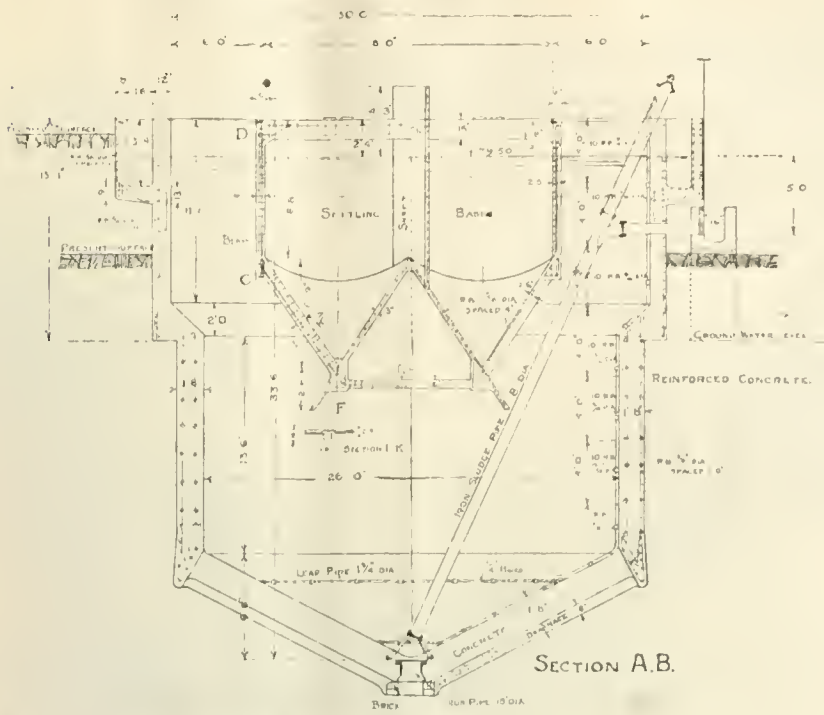
The sludge, when in a suitably "rotted-out" condition, will be passed into drying beds, where the water will be rapidly drained off through clinker beds and treated in the existing contact beds. Experience shows that sludge cake resulting from the Imhoff tanks rapidly drains and hardens, and is absolutely innocuous. Wagon ways are provided in the drying beds for the removal of the cake from time to time as required.

The estimated cost of the complete plant, which has been carried out in reinforced concrete throughout, and in water-bearing strata, was about £4,000. This figure has not been exceeded in actual cost: in fact, a slight saving has been effected.

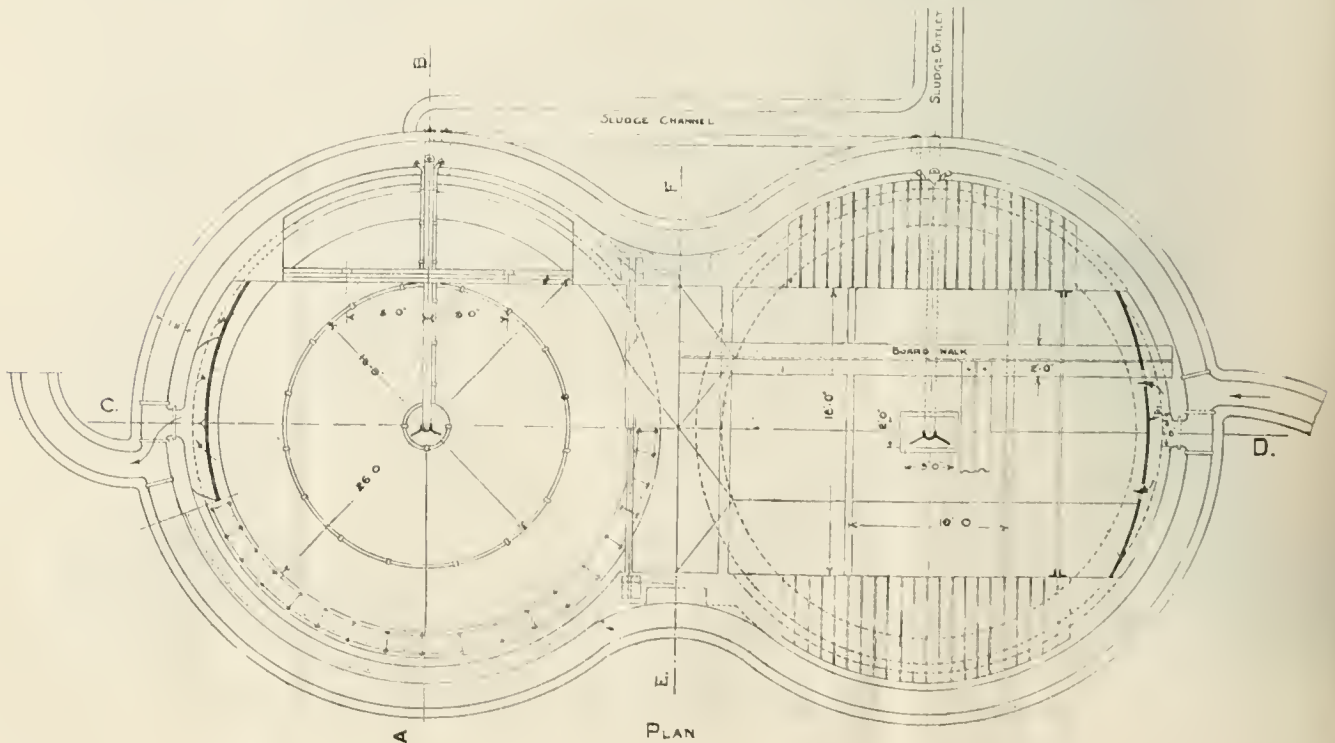
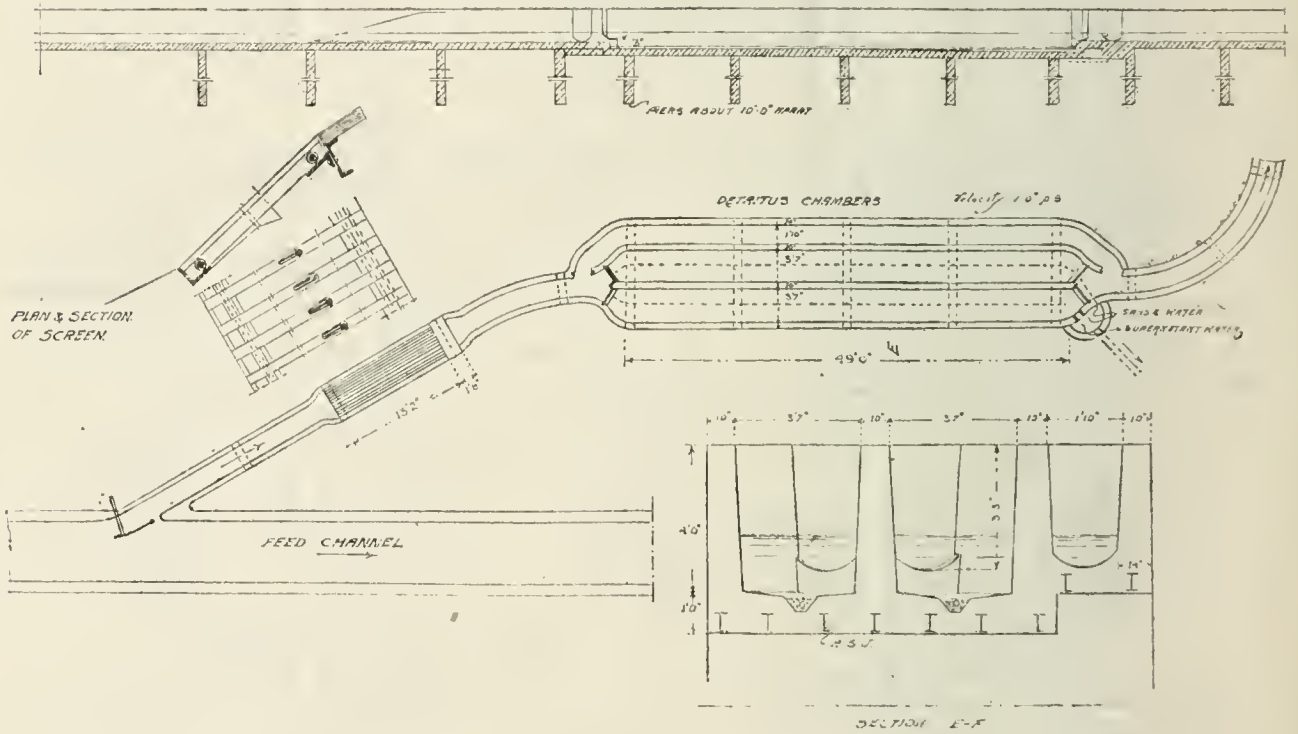
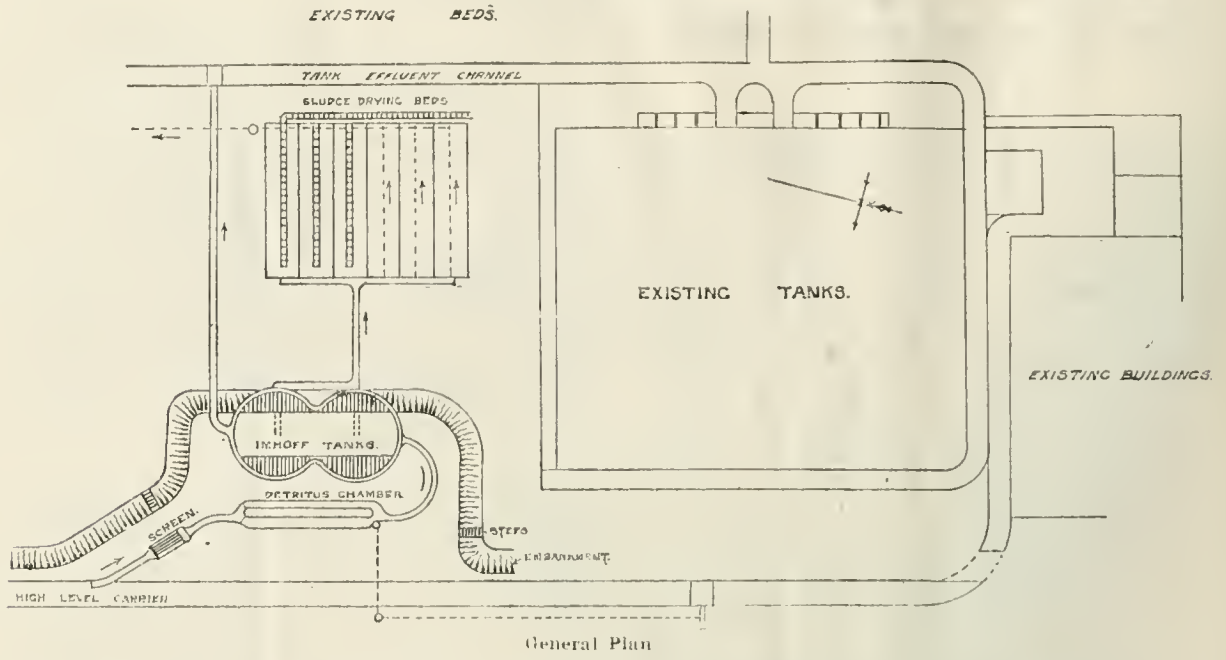
Claridge's Asphalte.—This material is being used on the roofs of the Imperial Tobacco Company's premises, Millbank, and H.M. Stationery Offices, Stamford-street.

Association of Managers of Sewage Disposal Works.—To-morrow (Saturday) the members of this body will pay a visit to the sewage works of the Tipton Urban District Council, which have just been reconstructed. Meeting at three o'clock at Dudley Port Railway Station, the party will arrive at the works half an hour later, where they will be met by Mr. W. W. Doughty, J.R., chairman of the Sewerage Committee and other members of the council. A short paper will be presented by Mr. W. H. Jukes, the surveyor.

The Scottish Road Trials.—The road surveyor of Renfrewshire, Mr. Robert Drummond, has reported to the Road Committee of Upper Renfrewshire that Road Board experiments in that district will be made on the south end of the Crookston-road. The sections will be treated as follows: (1) Ordinary macadam; (2) ordinary macadam, surface tarred; (3) macadam, grouted with pitch and sand; (4) macadam, grouted with pitch and oil; (5) macadam, grouted with pitch and oil and surface sealed with Trinidad bituminous mixture; (6) tar-macadam, surface sealed with distilled tar; (7) tar-macadam, surface sealed with Trinidad bituminous mixture; and (8) tar-macadam, surface sealed with Mexican bituminous mixture. The total estimated cost, including purchase of instruments, making observations, measurements, supervision, &c., is £807, of which £628 will be paid by the Road Board, leaving £179 to be borne by the county authorities. The work will be begun immediately.



EMSCHER TANKS INSTALLATION AT WITHINGTON SEWAGE WORKS, MANCHESTER.



EMSCHER TANKS INSTALLATION AT WITHINGTON SEWAGE WORKS, MANCHESTER

THE PROBLEM OF ROAD TRAFFIC.

Captain H. H. P. Deasy, late 16th [Queen's] Lancers, a member of the council of the Roads Improvement Association, has written a pamphlet with the above title, in which he attempts to solve this troublesome and complex problem.

He begins by stating that the problem is one that should introduce such an improved and popular system that the public and all "authorities concerned" shall regard it as efficient and just, and ensure the confidence of the public, that it should increase the traffic bearing capacity of the existing highways, and "effect a substantial reduction in the number of accidents of all kinds."

His solution of the problem is shortly as follows:

(1) A single Government Department entrusted with adequate powers, and suggests the title of the Highways Board.

(2) There should be only one law relating to traffic for the whole of Great Britain, as those at present in force are voluminous, scattered, incomplete, antiquated, and overlapping.

(3) There should be very few local by-laws or regulations which do not apply to the whole country.

(4) He says that the Highways Board "should consist of a small number of specially qualified persons selected solely on the ground of their competence," that there should be two departments of this board, one called the highways branch, the other the traffic branch, and he defines their respective duties.

(5) That this board should be advised on legal and technical matters by independent and well-paid experts.

(6) He suggests that the terms of reference should be—

(a) Consider all matters relating to highways and the traffic thereon, and advise Parliament upon these subjects.

(b) Formulate a standard code of by-laws for the proper control of the road traffic, all existing laws and by-laws being repealed.

(c) Make, modify, approve or cancel by-laws relating to general traffic on the highways applicable throughout the country, or only in particular localities, the Highways Board to be the only authority enforced by Parliament to do this.

(7) The board should prescribe routes for public service vehicles, and deal with their time tables so far as public safety is concerned.

(8) He suggests that a public inquiry should be held in most cases where any alteration is proposed in existing routes for public services.

(9) The board should hold an inquiry at an early date as to the present system of contribution by owners of public service and other vehicles towards the cost of upkeep, &c., of the highways, and report result to Parliament.

(10) That all highways should be classified.

(11) That the board should have power to limit or prohibit the use on a highway of any vehicle likely to cause undue damage on a road, or is dangerous or objectionable to the public.

(12) Fix special controls as to limits of speed after holding a public inquiry.

(13) Captain Deasy is of opinion that fixing a speed limit does not afford sufficient protection to the public, and that sec. 1 of the Motor Car Act, 1903, should be emphasised, which, if enforced, would place a much greater responsibility on the driver of a car under varying conditions which at present are met.

(14) The question of direction posts and signal posts should be standardised and more rigorously enforced.

Captain Deasy then advocates the allocation of State grants in aid of costs of existing highways, and the manner in which the Highway Board should proceed before making any grant or loan; also that the Highway Board should be empowered to consider all applications for permission to lay rails in the streets; that the board should be authorised to spend money on experiments connected with improvements on highways or road traffic, and give remuneration to originators of improved methods of highway construction or maintenance and matters relating thereto; further, that they should "devise, and, if possible, establish, a proper system of technical

education on all matters relating to the construction and maintenance of highways."

There are other matters contained in this valuable little pamphlet [published by E. J. Larby, 1 Paternoster-avenue, E.C., price 6d.] which can be read with profit by all those who are interested in the traffic problem. We have given a very full description of the principal matters contained in the pamphlet because we think they are well worth consideration, and in some cases no doubt one criticism.

SEWER OR DRAIN?

DECISION OF A HOUSE OF COMMONS COMMITTEE.

In the proceedings before the House of Commons Committee recently on the Walsall Corporation Bill, seeking modifications and extensions of by-laws, an important decision was announced with respect to the clause dealing with sewerage. This was Clause 69, dealing with sewers to be drained, and for the Local Government Board it was pointed out that the clause would alter the provisions of the general law. It was submitted that the subject-matter of the clause was not appropriate for legislation applicable only to particular districts in case where sewers and drains in the district had been constructed under the general law. A similar clause had been disallowed in another Bill by a Local Legislation Committee on the ground that the matter should be dealt with by general legislation. A similar clause had, however, been given to the Southgate Urban Council.

Mr. Beveridge (for the Walsall Council) said this clause was debated at great length with the West Bromwich Bill of last year, and a Bill was presented to the House of Commons backed by several gentlemen of influence, including Sir Charles Nicholson, Sir Luke White, and Mr. Middlebrook, to clear up the matter and lay down a general principle. The object of that Bill was to amend the definitions of "sewer" and "drain" in the Public Health Act. Under those definitions at present any drain for the drainage of more than one house became technically a sewer, and was therefore repairable by the local authority. Numerous decisions in the law courts illustrated the practical difficulties which arose from the present uncertain state of the law on the subject. He had looked into the law, and was bound to say he could not understand it. The law, as it stood, involved frequent interference by local authorities with private property. The cost of repairing drains which in all respects were private and of no use to the general public was thrown upon the whole body of rate-payers, and militated against the adoption of the best methods of draining houses and streets. This section of the Public Health Act had probably caused more controversy in law than any other. The clause now submitted was drafted upon the Bill that had been before Parliament. He contended that Walsall Corporation ought to have this clause given to them. Mr. J. Samuel: Suppose a street has been paved, flagged, and sewered, and is practically taken over by the corporation, why do you then call upon the owners to pay for any repairs to the sewer?

Mr. Beveridge: The corporation only step in when private owners do not do what the corporation think they ought to do.

Mr. Samuel: The owner might think that it was a sewer repairable by you, and you might say it was a drain. Therefore you might call upon them to do the work twice over.

Mr. Beveridge: It is all subject to the definition in the sub-section as to what is a public sewer which we are responsible to maintain and repair and what is a drain which the private owner must maintain and repair. There has been case after case to decide what is a sewer and what is a drain, and this clause will make the matter clear so far as Walsall is concerned.

The Committee granted the clause, but Mr. Samuel pointed out that it was more important in the interests of public health that Walsall should have back streets than they should have a clause of this kind.

Buxton's Thermal Water. Mr. Chamberlain, the Buxton water engineer, during excavations in the Crescent, discovered that a supply of thermal water had been going to waste. This new supply, which approximates in volume to 43,000 gallons a day, and possesses all the radio-active property of the Buxton natural water, has been diverted for use in the hot baths.

BROTHERHOOD OF THE CHEERFUL SPARROWS.

INAUGURAL DINNER OF WESTMINSTER BRANCH.

The Westminster branch of the Brotherhood of the Cheerful Sparrows held their inaugural dinner on Friday, May 22nd, at the Victoria Mansions Restaurant, Westminster. The Brotherhood was established in 1899 by a small party of fellow railway travellers, who, realising the uselessness of indiscriminate charity, came to the conclusion that by banding themselves together, and organising a society on business lines, it would be possible to give much more practical and effective help in cases of severe distress. Its objects are twofold: (a) To promote fraternity and general good fellowship among its members; (b) to assist in every manner possible persons in distress, either directly or through other institutions, irrespective of creed or politics.

A month or six weeks back it was discovered that among those engaged in the various branches of engineering work in Westminster, and frequently in contact with each other on business matters, there were thirty-three members of the Brotherhood. A suggestion that a Westminster branch should be established was adopted, and last Friday evening's function was arranged to mark its inauguration.

Fifty members of the Brotherhood were present at the dinner. Mr. H. D. Blake (chairman of the Westminster Committee), supported by Mr. J. N. Kingwill (president of the Brotherhood), and several members of the Executive Council and of the Westminster Branch Committee, presided. The toast list was very short, and the speakers were all of opinion that "Brevity is the soul of wit," and acted up to it.

Mr. J. N. Kingwill, who proposed "The Westminster Committee," reviewed the activities of the Brotherhood and the facilities and benefits it afforded to those needing help and assistance. He specially drew attention to the fact that any cases submitted as suitable for relief by any members had always been dealt with, and any relief that might be decided upon afforded within twenty-four hours. They thoroughly believed that he who gives quickly gives twofold.

Mr. H. D. Blake, in responding, pointed out that his committee were really very keen, and that already the membership in the district had increased from 33 to 80. He was sure that they would uphold the reputation of the Central Council for promptness and usefulness.

Mr. Wallace E. Riche, of 15 Dartmouth-street, Westminster, is acting as hon. secretary to the Westminster branch of the Brotherhood.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A., Borough Surveyor, Great Yarmouth.

SCOTTISH DISTRICT.

The annual Scottish meeting of the institution will be held in Dunfermline on June 5th and 6th.

The following papers will be read—viz.:—

"A Town Planning Scheme: Its Effects on Housing and Architecture," by Mr. Raymond Unwin.

"Edinburgh and Its Early Examples of Town Planning," by Mr. A. Horsburgh Campbell.

"Town Planning from a Lawyer's Point of View," by Mr. John L. Jack.

"The Advantages of Steam Tractor Haulage over Team Labour for Road Material," by Mr. W. L. Gibson.

On the first day the members are to be entertained to luncheon by the corporation of the city of Dunfermline. On the second day, by the courtesy of the Admiralty and Messrs. Easton, Gibb & Co., the members are to be permitted to visit the works at Rosyth.

SOUTHEND MEETING.

The programme of the meeting of the institution to be held at Southend-on-Sea on Saturday, June 6th, is as follows:—

11 a.m.—Members will assemble at the Palace Hotel. Reception by his Worship the Mayor (Alderman Joseph Francis, J.P.).

11.35 a.m.—Leave hotel to inspect the following works in course of construction: (a) Pier extensions (electric cars to pier head, kindly provided

by the Pier Committee); (b) Esplanade improvement and sea wall; (c) large swimming bath.

1.30 p.m.—Lunch at the Palace Hotel by kind invitation of the Mayor.

2.15 p.m.—Discussion on paper by Mr. E. J. Elford, M.INST.C.E., on "The Main Sewerage and Sewage Disposal Works, and other Recent Municipal Works, Southend-on-Sea."

2.45 p.m.—Leave hotel to inspect the following works: (d) Reinforced-concrete loading pier; (e) tramway boulevard; (f) sewage disposal works.

4.45 p.m.—Tea on the site of the sewage works at the invitation of Mr. E. J. Elford, followed, if desired, by further discussion on paper.

J. A. WEBB,
Hon. District Secretary.

Great Stanmore.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on Saturday, June 13th.

PROGRAMME.

11 a.m.—District executive meeting.

11.30 a.m.—District meeting.

Reception in the council chamber by the chairman of the council, Mr. Councillor J. Pearson, J.P.

District business.

Paper by Mr. Arthur J. Price, engineer and surveyor, on "The Municipal Works at Lytham," which will be taken as read.

Discussion.

1 p.m.—Lunch at Clifton Hotel.

2.15 p.m.—By the kindness of the Blackpool, St. Anne's, and Lytham Tramway Company, cars will be provided to enable the members to visit the West End outfall sewage works (in course of construction), the East End sewage and destructor works and slaughter-houses.

4.30 p.m.—Afternoon tea will be provided for the members at De Grey's Café.

ANNUAL GENERAL MEETING AND TOWN PLANNING, HOUSING AND ROAD CONFERENCES.

The forty-first annual general meeting of the institution will be held at the Town Hall, Cheltenham, on Wednesday, Thursday, Friday and Saturday, June 24th, 25th, 26th and 27th. Conferences will take place with delegates from the various corporations and local authorities of the United Kingdom and representatives of the different bodies interested in the subjects of town planning, housing and roads. An important exhibition of plans, maps and models of town planning and housing schemes has been arranged, and it is believed that the collection will be one of great educational and practical value. The exhibition will be open during the four days of the meeting. Ladies are invited to attend the meeting, visits and annual dinner, and the permission of the president may in their case be assumed, but due notice must be given on the reply form.

IRISH DISTRICT.

Mr. M. Sellars, hon. district secretary of the Irish District, is endeavouring to arrange for a two-days' District meeting in Cork towards the end of July, and the council appeal to English members to give this meeting strong support. Two dates are suggested—viz., July 17th and 18th, or July 24th and 25th, and it would be a convenience if English members would say which date would be preferable.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

EAST MIDLAND DISTRICT.

It is hoped that a District meeting will be held in South Leicestershire in the near future. Provisional arrangements are also in hand for a meeting (probably an Institution meeting) to be held at Cleethorpes (C. H. Waithman, Assoc.M.INST.C.E.) during September.

J. W. DUDLEY ROBINSON, B.SC.(LOND.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

NORTHERN DISTRICT.

Meetings will be held in Cumberland in June, at Ahwiek on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

SOUTH-WESTERN DISTRICT.

A South-Western District meeting will be held at Tisbury, Wilts, on Saturday, June 13th.

PROGRAMME.

12.15 p.m.—Meet at the Victoria Hall. Short business meeting, at which will be presented a paper, "Wiltshire Roads: Past and Present," by E. Plummer Davies, engineer and surveyor, Tisbury Rural District Council (member).

1.15 p.m.—Luncheon.

2.40 p.m.—Proceed by motor cars and motor buses to the waterworks at Lawn.

To Fonthill Arch (by Inigo Jones).

To eight new cottages on Fonthill Hill.

To Little Ridge. Inspect extensive additions to the residence of Mr. Hugh Morrison, J.P., county alderman.

To Old Tithe Barn, Place Farm, Tisbury, one of the largest barns in England.

4.45 p.m.—Tea.

C. OWEN BAINES,
Hon. District Secretary

Paignton.

NORTH-WESTERN DISTRICT.

A meeting of this district, followed by a social evening, will be held at the Mitre Hotel, Manchester, on Friday, July 3rd.

EASTERN AND NORTH-EASTERN DISTRICTS.

A joint Eastern and North-Eastern District meeting will be held at Hunstanton in July.

B. WYAND,
Secretary.

39 Victoria-street, S.W.

INSTITUTION OF WATER ENGINEERS.

SUMMER GENERAL MEETING.

The nineteenth summer general meeting will be held at Stockport on Thursday, Friday and Saturday, the 11th, 12th and 13th of June next, under the presidency of Mr. Thomas Molyneux, Assoc.M.Inst.C.E., corporation waterworks engineer.

By kind permission of the mayor and corporation, the meetings will be held in the Town Hall, Stockport, and at the opening of the proceedings on Thursday the institution will be welcomed to Stockport by his Worship the Mayor (Councillor Thomas Worthington Potts, J.P.).

Ladies will be cordially welcomed at the meetings and visits, and all official functions except the annual dinner.

The programme will include the presentation of premiums awarded by the council for papers presented during the year 1913.

PAPERS AND COMMUNICATIONS.

The following papers have been promised for reading and discussion at this meeting, and advance copies will be sent out as soon as printed to members who signify their intention of attending the meeting, also, so far as the stock will allow, to those who, being unable to attend the meeting, are anxious to assist in the discussion by correspondence:—

- (1) "The Character of Mechanically Filtered Water," by Prof. Sheridan Delépine, of the University of Manchester.
- (2) "The Aëration and Filtration of Water for Swimming Baths," by L. Holme Lewis, M.I.MECH.E. (member).
- (3) "Notes on Scraping a 15-in. Water Main," by J. S. Barrowclough (member).

A lecture, entitled "The Geological Structure of the Stockport District," will be delivered by Prof. George Hickling, D.Sc., of the University of Manchester.

The president-elect (Mr. Thomas Molyneux) will deliver his presidential address on Thursday, June

11th, and will also supply a description of the Stockport waterworks, with map of the district of supply, which will be circulated among those present at the meeting.

VISITS TO WORKS.

On Thursday afternoon, June 11th, starting from the Town Hall, Stockport, visits will be made to the Wilmslow pumping station and softening works, and to the Alderley balancing reservoir (reinforced concrete, under construction), where afternoon tea will be provided by the president and Mrs. Molyneux.

On Friday, June 12th, starting from the Midland Hotel, Manchester, at 10 a.m., visits will be made to the recently completed Kinder reservoir and filtration plant, where lunch will be provided by the corporation of Stockport, and to the Lyme Park reservoirs; also to the works of Messrs. Mirrlees, Bickerton & Day, Limited, Hazel Grove (Diesel oil engines under construction), where afternoon tea will be provided.

On Saturday afternoon, June 13th, members will be free to visit the Colliery Exhibition or the Victoria Park Baths (at the latter will be seen an installation for filtering the water used in the swimming baths).

SOCIAL FUNCTIONS.

The annual dinner will be held at the Midland Hotel, Manchester, on Thursday evening, June 11th, when the Mayor of Stockport, the Lord Mayor of Manchester, and other distinguished guests will be entertained by the institution.

In addition to the luncheon provided on Friday at the Kinder works, the corporation of Stockport will entertain the members at luncheon on Thursday, June 11, at the Town Hall Stockport.

The committee of the Manchester Engineers Club have kindly offered to elect the members attending the meeting as hon. members of the club during the three days of the meeting. Admission on presentation of programme card.)

PERCY GRIFFITH,
Secretary.

20 Victoria-street, S.W.

Dermatine Hose at Sandwich.—The Dermatine Company, Limited, Neate-street, Camberwell, S.E., have received from Mr. W. Ryder Richardson, secretary of the Royal St. George's Golf Club, Sandwich, Kent, where the Amateur Golf Championship was decided last week, the following communication: "After various trials, I have not found any hose that stands such hard wear as the Dermatine hose. . . . We shall be using the hose day and night, especially just now, prior to the Amateur Championship, when we want the greens in extra good order."

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

SENIOR DRAUGHTSMAN.—May 30th.—Lancashire County Council. £100—£120 per annum.—County Bridgmaster, County Offices, Preston.

SEWAGE FARM MANAGER.—June 1st. Balby-with-Hexham Urban District Council.—Mr. George Gledhill, surveyor, Council Offices, Low-road, Balby, near Doncaster.

BRIDGE AND MAIN ROAD SURVEYOR. June 1st.—County Council of Devon. £400 a year, with £200 a year for expenses.—Mr. F. Bailey, clerk, Castle of Exeter.

RESIDENT ENGINEER.—June 1st.—Chard Town Council. 3½ guineas per week.—Mr. J. A. Forward, town clerk.

CLERK OF WORKS.—June 3rd.—Devon County Council.—Mr. C. Curtis Gray, acting county surveyor, No. 1 Division, The Square, Barnstaple.

SURVEYOR'S ASSISTANT.—June 3rd.—Bedwelty Urban District Council. £100—£150 per annum.—Mr. T. J. Thomas, clerk, High-street, Bargoed.

COUNTY SURVEYOR.—June 4th.—Hertford County Council. £800 a year.—Mr. Charles E. Longmore, clerk, Clerk of the Peace Office, Hertford.

ENGINEER AND SURVEYOR.—June 5th.—Cheadle and Gatley Urban District Council. £250 per annum.—Mr. Arthur Briggs, clerk, Council Offices, Cheadle, Cheshire.

INSPECTOR OF ROADS.—June 9th.—Corporation of Aberdeen. £200 per annum.—Mr. W. Dyack, burgh surveyor, Townhouse.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

NEWBURY. June 10th.—Plans and estimates for semi-detached cottages, for the Newbury Rural District Council. Cost not to exceed £320 per pair.—Mr. S. V. Pinniger, clerk, Market-place.

SUNDERLAND.—June 23rd.—Designs for a secondary school for 600 scholars, for the Corporation of Sunderland. Premiums, £100, £50, and £25.—Mr. J. W. Moncur, borough engineer and surveyor, Town Hall.

MIDDLETON.—July 16th.—Designs for a town hall, the cost of which must not exceed £18,000. Premiums £100, £50, and £25.—Town Clerk.

LONDON.—September 7th.—Designs for elementary schools, for the London County Council.—Education Officer, Education Offices, Victoria-embankment, W.C.

BELPER.—Designs and estimates for the erection of a bridge over the River Derwent, for the Belper Rural District Council.—Mr. Robert C. Cordon, surveyor, Duffield, near Derby.

CHESTER.—Designs for working-class dwellings, for the Corporation of Chester. Premiums, £50, £25, and £10. Mr. Patrick Abercrombie, M.A., Liverpool University School of Civic Design, has been appointed assessor.—Mr. J. H. Dickson, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

CHARD.—June 1st.—For the construction of covered reservoir, well, tunnel, and the laying of 7-in., 5-in., 4-in., 3-in. and 2½-in. cast-iron water mains, valves, hydrants and other castings, for the corporation.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

NARBERTH.—June 1st.—For the erection of thirty houses, for the rural district council.—Mr. J. P. James, architect and surveyor, Frogmore, Tenby.

DOVER.—June 1st.—For the erection of twelve workmen's cottages, for the corporation.—Mr. W. C. Hawke, borough engineer.

ESSEX.—June 1st.—For the erection of a new bridge over the river Blackwater in ferro-concrete work on the Hemelbique system, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

BRENTWOOD.—June 1st.—For the construction of underground conveniences, for the urban district council.—Mr. A. J. Meeson, surveyor.

RAMSBURY.—June 1st.—For the erection of two or three pairs of dwellings, for the rural district council.—Mr. W. Strickland, surveyor, Hungerford.

CARLOW.—June 2nd.—For the erection of thirty-three dwellings, for the urban district council.—Mr. W. A. Lawler, town clerk.

LEYBURN.—June 2nd.—For the construction of measure and inspection chambers, for the rural district council.—Mr. Fred. J. Rodwell, 37 and 38 Prudential Assurance Chambers, Leeds.

CORNWALL.—June 2nd.—For widening a bridge, for the county council.—Mr. A. E. Brookes, county surveyor, Truro.

BRADFORD.—June 3rd.—For duplicating a pipe line in the Aire Valley in connection with the Nidd aqueduct, for the corporation.—Mr. James Watson, waterworks engineer, town hall.

HOVE.—June 3rd.—For the construction of an underground lavatory, for the corporation.—Mr. H. H. Scott, borough surveyor.

BOURNE.—June 3rd.—For the erection of a 16-bed isolation hospital, for the rural district council.—Mr. C. W. Bell, clerk.

SAXMUNDHAM.—June 3rd.—For providing and laying about 2½ miles of cast-iron water mains, with valves, hydrants and other fittings; also the construction of a reservoir and pumping station with machinery, filter plant, and incidental works, for the urban district council.—Mr. P. F. Mackenzie-Richards, engineer, 69 Victoria-street, Westminster, S.W.

SCARBOROUGH. June 3rd.—For the execution of water supply works, for the rural district council.—Mr. J. W. Read, clerk.

HERTS.—June 4th.—23rd.—For additions to the county asylum, for the Visiting Committee.—Messrs. G. T. Hine & Pegg, architects, 35 Parliament-street, Westminster, S.W.

COATES-IN-WHITESLEY. June 4th.—For the erection of twelve cottages, for the rural district council.—Mr. A. W. Ruddle, architect, 6 Long-causeway, Peterborough.

SHEFFIELD.—June 4th.—For the extension of the town hall, for the corporation.—City Architect.

BOOTLE.—June 5th.—For laying a branch main, constructing a receiving tank, and other works, for the rural district council.—Mr. W. Britten Jones, 67 Market-street, Millom.

KINGSTON-UPON-THAMES.—June 6th.—For the erection of a urinal, for the corporation.—Mr. R. Hampton Clucas, borough surveyor.

MIDDLESBROUGH.—June 6th.—For the extension of a dispensary, for the corporation.—Mr. S. E. Burgess, borough engineer.

TEWKESBURY.—June 6th.—For the erection of twelve workmen's dwellings, for the corporation.—Mr. W. Ridler, borough surveyor.

LEEDS.—June 8th.—For excavating and pipe-laying work, for the corporation.—Mr. C. G. Hensell, waterworks engineer, Great George-street.

FOREHOE.—June 8th.—For the erection of three pairs of cottages, for the rural district council.—Mr. J. O. Bond, architect, 29 Castle Meadow, Norwich.

BEDWELLYTY.—June 8th.—For the construction of foundations for additional hospital blocks, for the urban district council.—Mr. D. H. Price, surveyor.

BRADFORD.—June 8th.—For building a new entrance to public market, for the corporation.—City Architect.

LANARK.—June 8th.—For alterations to county sanatorium, for the county council.—Messrs. Alex. Cullen, Lockhead & Brown, Hamilton.

BRIGHTON.—June 8th.—For additions to municipal offices, for the corporation.—Mr. T. Garrett, architect, 34 Ship-street.

WAKEFIELD.—June 8th.—For the erection of conveniences, for the corporation.—Mr. J. P. Wakefield, city surveyor.

MANCHESTER.—June 10th.—For the extension of the Education Offices, for the Education Committee.—Education Offices, Deansgate.

EXETER.—June 10th.—For building a manual instruction centre, for the Education Committee.—Mr. J. Jerman, architect, 1 Bedford-circus, Exeter.

WEST RIDING.—June 12th.—For alterations and additions to a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

GLASGOW.—June 13th.—For the erection of a public convenience, for the corporation.—Office of Public Works, City Chambers, 64 Cochrane-street.

SALE.—June 13th.—For the erection of a school, for the Administrative Sub-Committee for Education.—Messrs. Hoy & Sisley, architects, 199 Deansgate, Manchester.

DEVON.—June 15th.—For the construction of a bridge over the river Yarty, for the county council.—Mr. W. P. Robinson, county surveyor, 22 Queen-street, Exeter.

CROYDON.—June 19th.—For sinking and boring a well, for the corporation.—Borough Engineer.

ARUNDEL.—June 21st.—For the erection of ten cottages, for the corporation.—Mr. A. Holmes, town clerk.

PORTSMOUTH.—June 23rd.—For the erection of a school, for the Education Committee.—Mr. C. C.

Vernon-Inkpen, architect, 40 Commercial-road, Portsmouth.

BLAENAVON.—June 23rd.—For the erection of fifty houses, for the urban district council.—Mr. E. W. Edwards, surveyor.

LONDON.—June 30th.—For the construction of two storage reservoirs in the Thames Valley, together with intake works on the banks of the Thames, and certain contingent works, for the Metropolitan Water Board.—Chief Engineer, Savoy-court, London, W.C.

Iron and Steel.

CHARD.—June 1st.—For the supply of, approximately, 450 tons of 7-in., 5-in., 4-in., 3-in. and 2½-in. cast-iron pipes, junctions, bends, tapers, and other castings; also for the supply of 7-in., 5-in., 4-in. and 3-in. sluice valves, fire hydrants, air valves, and surface boxes, for the corporation.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

BEDLINGTON.—June 2nd.—For the supply of cast-iron water pipes, for the urban district council.—Mr. J. E. Johnston, surveyor.

BRADFORD.—June 3rd.—For the supply of 5,100 tons of cast-iron pipes, 450 tons of special castings, and mild steel pipes, for the corporation.—Mr. James Watson, waterworks engineer, Town Hall.

FLEET (Hants).—June 4th.—For the supply and delivery of 2,700 yds. of 12-in. diameter cast-iron pipes, 1,900 yds. of 10-in., 2,050 yds. of 9-in., 1,060 yds. of 8-in., 2,400 yds. of 7-in., 900 yds. of 6-in., and pipes of smaller diameters, also bends, taper junctions, and other specials, for the urban district council.—Mr. T. J. Moss-Flower, 28 Victoria-street, Westminster, and Carlton Chambers, Bristol.

KIRKCALDY.—June 5th.—For supplying cast-iron pipes and special castings, for the District Committee.—Messrs. J. and O. Leslie & Reid, 72A George-street, Edinburgh.

MADRAS.—June 17th.—For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer, and Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

Roads.

SOYLAND.—June 1st.—For the supply of broken blue rock, for the urban district council.—Mr. W. Whitehead, surveyor, Ripponden, Yorks.

PONTYPRIDD.—June 1st.—For the execution of private street work, for the urban district council.—Mr. W. E. Lowe, engineer and surveyor.

FOOTS CRAY.—June 2nd.—For laying Durax or other approved granite sett paving, for the urban district council.—Mr. W. A. Farnham, engineer and surveyor.

GELLYGAER.—June 2nd.—For tar-spraying 2½ miles of roads, for the urban district council.—Mr. F. Head, engineer and surveyor.

LLANDAFF.—June 2nd.—For work of road widening, for the rural district council.—Mr. J. Holden, surveyor, 20 Park-place, Cardiff.

HOVE.—June 3rd.—For paving and other works, for the corporation.—Mr. H. H. Scott, borough surveyor.

GLAMORGAN.—June 3rd.—For road widenings and diversions, for the county council.—County Hall, Cardiff.

SEFTON.—June 3rd.—For the supply of road materials and carting, for the rural district council.—Mr. H. P. Cleaver, clerk, Broughton-terrace, West Derby-road, Liverpool.

EDINBURGH.—June 4th.—For asphalt paving works, for the corporation.—City Road Surveyor, City Chambers.

BLYTH.—June 4th.—For making up certain streets, for the urban district council.—Mr. R. Grieves, surveyor.

STANLAND.—June 4th.—For paving and sewerage works, for the urban district council.—Messrs. Jackson & Fox, surveyors, 7 Rawson-street, Halifax.

MALDON.—June 4th.—For the supply and delivery of broken granite and flints, also for steam rolling, for the corporation.—Mr. T. R. Swales, borough engineer.

MIRFIELD.—June 5th.—For making up a road, for the urban district council.—Mr. E. Gill, surveyor.

BARNSTAPLE.—June 5th.—For the purchase of a 12-ton steam roller with scarifier.—Mr. E. Y. Saunders, borough surveyor.

ABERSYCHAN.—June 6th.—For the execution of a road improvement, for the urban district council.—Mr. E. Whitwell, surveyor.

ROMSEY.—June 6th.—For the hire of two 10-ton steam rollers, for the rural district council.—Mr. C. W. P. Dyson, district surveyor.

WARRINGTON.—June 8th.—For 400 tons of tarred macadam and 1,000 yds. of 18-in. stoneware pipes, for the corporation.—Borough Surveyor.

MANCHESTER.—June 8th.—For road reconstruction in granited rock asphalt, and other works, for the corporation.—Surveyor to the Withington Committee, Town Hall, West Didsbury.

SELBY.—June 8th.—For making a street and sewer, for the urban district council.—Mr. Bruce Gray, surveyor, New-lane, Selby.

TANGIER.—June 8th.—For the construction of about 10 miles of road, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

SUTTON-IN-ASHFIELD.—June 8th.—For making up twelve streets, for the urban district council.—Mr. W. Burn, surveyor.

LEWISHAM.—June 9th.—For making up certain roads, for the borough council.—Borough Surveyor.

ILFORD.—June 9th.—For paving with granite setts, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

HORNSEY.—June 10th.—For making good a certain road, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

ST. HELENS.—June 10th.—For tar macadamising a road, for the corporation.—Mr. A. W. Bradley, borough engineer.

RYTON.—June 10th.—For road construction works, for the urban district council.—Mr. John P. Dalton, surveyor.

HASTINGS.—June 12th.—For steam rolling certain roads, for the rural district council.—Mr. D. Paine, district surveyor, Stonelynk Farm, Fairlight.

RUNCORN.—June 15th.—For the supply of granite macadam, setts, kerbstones, and sanitary pipes, for the rural district council.—Mr. G. F. Ashton, clerk.

WANDSWORTH.—June 15th.—Tenders are invited for the purchase of the following disused rolling stock—viz.: Seven water vans, and two water carts.—Mr. P. Dodd, borough engineer, 215 Balham High-street, London, S.W.

EPSOM.—June 16th.—For making up Leigh-road, School-road and Spencer-road, for the rural district council.—Mr. T. E. Ware, surveyor of highways, Waterloo-road, Epsom.

LEWES.—June 19th.—For road rolling and the supply of 600 tons of 2-in. broken granite and 600 tons of broken surface-picked flints, for the corporation.—Borough Surveyor.

LARNE.—June 25th.—For the construction of a new street, for the urban district council.—Mr. W. G. Younge, clerk.

Sanitary.

WARWICK.—June 1st.—For the construction of manholes, chambers, sedimentation and storm-water tanks, and other works, for the corporation.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

GELLYGAER.—June 2nd.—For the construction of sewers, for the urban district council.—Mr. F. Head, engineer and surveyor, Hengoed Glam.

GELLYGAER.—June 2nd.—For works of sewerage, for the urban district council.—Mr. F. Read, engineer and surveyor, Hengoed, Glam.

EPSOM.—June 2nd.—For the removal of house refuse, for the rural district council.—Mr. F. A. Pratley, surveyor.

HUNSLET.—June 2nd.—For the extension and alteration of sewage works, for the rural district council.—Messrs. C. H. Marriott, Son & Shaw, engineers, Church-street Chambers, Dowsbury.

KENT.—June 3rd.—For constructing drainage work and connections at a school, for the county council.—Mr. P. Harman, correspondent to the Education Committee, 2 Rosslyn-villas, Holloway, Regent's Park.

NORTH DUBLIN.—June 3rd.—For the construction of sewers and water mains, for the rural district council.—Mr. P. H. McCarthy, 39 Westmorland-street, Dublin.

ESHER AND THE DITTONS.—June 3rd.—For laying (No. 1) a 12-in. cast-iron sewer about 730 ft. long, and (No. 2) a 9-in. stoneware pipe sewer about 380 ft. long, for the urban district council.—Mr. H. C. Fread, engineer and surveyor.

HAMPSHIRE.—June 3rd.—For the construction of a surface-water drain, for the county council.—Mr. W. J. Taylor, county surveyor, The Castle, Winchester.

HIGHAM FERRERS.—June 8th.—For the construction of sewage disposal works, for the corporation.—The Surveyor.

KEIGHLEY.—June 8th.—For the construction of a 12-in. pipe sewer, for the corporation.—Borough Engineer.

BLAYDON-ON-TYNE.—June 9th.—For scavenging work, for the urban district council.—Mr. R. Biggins, sanitary inspector.

SOUTHALL-NORWOOD.—June 9th.—For laying concrete surface-water sewers, manholes, and appurtenant works, for the urban district council.—Mr. R. Brown, engineer, Town Hall.

LANCHESTER.—June 10th.—For constructing sewers and manholes, for the rural district council.—Mr. J. R. Lupton, surveyor.

HALE.—June 10th.—For the conversion of thirty-nine privies into water-closets, for the urban district council.—Mr. G. F. Bulmer, sanitary inspector.

GOOLE.—June 10th.—For the construction of branch sewers and connections consisting of about 6 miles of stoneware pipe sewers, with manholes and appurtenances, for the urban district council.—Mr. Robert Tyson, clerk.

BURY.—June 11th.—For the construction of brick sewer, and reconstruction of manholes, for the corporation.—Mr. J. A. Settle, borough engineer.

HAYES.—June 13th.—For the construction of sewerage at Yeading, for the urban district council.—Mr. D. C. Fidler, engineer and surveyor.

HENDON.—June 15th.—For works of sewage disposal and sewerage, for the urban district council.—Mr. S. S. Grimley, Council Offices.

MANCHESTER.—June 15th.—For the construction of main drainage work No. II. (2), Gorton intercepting sewer, for the Rivers Committee.—City Surveyor.

LIVERPOOL.—June 16th.—For the construction of a main sewer, known as the northern outfall sewer, between Brasenose-road, Kirkdale, and the existing Walton outfall sewer, on the Walton Hall estate, for the Health Committee.—City Engineer.

MATLOCK.—June 22nd.—For the completion of the main sewerage, consisting of main outfall and subsidiary sewers of earthenware, steel and cast-iron pipes, with manholes, ventilation and flushing tanks, for the urban district council.—Messrs. J. Diggle & Son, engineers, 14 Victoria-street, Westminster, S.W.

Stores.

CHURCH.—June 1st.—For the supply of road materials, sanitary pipes, gullies, manhole covers, lamphole covers, street grids, manhole step-irons, disinfecting powder, disinfecting fluid, brooms, pitch and creosote oil, for the urban district council.—Mr. J. B. Fallowfield, surveyor.

PAIGNTON.—June 5th.—For the supply of coal, coke, granite, lamp columns, gully gratings, oil, firewood, and other articles, for the urban district council.—The Surveyor.

CLECKHEATON.—June 10th.—For the supply of granite, dress, cement, cartage, stoneware pipes, kerbs, setts, fodder, tar, pitch and oil, for the urban district council.—Mr. John H. Linfield, clerk.

Miscellaneous.

WARWICK.—June 1st.—For the supply of electric motors, centrifugal pumps, switchgear, automatic control apparatus, pipes, and valves, at the L nbridge pumping station, for the corporation.—Messrs. Dodd & Dodd, County Chambers, Corporation-street, Birmingham.

MADRAS.—June 1st.—For the supply of two petrol-driven motor fire engines, for the corporation.—Mr. James R. Coats, engineer.

RHONDDA.—June 5th.—For laying out a cemetery, for the urban district council.—Mr. E. Taylor, acting engineer and surveyor.

WEYBRIDGE.—June 8th.—For the supply of a motor fire engine, for the urban district council.—Mr. Robert Ellwood, clerk.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance. ‡ Provisionally accepted.

ABERDEEN.—Accepted for the construction of a reinforced concrete roof and contingent works at a reservoir, for the corporation.—Water Engineer, Aberdeen: W. Tawse, Aberdeen, £12,897.

ALDERSHOT.—For the supply of 100 tons of 2½-in. basalt, 200 tons of slag tar-macadam, 130 tons of ¾-in. and 1½-in. limestone tar-paving, and 1,750 yds. of 2½-in. Hungry Hill flints, for the urban district council.—Mr. F. C. Uren, surveyor:

	TAR-MACADAM.	
	2½ in.	Per ton.
J. Oakes & Co., Alfreton Ironworks, Derbyshire	s. d.	18 9
Claridge's Patent Asphalt Company, London	17 10	18 4
J. Smart & Son, Walsall	17 7	17 7
Tarmac, Limited, Wolverhampton	17 7	17 7
Tytherington Stone Company, Falfield, R.S.O., Glos.	16 9	17 9

	TAR-PAVING SUPPLY.		
	1½ in.	¾ in.	Limestone grit.
Buxton Lime Firms, Buxton, Derbyshire	s. d.	s. d.	s. d.
Reed & Son, Gurney Shade, near Bath	19 6	21 6	15 7
Tytherington Stone Company, Falfield, R.S.O., Glos.	17 8	18 8	9 4
F. Holson & Son, Nottingham	17 2	18 8	—
J. Greatorex & Son, Matlock	16 5	18 5	13 8
J. Wainwright & Co., Shepton Mallet	15 8	16 8	9 4

TOOLS.
 Strapped Navy Shovels, No. 3, with riveted eye handles.—Stephens & Johnson, Aldershot, 30s. 6d. per dozen; F. Bird & Co., 27s. 6d. per dozen.
 Solid Steel Shovels, No. 8, and riveted eye handles.—Stephens & Johnson, Aldershot, 25s. per dozen; F. Bird & Co., 15s. 6d. per dozen.
 Pick Handles.—Stephens & Johnson, Aldershot, 6s. 6d. per dozen; F. Bird & Co., 6s. 9d. per dozen.
 Stone Hammers.—Stephens & Johnson, Aldershot, 6½d. per lb.; F. Bird & Co., 4d. per lb.
 Scavengers' Brooms.—Stephens & Johnson, Aldershot, 29s. 6d. per dozen; F. Bird & Co., 25s. 9d. per dozen.
 Broom Handles.—Stephens & Johnson, Aldershot, 4s. 3d. per dozen; F. Bird & Co., 4s. per dozen.
 Extra Strong Galvanised Buckets.—Stephens & Johnson, Aldershot, 24s. 6d. per dozen; F. Bird & Co., 17s. 6d. per dozen.
 Heavy 4-prong Trenching Fork, with riveted eye handle.—Stephens & Johnson, Aldershot, 39s. 6d. per dozen; F. Bird & Co., 25s. per dozen.
 Mud Scoops.—Stephens & Johnson, Aldershot, 15s. per dozen; F. Bird & Co., 26s. 6d. per dozen.
 Gully Scoops.—Stephens & Johnson, Aldershot, 36s. per dozen; F. Bird & Co., 60s. per dozen.
 Picks (steel tipped), solid eye road.—Stephens & Johnson, Aldershot, 26s. 9d. per cwt.; F. Bird & Co., 23s. 6d. per cwt.

2½-IN. RED HUNGRY HILL GRAVEL.
 Fleet-road.—W. Norris, Farnham, 5s. 4d.; Lampport & Son, Farnham, 5s. 2d.
 Cambridge-road.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, Farnham, 5s. 9d.
 Barrack-road.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, Farnham, 5s. 9d.
 Herrett-street.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, Farnham, 6s.
 King's-road.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, Farnham, 6s.
 Sandford-road.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, 6s.
 Frederick-street.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, Farnham, 6s.
 Heathland-street.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, 6s.
 Alexandra-road.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, 6s.
 Ayling-lane.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, 6s.
 Lower Farnham-road.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, 6s.
 Cemetery-road.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, 6s.
 Church-hill.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, 6s.
 Church-lane.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, 6s.
 The Grove.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, 6s.
 North-lane.—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, 6s.
 Stock (in council's yard).—W. Norris, Farnham, 4s. 11½d.; Lampport & Son, 6s.

CEMENT.
 Hinckley & Co., Aldershot.—36s. 6d. per ton.
 Lewes Portland Cement and Lime Company, Lewes.—35s. 6d. per ton.

British Portland Cement Manufacturers, London.—35s. 5d. per ton.
 Wiggins & Co., London.—33s. 7d. per ton.
 2½-IN. BROKEN GRANITE.
 Croft Granite Company, Limited, Croft, near Leicester.—15s. 2d. per ton.
 Tytherington Stone Company, Falfield, R.S.O., Glos.—15s. 1d. per ton.
 Enderby and Stoney Stanton Granite Company, Narborough.—14s. 11d. per ton.
 F. Hodson & Son, Nottingham.—14s. 8d. per ton.
 British Macadams, Limited, London.—14s. 7d. and 14s. 1d. per ton.
 Field & Mackay, Limited, Clee Hill.—14s. 1d. per ton.
 H. L. Cooper & Co., London.—14s. 1d. per ton.
 Clee Hill Dhu Stone Company, Ludlow.—14s. 1d. per ton.
 Johnston Brothers, London.—13s. per ton.
 Roadstone Supply Company, Shepton Mallet.—12s. per ton.
 Road Maintenance and Stone Supply Company, London.—Unpriced.

BRIDGWATER.—For pulling down existing buildings, and erection of coach-house, lairage, slaughter-house, and offices, for the corporation.—Borough Surveyor:—

ALTERATIONS	
T. Stockham, Bridgwater	£889
C. C. Bird, Bridgwater	870
C. Bryer, junr., & Co., Bridgwater	845
A. Geen, Bridgwater	839
S. Palmer, Bridgwater	836

PAINTING.	
H. Bell & Son, Bridgwater	£77
C. Bryer, junr., & Co., Bridgwater	70
T. Stockham, Bridgwater	65
F. Brown, Bridgwater	57

CARLISLE.—For alterations to buildings, for the corporation.—Mr. H. C. Marks, city engineer and surveyor:—

G. Black, Carlisle	£823
J. Laing & Sons, Carlisle	782
J. & R. Bell, Carlisle	740
J. Logan, Carlisle	730
T. Dowell & Son, Carlisle	729
E. J. Hill, Carlisle	727

FINSBURY.—For paving work with creosoted deal on Portland cement concrete, for the borough council. Mr. P. G. Killick, borough surveyor:—

3-in. by 4-in. by 8-in. Creosoted Deal Paving on 6-in. Portland Cement Concrete, Covercross-street (part of).—G. J. Anderson, Poplar, 13s. 2d.
 Turnmill-street and part of Covercross-street.—G. J. Anderson, Poplar, 12s. 9d.
 Allowance for old stone, 1s. 7d. per yard.

FOOTS CRAY.—For the erection of council offices, for the urban district council.—Mr. W. A. Farnham, surveyor:—
 BUILDING, HEATING SCHEME "B," AND AMERICAN WHITEWOOD.

C. E. Skinner & Son, Chatham	£2,570
J. W. Ellingham, Dartford	2,416
A. Morris Fenn, Woolwich, S.E.	2,356
H. T. Vaughan, Plumstead, S.E.	2,333
W. F. Blay, Limited, Dartford	2,300
Friday & Ling, Erith	2,278
Thomas & Edge, Woolwich, S.E.	2,257
H. Somerfeld & Son, Clapham, S.W.	2,251
F. Webster & Son, East Dulwich, S.E.	2,133
T. M. Brightling, Sidcup	2,073

HOLMFIRTH.—For the construction of sewers and man-holes, for the urban district council.—Messrs. J. Barrow-clough & Son, engineers:—
 S. & S. Sykes, Golcar £2,190
 A. Graham, Huddersfield 1,975
 R. Turner, Holmfirth 1,859
 W. Waring & Sons, Huddersfield 1,659
 Wagstaff & Turner, Holmfirth 1,649
 E. Gill, Holmfirth 1,490

HERTS.—For the erection of a school at Fleetville, for the county council.—Mr. Urban A. Smith, county surveyor, Hatfield:—

Peppiatt & Cooper, London	£2,273
Blow & Peters, St. Albans	2,120
C. B. King, Limited, Hampstead	2,109
T. Bow, Nottingham	1,894
Miskin & Son, St. Albans	1,863
Hacksley Brothers, Wellingborough	1,862
Ekins & Co., Hertford	1,790
Brown & Son, Wellingborough	1,788
Henson & Son, Wellingborough	1,728

HOLYWOOD (Ireland).—For the supply of road metal and screenings, for the urban district council:—

J. Boyd, Holywood, Co. Down. 1s. 6d. per ton for 2½ in., and 4s. 3d. for other and screenings; roller, 28s. 6d. per day.	
M. Gill, Newtonards, Co. Down. 4s. 10d. per ton for all, and 23s. 6d. per day for roller.	

HORNCastle.—Accepted for the supply of materials, for the urban district council.—Mr. F. Weeber, surveyor, Horncastle:—

Ellis & Everard, Leicester.—280 tons of Bardon Hill granite, 13s. 3d. per ton.
 Groby Granite Company, Leicester.—60 tons of Groby granite, 12s. 9d. per ton, and 220 tons of Groby granite, 12s. 7d. per ton.
 Contract and Works Supply Company, Scunthorpe.—115 tons of slag, 6s. 6d. per ton.
 E. P. Davis, Bonnerley.—90 tons of slag chippings, 7s. 4d. per ton.

NEWPORT (Mon).—For the construction of stoneware pipe and cast-iron pipe sewer, for the corporation.—Mr. H. Tremelling, borough engineer:—

W. E. Evans, Skinner-street, £598.

PAIGNTON.—For laying cast-iron water mains, with connections, for the urban district council. The Water Engineer, Town Hall:—

G. Pollard & Co., Taunton, £138.

RAWTENSTALL.—Accepted for paving and sewerage certain streets, for the corporation.—Mr. J. Johnson, borough surveyor:—

J. R. Crisp, Stalybridge.

SAMFORD.—For constructing a water supply, for the rural district council.—Mr. H. J. Wright, architect, Ipswich:—

Sheldrake & Son, Hornsea	£215
W. T. Wheeler, East Berylholt	215
A. Dunningham, Raydon, West Hadleigh	208
Engineer's estimate.	£215.

SHREWSBURY.—Accepted for providing and laying 130 lin. yds. of 9-in. cast-iron pipes, with manholes, for the corporation.—Mr. A. W. Ward, borough surveyor:—

H. Price, Shrewsbury, £256.

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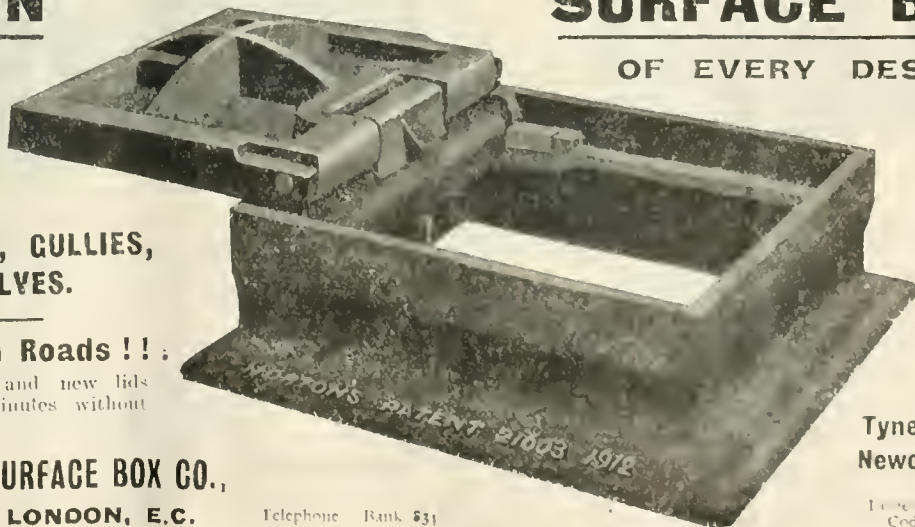


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MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JUNE.

- 5-6. Institution of Municipal and County Engineers: Meeting in Dunfermline.
 6.—Institution of Municipal and County Engineers: Meeting at Southend.
 11-13.—Institution of Water Engineers: Summer Meeting at Stockport.
 13.—Institution of Municipal Engineers: Western District Meeting at Tisbury. Mr. E. Plummer Davies on "Wiltshire Roads, Past and Present."
 17. Royal Institute of British Architects: Annual Dinner, Hotel Cecil.
 24.—Institute of Sanitary Engineers: Visit to Luton sewage farm. Train from St. Pancras, 2.50 p.m.
 24-27.—Institution of Municipal and County Engineers: Annual Meeting and Town Planning, Housing and Road Conference at Cheltenham.

JULY.

3. Institution of Municipal Engineers: North-Western District Meeting at Manchester.
 4-11.—Royal Sanitary Institute: Annual Congress and Exhibition at Blackpool.
 6-10.—Institution of Mechanical Engineers: Summer Meeting in Paris.

SEPTEMBER.

26. Institution of Municipal and County Engineers: Meeting at Scarborough.

TENDERS WANTED.

WEYBRIDGE URBAN DISTRICT COUNCIL.
TENDERS FOR MOTOR FIRE ENGINE.

The Weybridge Urban District Council invite Tenders for the Supply of a Motor Fire Engine.

Copies of the Specification can be obtained on application to the undersigned.

Tenders to be sent in, marked "Tender for Motor Fire Engine," to me not later than June 8th, 1911.

ROBERT ELLWOOD,
Clerk

Council Offices,
Weybridge.

May 26, 1911.

(1.6-2)

(Continued on p. xxii.)

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

HUNGERFORD RURAL DISTRICT COUNCIL.

APPOINTMENT OF SEWAGE WORKS MANAGER.

The above Council invite applications for the post of Sewage Works Manager.

Applicants must have had previous experience in the working of Air Compressors and Ejectors.

Wages 35s. per week.

Applications, with not more than three copies of testimonials, to be sent to the undersigned not later than the 14th June, 1911.

W. STEPHENSON RAINE,
Engineer and Surveyor.

Hungerford.

May 25, 1911.

(1.616)

DEVON COUNTY COUNCIL.
RECONSTRUCTION OF EMBERLEIGH BRIDGE.

Wanted, a thoroughly competent Clerk of Works. Applicants will only be considered from those applicants who are experienced in Reinforced Concrete Construction, and should be accompanied by three recent testimonials, to reach the undersigned on or before Wednesday, 3rd June, 1911.

(Signed) C. CURTIS GRAY.

(Acting) County Surveyor
(No. 1 Division).

The Square, Barnstaple.

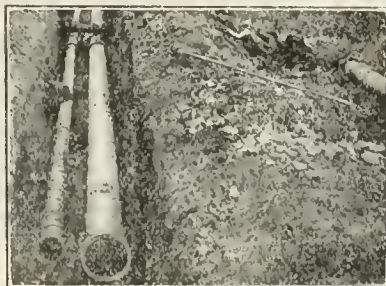
(1.651)

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SILVER MEDAL.

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

JUNE 5, 1914.

No. 1,168.

Minutes of Proceedings.

Working-class Accommodation in Greater London.

A return designed to show the amount of housing for persons of the working class that was provided during the year 1912 in London and the districts in the neighbourhood within the area of Greater London has been issued by the London County Council. Similar returns have been prepared since 1902, but in previous years these did not relate to the whole of Greater London. From 1902 to 1905 only thirty extra metropolitan districts were included, and this number was increased in 1906 to forty-three. The present return comprises the twenty-eight metropolitan boroughs, the City of London, and in Extra London two county boroughs, seven municipal boroughs, sixty-two urban districts, and fifty-six parishes in rural districts. For the first time on record, there has been a net reduction in the number of working-class rooms provided in the county at large, the 4,167 rooms provided in new houses being more than counterbalanced by 6,790 rooms in houses demolished, the net loss of accommodation being 2,623. Compared with this loss of 2,623, the average number of rooms provided during the first five years for which information is available—namely, 1902 to 1906—was 17,372. In 1912 some addition was made to working-class accommodation in nine metropolitan boroughs, but the only metropolitan boroughs where any material amount of additional housing was provided during the year are Wandsworth, Fulham, Woolwich, Lewisham, and Hammersmith, and in each case the numbers are far less than those for the period 1902-6. It appears that the additional housing provided in Fulham in 1912 was almost entirely due to the erection of dwellings by the Peabody Trustees, and that in Hammersmith, to a considerable extent, to the erection of cottages by the London County Council on its Old Oak estate. In Wandsworth, Woolwich, and Lewisham the houses were provided by ordinary commercial operations. No houses of the working class were provided during the year in the City of London and nine metropolitan boroughs—namely, Battersea, Bethnal Green, Chelsea, Finsbury, Hampstead, Holborn, Islington, Paddington, and Stoke Newington. In eleven other metropolitan boroughs, although some new working-class houses were provided, the demolitions exceeded these, so that the amount of accommodation was reduced. A table in the report shows that the net accommodation provided in Extra London has fallen, with great regularity, from 38,473 rooms in 1906 to 10,961 rooms in 1912, and that the fall has extended to every section of the area. It is interesting to note that in central London the accommodation provided in 1912 consisted mainly of two-roomed and three-roomed tenements, in the rest of London of three, four, and five-roomed tenements and cottages, and in

Extra London of four and five-roomed cottages. The average rent per room of the new accommodation provided during the year was: Central area, 3s. 5½d.; rest of London, 2s. 7d.; Extra London, 2s. 3¾d. The high average in the central area is produced by the rents of tenements in certain block dwellings in St. Marylebone and South St. Pancras, and is to some extent due to the fact that each of the tenements in the latter contains a kitchen-scullery which is not counted as a room. Assuming the average in Central London to be represented by 100, the middle zone and the outer zone would be represented by seventy-three and sixty-six respectively. In the outer zone itself there is considerable variation in rents, the governing circumstance being mainly the distance or accessibility from London. In the case of Barking, however, as in past years, rents are exceptionally low—1s. 6½d. per room. That the average rents of four-roomed tenements is slightly higher than the average for five-roomed tenements in Extra London appears to be mainly due to the fact that a considerable number of four-roomed tenements are provided in districts where the rents generally are on a higher level than in other districts, such as Ealing, Willesden, Hendon, and Croydon; that some of the four-roomed tenements are of a particularly good class; and that a considerable number contain a box-room or bath-room or both.

* * *

The announcement of a meeting at Southend, with a paper by Mr. E. J. Elford, M.INST.C.E., the borough engineer, would in itself have been sufficient to insure an interesting meeting and a large attendance to-morrow; and the paper having been already published in the *Journal* of the Institution, there can be little doubt that its perusal will make members all the more anxious to discuss and view the works which the author so clearly and excellently describes. The greater part of the paper is occupied by a description of the main sewerage and sewage disposal works, the necessity for which arose owing to the extraordinary development of the town and increase in the population which occurred after the 1898 installation, which was designed by the late Mr. James Mansergh, M.INST.C.E. The actual population at that time was only 23,000, and it was estimated that this might increase to 40,000 in thirty years. As a matter of fact this number was reached in only six years, and its attainment was followed by the issue of a writ against the corporation by the owner of some oyster layings over 3 miles up the river. The story of this litigation will probably be well remembered by our readers. The Court of first instance not only awarded the plaintiff £1,500 damages, but, what was perhaps more serious,

granted an injunction restraining the corporation from discharging sewage from the outfall complained of. It is true that the injunction was dissolved by the Court of Appeal, but the corporation were heavily mulcted in damages and costs, and being threatened with further proceedings they were compelled to agree with their adversary on somewhat onerous terms, and to undertake the construction of new works. The first scheme proposed was prepared by the late Mr. R. Strachan, M.A.S.T.C.E., but met with violent opposition, and the Bill in which it was embodied was ultimately rejected by the House of Lords' Committee on the ground that it did not include any means for the effective purification of the sewage before discharge. Mr. Elford was then asked to report upon the matter, and he naturally expressed the opinion that the discharge of the crude sewage during the first four hours of the ebb tide into the estuary of the Thames constituted a method of disposal which was at once effective, economical, and free from objection. In support of this view he was able to cite no less an authority than the Fourth Report of the Royal Commission on sewage disposal. Having regard, however, to the experiences of the corporation in the law courts and in Parliament, he felt compelled to advise the adoption of some means of purifying the sewage before discharging it into the estuary. Mr. Elford's report was adopted, and he was instructed to prepare a scheme. After holding a local inquiry, the Local Government Board suggested to the corporation that their proposals, both as regards the construction and the subsequent operation of the works, should be embodied in a special statute, in order to avoid any risk of further litigation. This course was followed, and an Act was obtained which fixed a definite standard of purity for the effluent, and also prescribed the method of taking samples and of examination.

Such is the history of one of the greatest legal struggles with regard to sewage disposal, and the circumstances are of a kind to lend a very special interest to the very clear and complete description of the works embodied in Mr. Elford's paper. Any observations which we may have to make in regard to that part of the paper must, of course, be held over until next week. We may, however, state here that Mr. Elford also deals with other works of interest, including the refuse destructor, esplanade works, swimming bath, loading pier, improvement of the Southend pier, and tramway boulevard. It will be seen therefore that attendance at the meeting at Southend to-morrow should prove both pleasant and profitable to those members who are able to make the journey.

* * *

The Control of Ashpits. Among the smaller matters of sanitary administration which come within the ken of the municipal engineer not the least important is that of the construction and control of ashpits. In another column will be found the first portion of an article in which Dr. R. H. Quine sets forth the powers given to local authorities under the Public Health Acts, and discusses the measure of efficiency with which those powers are being exercised. The provisions of the Public Health Act, 1875, are good enough as far as they go. A careful examination of the Act will enable the reader to discover in various places a series of provisions, not only with regard to the construction, but also as to the repair and maintenance of ashpits, and the prevention of nuisances from dust, ashes, and refuse. As Dr. Quine points out, the intention of the Act is the *prevention* of nuisances from these causes, rather than their abatement. The operation of the Act soon dis-

closed three defects. In the first place it left untouched all those houses which were in existence when it was passed. Again, doubts arose as to the meaning of the word "ashpit," and particularly as to whether it included the light, movable receptacle which is now in general use. Lastly, there was no sufficient control of the occupier so as to compel him to facilitate the work of removal. These defects were dealt with by the Public Health Acts (Amendment) Act, 1890, which provided (a) that by-laws governing the construction and keeping of ashpits could be made to apply to houses erected before 1875; (b) that the term "ashpit" should include every form of receptacle for ashes; and (c) that a local authority might make by-laws imposing duties on occupiers so as to facilitate the collection of house refuse. In considering these amendments—very useful as they no doubt are—it must be constantly borne in mind that the Act of 1890 is an adoptive Act, and is therefore not of general application. Some misapprehension appears to have arisen in certain quarters in regard to the effect of the extended definition of the term "ashpit" just referred to. The exact words of the statute are: "The expression ashpit in the Public Health Acts and in this Act shall, for the purposes of the execution of those Acts and of this Act, include any ashtub or other receptacle for the deposit of ashes, faecal matter, or refuse." It will thus be seen that in those districts to which this definition applies all the provisions of the Public Health Act, 1875, with regard to ashpits are extended to every form of receptacle for ashes, including the movable bin; and the enlarged definition does not merely mean that other receptacles may be used instead of the old ashpit, and free from the control by by-law and otherwise to which the old ashpit was subjected.

There can be no doubt that in the past many sanitary authorities have been not a little remiss in the exercise of their powers in regard to this matter. Now that it is generally known that the place of refuse deposit forms the finest possible breeding ground for flies, and that these insects are expert in the dissemination of the germs of several diseases, the whole question of the storage, collection and destruction of house refuse has assumed a new importance. In the past many authorities have omitted to make by-laws altogether, or have displayed some laxness in their enforcement. Others have not seen fit to adopt the appropriate sections of the Act of 1890, and are in consequence limited as to their power of control by the Act of 1875, the defects in which have been emphasised above. Dr. Quine therefore, in our opinion, does well to call attention to the matter at the present juncture. The precise nature of the functions of the several departments concerned is evidently fair matter for discussion, and no doubt some of our readers will disagree with the opinions which Dr. Quine expresses as to this matter. Nevertheless, all will agree that stricter control is required, by whatever means it may be accomplished.

* * *

Thames Floods. It is now little more than a year ago that Lord Desborough, in a statement made to the Thames Conservancy, indicated that a sectional survey of the river was in progress, and that upon its completion it would be possible to give some details of a scheme by which the water that falls upon the area drained by the Thames could be got to the sea much more quickly than is possible at the present time, with a consequent reduction of flooding. Prior to that time owners of riverside lands which were subject to floods had repeatedly requested that their trouble should receive the earnest consideration of the con-

servators. This consideration has resulted in the issue of a report by Mr. C. J. Griffiths, the engineer to the board, which has aroused the keenest interest of those immediately concerned and of the thousands who use the river for the purposes of pleasure. Briefly, the effect of the report is that, in order to obviate the flooding of 30,000 acres of private land, a sum of over £3,000,000 sterling would have to be expended. The river would require widening to a maximum width of 275 ft. at Teddington, and to a minimum width of 180 ft. at Oxford, while the depths likewise would have to be increased to 12 ft. and 8 ft. at these places respectively. The majority of the islands would have to be removed. The by-pass channels would vary in section from 150 ft. wide by 8 ft. deep to 100 ft. wide by 8 ft. deep, according to gradient and volume. There would be seventeen of these channels between Teddington and Oxford. Nearly all the masonry and arch bridges across the Thames would require rebuilding as well as all the towpath and numerous small bridges along the 95 miles of river. The scheme . . . would necessitate the purchase of upwards of 1,200 acres of land, the excavation of some 12,000,000 cub. yds. of material, and its disposal in bank formation and spoil grounds. . . . The question of mill rights would have to be dealt with.

The report may perhaps best be regarded as a reply to complaints, rather than as embodying a scheme which is put forward as a practical proposal. It is perfectly clear that the execution of the works outlined above would completely destroy the amenities of the river, which form such a large factor in the maintenance of the prosperity of many of the towns on its banks. It is unfortunate that the prevention of the floods is such an expensive matter and would involve wholesale vandalism. On the whole we think that public opinion will incline to the view that it is preferable to have the river as at present including the floods!

* * *

**Staffordshire
By-ways:
Footpaths and
Bridle Roads.**

The excellent work performed by the North Staffordshire Field Club in the interpretation of the topographical history of the county, and in maintaining public interest in its natural features and its antiquities, is, no doubt, well known to the surveyors to local authorities in that part of the North Midlands. Always alive to the importance to the public of the preservation of the minor highways and by-ways of Staffordshire, the Field Club has recently taken the step of inviting surveyors to show on their ordnance maps the public footpaths and bridle roads in their districts, and the district council of Stone has already authorised the marking of these rights of way on their ordnance sheets. It is, of course, one of the ordinary duties of a surveyor to prepare for his council reports as to the facts in connection with public rights of way, and the particular merit of the present proposal is, clearly, that it would provide for comprehensive schedules of such paths and roads being made, once for all, in each district. The expression "once for all" applies, of course, only to existing rights of way, and it must be recognised that paths and roads may become rights of way in the future in the same way as in the past. The scheme is supported by the influential local paper the *Staffordshire Advertiser*, though that journal believes that to act on the advice of the Field Club may result in a crop of litigation—a view expressed by Mr. C. J. Blagg, a solicitor well known in the county. Such litigation as is necessary to secure public rights may, however, be faced with courage, and with the conviction that the law is meant to be used for rightful purposes, and is not, as a Devonshire man would say, useful

only in "hookem-snivey" dealings. The law may be a "hass," but if so it is, in this respect, the daps of a good many individuals.

* * *

**Tests for
Coal-tar Creosote.**

The practical value of materials of certain classes often depends upon the presence, and in other cases the absence, of small proportions of particular substances, and it is therefore important that we shall be provided with the means of making tests by which the proportion of the favourable or unfavourable ingredient may be readily and truly determined before we make use of a consignment of such a material. Creosote is a material of this character, and it is essential to have reliable tests of its composition, and desirable that such tests shall be simple, and easily made. A paper on "Paraffin Bodies in Coal-tar Creosote, and their Bearing on Specifications" was read before the American Association for the Advancement of Science last January by Mr. S. R. Church and Mr. J. M. Weiss, research chemists to the Barrett Manufacturing Company, and we are able, through the courtesy of Prof. Arthur Blanchard, to reproduce the paper in to-day's issue. The considerations put forward in this paper seem to be of a very practical kind, and, as regards the comparison between the dimethyl sulphate method and the sulphonation method, the objections to the use of the former material are of practical importance, especially to those who make tests from time to time with simple and inexpensive apparatus and without the advantages of a well equipped laboratory. The authors' view as to the limitations of the sulphonation test with respect to the presence of oils of petroleum origin may perhaps be unacceptable to some chemists, but it seems to be based on the results of a considerable number of tests.

* * *

**The Melting Points
and Viscosities
of Refined Tars.**

In a short paper, which is reproduced on another page, some interesting data are presented, showing the relations between viscosities, melting points, and free carbon contents of refined tars. This paper, by Mr. P. P. Sharples, chief chemist of the Barrett Manufacturing Company, of New York, was read at a meeting of the American Association for the Advancement of Science, and was intended to bring out practical points relating to the drawing up of specifications. The figures are valuable, not only as throwing light upon the text of the paper, but also as a part of the data of the subject, and we are glad to avail ourselves of the opportunity of placing them before our readers. Any authentic information as to the properties of refined tars is welcome at the present time, and there is no property of tar more important than its viscosity, assuming that the material is stable under traffic and weather conditions.

* * *

**Motor Omnibuses
and
Special Road Tolls.**

Owing to the importance of the principle involved, the fate of clause 25 of the Bill promoted by the Middlesex County Council for the making of the new western approach road to London is being awaited with much interest. The opinions which we ventured to put forward on this matter have been quoted by a considerable number of journals. With a full sense of responsibility for the arguments which we adduced, and for the conclusions which we drew from them, we find, on going through our article, that we have nothing to add and nothing to take away from our presentment of the case, and those of our readers who are interested in the matter may, therefore, be referred to our issue of May 15th, page 793.

Wood Bridge, Guildford.

REINFORCED CONCRETE REPLACES MASONRY.

Interesting particulars of a reinforced concrete bridge which the Surrey County Council, acting upon the advice of the county engineer, Mr. A. Dryland, ASSOC. M. INST. C. E., have erected in place of a masonry structure spanning the river at Guildford, appear in the May issue of "Kahncrete Engineering," a bi-monthly, which, as its name implies, is concerned with reinforced concrete work on the well-known Kahn system.

The clear span between the abutments of the new bridge is 70 ft., and the width between the parapets is 40 ft., made up of two 6-ft. 6-in. footpaths and a 27-ft. roadway. Arch ribs spaced at 5 ft. centres support the decking slab, one rib being under each parapet and two ribs being placed close together at the centre of the structure. This arrangement allows one-half of the bridge to be constructed without having to divert the traffic.

The bridge had to be designed to carry a test load consisting of three 20-ton traction engines in a train travelling over the bridge, in addition to the dead load of the structure. The train was placed in a

taken—(a) with the dead load on one-half the span, and dead and live load on the other half, to arrive at the maximum bending moment (which now occurs at the abutment), and (b) the live and dead load over the whole span to ascertain the maximum thrust of the rib. These diagrams are also shown.

The arched ribs, which are 20 in. by 12 in. at the crown and 60 in. by 12 in. at the abutments, are reinforced with Kahn trussed bars and Kahn rib bars of sufficient sectional area to resist the maximum bending moments given by the two diagrams; thus, the area of steel at the quarter points of the arch is determined from the bending moment derived from the three-hinged diagram, and the area of steel at the abutment is determined from the bending moment given by the fixed end diagram. The general arrangement and details of the reinforcement are clearly shown in the diagrams.

Considerable difficulty was experienced in providing satisfactory foundations to the abutments. The ground under the abutments was of poor pressure-bearing quality, and 12-in. by 12-in. "Kahn"



WOOD BRIDGE, GUILDFORD.

position which caused a maximum bending moment on the span, and a uniformly distributed load was calculated which would produce an equal bending moment. This uniform load worked out at 200 lb. per square foot, which is the load per square foot for main road bridges recommended by various authorities on arched bridge design.

In the preliminary stages the arched ribs were treated as being of the three-hinged type, assuming a hinge at each abutment and another hinge at the crown. The span was divided into equal panels, and the load on each panel point calculated on the assumption that the live load extended over one-half the span, this being the loading which would produce the maximum bending moments in the rib. This diagram is shown herewith, together with the diagrams of stresses produced at various sections of the rib.

The design was checked on the assumption that the ribs were fixed at the ends to the abutment buttresses—that is, on the elastic theory without any hinges. A diagram was drawn for this type of arch based upon Prof. Landsberg's "Method of the Reaction Locus." The centre line of the rib is divided into panels in such a way that the length of the panels divided by the average amount of inertia in that panel is constant. For all practical purposes the moment of inertia is taken on the section of the concrete neglecting the reinforcement. Since the rib reduces the depth from the abutment to the crown the length of the panels, and therefore the load on the panels decreases from the abutment to the centre of the span. Two systems of loading were

piles, 22 ft. long, six to each rib buttress, were driven to assist in taking the pressures. Several of the piles could not be driven in their true positions owing to the presence of the foundations of the old bridge. Finally, a very thick, heavily reinforced slab was put in between the rib buttresses over the existing foundations. This treatment has proved to be entirely satisfactory. The fronts of the buttresses are connected by a reinforced concrete wall, 5 in. thick at the top, to 7 in. thick at the bottom, reinforced with $\frac{1}{2}$ -in. Kahn rib bars 12 in. to 6 in., centres to form a retaining wall for the earth-filling over the abutments.

The centering of the ribs was of special design, as a clearway 16 ft. wide and 7 ft. 6 in. high above summer water-level had to be provided in order that the river traffic should not be stopped for any period of the work. The concreting of the arched ribs was commenced simultaneously at each end of the rib in order not to put undue tendency to deformation on the centering and the rib, and the decking slab was cast in one operation for one-third its length from each abutment for one day's work. The work was stopped on a plane approximately normal to the centre line of the rib, and the joint at the commencement of the next day's work was carefully cleaned and coated with cement grout to key the new work with that already cast. The arch ribs are stiffened laterally by seven 12-in. by 10-in. braces reinforced with four $\frac{1}{2}$ -in. Kahn rib bars, bound together with $\frac{3}{8}$ -in. diameter ties at 9-in. centres. The decking slab is designed to carry the 7½-ton back wheel load of a 20-ton road engine.

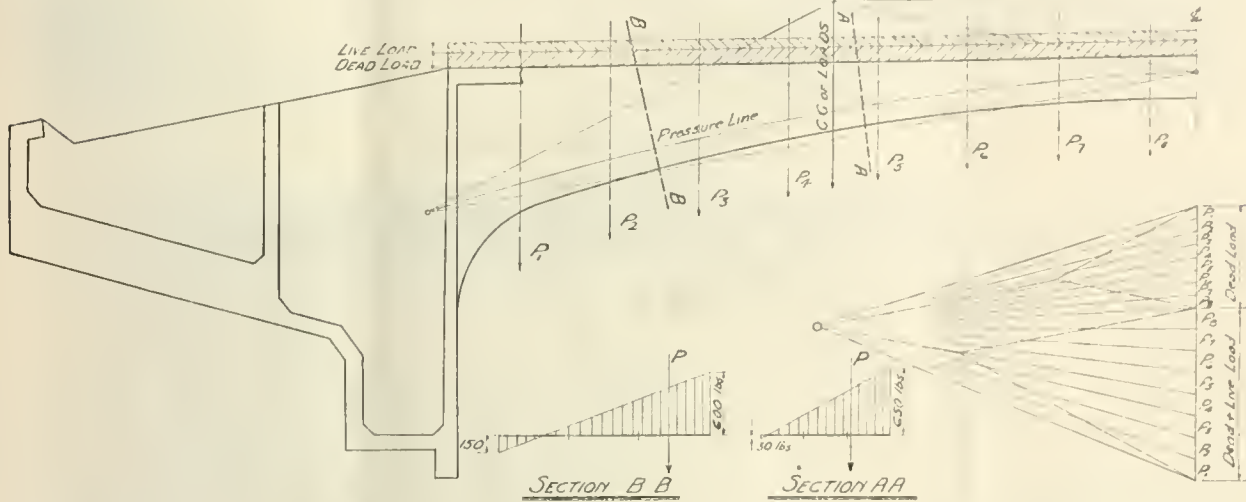
This is assumed to rest on a strip of wheel tyre 24 in. wide and 6 in. long. The load is then spread at an angle of 45 deg. in all directions through the 6 in. thick wood block and foundation material so that the area covered by the load is 3 ft. by 1 ft. 6 in. The bending moment due to the weight of the roadway material and the weight of the concrete slab is added, and the whole moment is resisted by a 9-in. thick slab reinforced with $\frac{1}{2}$ -in. Kahn trussed bars spaced 7 $\frac{1}{2}$ -in. centres, allowance being made for the continuous action of the slab, for which $\frac{1}{2}$ -in. Kahn trussed bars spaced at 12 in. apart are provided.

Three-eighths-in. Kahn rib bars, one to each bay of slab, are provided to act as temperature and dis-

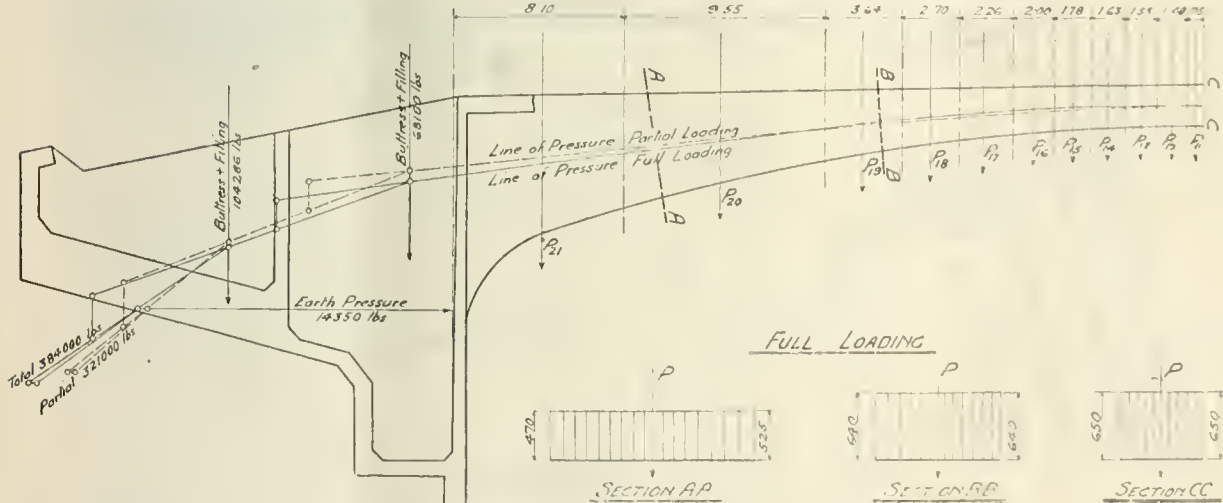
The outside ribs of the bridge are carried to a level of about 12 in. above the footpath, and have a moulded string course on the outside to give relief to the elevation. The abutment piers are relieved by panels and have moulded caps. The parapet is formed of cast concrete balusters, in each of which was cast a Kahn rib bar projecting at each end to form a secure connection with the weathered moulded coping, which was cast in position, having expansion joints about 30 ft. apart. The proportions of the balusters were taken from balusters on another bridge under the county engineer's contract by means of a plaster cast.

The bridge was opened for traffic by Mr. A. C.

STRESS DIAGRAM FOR THREE-HINGED ARCH



STRESS DIAGRAM FOR ELASTIC ARCH WITH VARYING MOMENT OF INERTIA



STRESS DIAGRAMS FOR WOOD BRIDGE, GUILDFORD.

tribution bars. The decking slab was cast at the same time as the arch rib, and was stopped at the end of each day's work against a straight vertical screed board which was placed at the centre of the span between the ribs, this being the most satisfactory position for the joint from the point of view of shear resistance and bending moment.

The whole of the concrete for the reinforced work is composed of 9 cub. ft. of clean gravel to pass a $\frac{3}{4}$ -in. screen, but to be retained on $\frac{1}{2}$ -in. screen; 4 $\frac{1}{2}$ cub. ft. of clean, sharp sand, and one bag (224 lb.) of English Portland cement to comply with the British Standard specification for medium setting cement. The reinforcing steel was Kahn trussed bars and Kahn rib bars, supplied by the Trussed Concrete Steel Company, Limited, complying with the standard specification for structural steel.

The road foundation was of mass concrete, laid with a finishing coat to take the 4-in. wood-block paving. The cross-fall of this paving was $\frac{3}{8}$ in. The footpath is paved with 2 in. thick artificial stone paving, with a granite kerb adjoining the roadway.

Pain, the chairman of the Highways and Bridges-Committee, on September 1, 1913, and was tested on November 8, 1913. Deflectometers were placed under the crown of the two ribs on each side of the centre ribs on a temporary scaffolding erected from the river bed. The train of road engines, before described, was then run across the ribs under test in both directions, and also stopped over the crown of the arch and at various other points as directed by the county engineer and the engineer of the Trussed Concrete Steel Company.

The deflection at any position of the loading was practically unmeasurable, amounting to $\frac{1}{8}$ in., which is $\frac{1}{175,000}$ part of the span. The specification stipulated that the deflection under the test load was not to exceed $\frac{1}{1,000}$ part of the span, with a permanent set not exceeding $\frac{1}{2}$ in. at the centre. The allowable deflection was therefore 1 $\frac{1}{4}$ in.

The accompanying photograph shows the bold and artistic outlines of the bridge. Timber guard piles, which were driven on the up and down stream sides of the bridge, although they do not enhance the

appearance, serve the useful purpose of protecting the arch ribs from damage by the collision of barges plying the river.

The whole of the design for the bridge was executed on the Kahn system of reinforced concrete by the Trussed Concrete Steel Company, Limited, Caxton House, Westminster, acting as consulting engineers to the Surrey County Council, and was checked by an independent engineer appointed by the county council, Mr. B. L. Hurst, M. INST. C.E.

ROYAL SANITARY INSTITUTE CONGRESS.

THE MUNICIPAL AND COUNTY ENGINEERS' CONFERENCE.

The conference of engineers and surveyors to county and other sanitary authorities to be held in connection with the forthcoming annual congress of the Royal Sanitary Institute at Blackpool will be

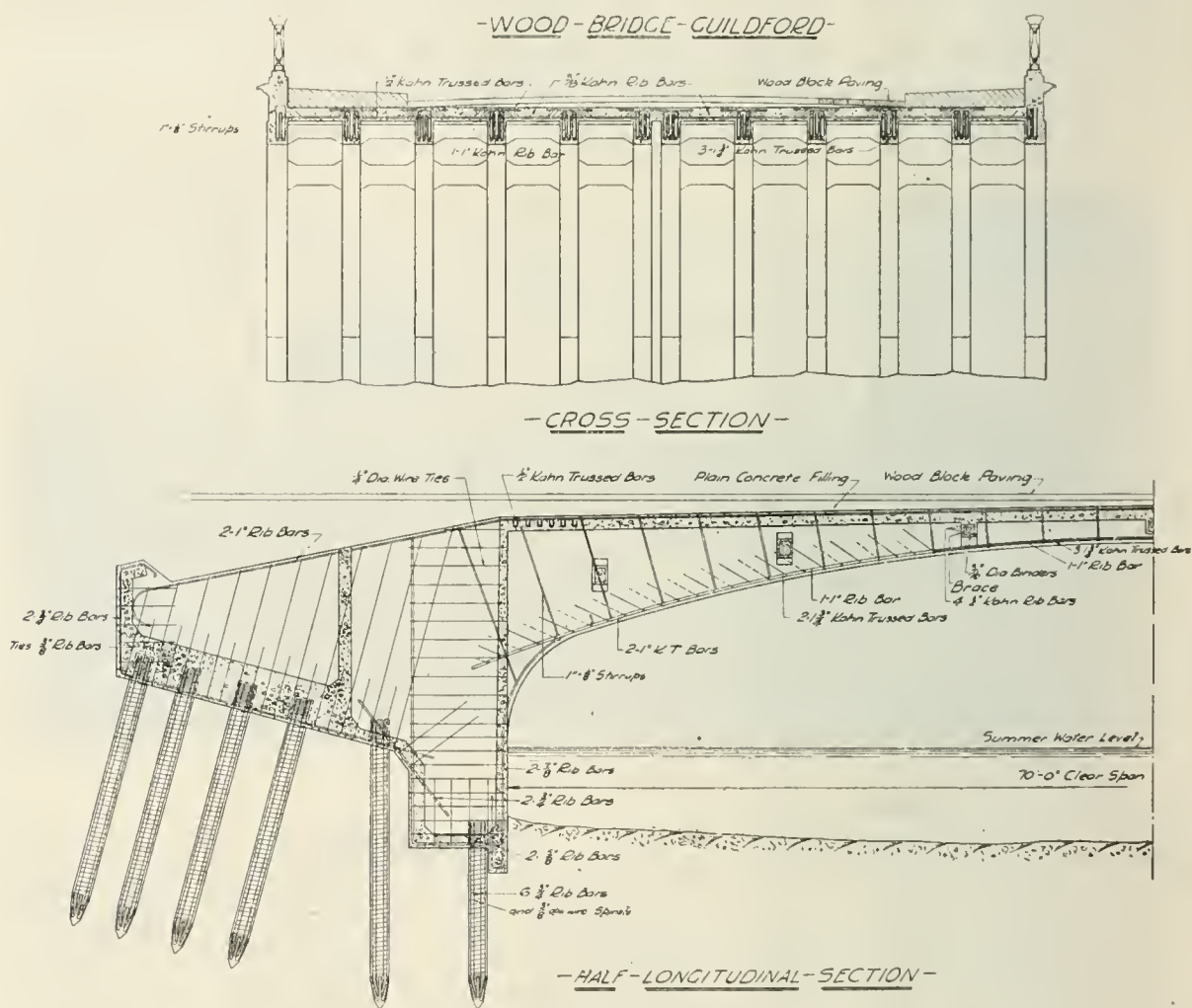
INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

THE MEMBERSHIP ROLL.

At the last meeting of the council of the Institution of Municipal and County Engineers the following applications were approved for election to membership:—

Members.—Messrs. H. C. Phillips, district surveyor to the Hursley Rural District Council; A. S. F. Mody, municipal engineer, Cochin State; W. H. Murphy, municipal engineer, Bangalore; and G. C. Bedington, assistant engineer, Public Works Department, Federated Malay States.

Associate Members.—Messrs. W. Jaggat, engineering assistant to borough engineer, Huddersfield; J. K. Hunter, engineering assistant to borough engineer, Leigh; H. S. Ganderton, engineering assistant



DESIGN OF WOOD BRIDGE, GUILDFORD.

presided over by Mr. John S. Brodie, M. INST. C.E., the borough engineer and surveyor of that town, the following being vice-presidents—viz.: Messrs. J. A. Brodie, city engineer, Liverpool; J. Cook, engineer, Fylde Water Board; T. Cookson, borough surveyor, Preston; C. Cross, surveyor, Kirkham Urban District Council; H. Fenton, surveyor, Thornton-le-Fylde Urban District Council; Gilbert J. Fowler; T. Harrop, surveyor, Bispham Urban District Council; J. W. Hipwood, borough surveyor, Morecambe; T. H. Maxwell, surveyor, Fylde Rural District Council; T. de Courcy Meade, city surveyor, Manchester; E. L. Morgan, borough surveyor, Bolton; S. S. Platt, borough engineer, Rochdale; W. H. Schofield, county surveyor, Lancashire; W. Stubbs, borough surveyor, Blackburn. Messrs. E. Frobisher, surveyor to the Fleetwood Urban District Council, and A. J. Price, engineer and surveyor to the Lytham Urban District Council, are acting as local secretaries, and Mr. J. E. Worth, London County Council, as recording secretary to the conference, which is open to all municipal and county engineers.

to borough surveyor, Torquay; W. S. Jones, chief assistant, sewerage draughting department, Metropolitan Water and Sewerage Board, Brisbane; H. R. Sayer, resident engineer on Hartley Wintney sewerage and sewage disposal contract; B. V. Bradforth, engineering assistant to borough engineer, Croydon; O. Hilton, engineering assistant to the urban district council, Watford; R. K. Wortley, engineering assistant to borough engineer, Southend.

Students.—Messrs. F. Cleaver, county surveyor's office, Northampton; W. Manger, assistant to county surveyor, Northampton; D. G. Wild, borough surveyor's office, Blackpool; W. B. Mather, borough surveyor's office, Blackpool.

Transfers from Associate Members to Members.—Messrs. F. Pritty, burgh surveyor and water engineer, Prestwich; B. D. Tracy, engineering assistant to city engineer, London; and A. Bromly, borough surveyor, Godalming.

Transfer from Student to Associate Member.—Mr. F. M. McRae, engineering assistant to borough engineer, Hampstead.

THE RELATION BETWEEN THE MELTING POINT AND THE VISCOSITY OF REFINED TAR.*

By PHILIP P. SHARPLES.

The rough dependence of the viscosity of refined tars, as determined by any of the standard instruments and their melting point has been long recognised. Many discrepancies have, however, been noted, and apparently little thought has been given to the relation between the two in making specifications.

Table I. shows a series of samples taken from refined tars made on a manufacturing scale from the same raw tars. The methods used in analysis are those described by S. R. Church in the *Journal of Industrial and Engineering Chemistry*, Vol. iii., No. 4, April, 1911, and Vol. v., No. 3, March, 1913.

The melting point is the $\frac{1}{2}$ -in.-cube method in water, starting, however, at 40 deg. Fahr. instead of 60 deg. Fahr.

The Schutte penetrometer is, strictly speaking, not a penetrometer, but a modified melting point [? tester]. An arbitrary melting point is assigned, and the time

changes than oils or asphalts, and not enough attention has been paid to viscosity changes with temperature.

The work in Table II. was undertaken to show that, although a specification was rather closely drawn for the Engler reading at 60 deg. Cent., it yet failed in its object in that it admitted all mixtures of tar H and tar D from 40 per cent H to 80 per cent H. Testing the same mixtures at 50 deg. Cent. shows that the same limit in the upper part of the table would confine the mixture to within 20 per cent, while at 40 deg. Cent. the same limit would confine it to within 15 per cent.

The table also illustrates, again, the rapid increase in the time interval as the temperature of the determination of the viscosity approaches the melting point. Thus, under 60 deg. Cent., the space interval is 46 for the 50 per cent H mixture, but this is increased to 256 for the 80 per cent H mixture at 40 deg. Cent.

The examples that have been cited have been in series of tars of nearly uniform composition. An illustration of the effect of free carbon on the relation between the melting point and the viscosity is given in Table III. The effect of the free carbon is very

TABLE I.
A SERIES OF SAMPLES OF REFINED TAR MADE FROM SAME RAW TAR.

Sample No.	Free carbon.	Distillation total to 315 C.	Melting point.	Schutte Penetrometer.	Viscosity Engler 100 c.c. at 100° C.	Float test at 50 C.
5	12.1	21.8	—	29 sec. at 40° F.	94 sec.	34 sec.
7	12.0	19.2	—	108 " 40° F.	127 "	35 "
8	14.0	10.4	—	114 " 50° F.	159 "	68 "
9	14.4	14.9	50.9	85 " 60° F.	208 "	75 "
10	17.2	12.7	99.7	90 " 70° F.	335 "	110 "
11	18.2	19.4	108.7	88 " 80° F.	431 "	170 "

taken at the assumed melting point to force out under constant pressure a plug of the material cooled to 10 deg. Fahr. is noted. The arbitrary melting point is so chosen on a 10 deg. Fahr. scale that the number of seconds is, as near as possible, 100 deg.

The float test is the New York Testing Laboratory test. The plug was cooled to 41 deg. Fahr. before floating. The Engler test is made under standard conditions with the exception that 100 c.c. were run off instead of 200 c.c. The reduction of the number of cubic centimetres with viscous materials allows more concordant results to be obtained, and gives lower figures.

A comparison of the three melting points and the Schutte penetrometer figures show that they advance quite regularly together. Other experiments have shown this same relation to hold true, provided the

TABLE II.
COMPARISON OF MIXTURES OF TAR H AND TAR D, ON ENGLER VISCOSIMETER 100 C.C. AT THREE TEMPERATURES

Mixture.	Free carbon est.	40° C	50° C	60° C
40% H } 60% D }	4.4	75.7 sec.	54.0 sec.	41.0 sec.
50% H } 50% D }	5.0	88.1 sec.	57.6 sec.	45.6 sec.
40% H } 40% D }	5.6	97.3 sec.	62.5 sec.	47.0 sec.
70% H } 30% D }	6.2	110.5 sec.	66.3 sec.	49.7 sec.
80% H } 20% D }	6.8	136.1 sec.	83.3 sec.	56.0 sec.

free carbon content is very nearly the same. Samples 7 and 8 may then be included in our further examination of the results without introducing undue error.

An examination of the float test shows an increasing interval between samples as we ascend in the series. Between 7 and 8 the interval is 20 seconds, while between 10 and 11 the interval is 60 seconds.

The results with the Engler viscosimeter show the same tendency much more accentuated. The interval between the samples 7 and 8 is 32 seconds, while between samples 10 and 11 it is 96 seconds. It is interesting to note that the ratio is the same as in the float test.

A more careful consideration of temperature in testing tar materials with viscosimeters would seem to be indicated. The tars are more sensitive to temperature

marked. In the Schutte and float test the times are markedly increased. With the Engler the results are more irregular, but show a marked increase with the high carbon tar. From a physical standpoint the increase of free carbon might be expected to have this effect. It impedes the flow of the material with increase of temperature, and in that way up to the point at which the free carbon tends to weaken the binding and lasting qualities of the tar would seem to be a desirable addition. The inclusion of both the melting point and the viscosity in a physical examination of refined

TABLE III.
REFINED TAR: RELATION OF VISCOSITY TO CARBON CONTENT.

Sample.	Free carbon.	Melting point.	Schutte Penetrometer at 50° F.	Engler 100 c.c. at 21.2° F.	Float test at 21.2° F.
1	1.4	110° F.	42.2 sec.	302 sec.	153 sec.
2	14.6	109° F.	80.1 sec.	298 sec.	192 sec.
3	30.6	112° F.	144.9 sec.	739 sec.	337 sec.

tars to be used as binders would seem to be warranted. The viscosity at 100 deg. Cent. compared with the melting point would give an indication of the behaviour of the tar with uniform distributors, and also an indication of its resistance to temperature changes when used on the road. In conclusion, first, the viscosity of tars of the same composition varies with the melting point, but not in direct ratio; second, the viscosity of tars of the same melting point, but of different carbon content, increased with the carbon content.

Motor Cycles for Road Officials.—Mr. John H. Middleton, Assoc. M. I. N. S. T. C. E., surveyor to the Pembroke, Co. Dublin, Urban District Council, writes: "I have recently recommended my council to purchase a motor cycle for the use of the road foreman, as at present he has to ride about 40 miles a day on an ordinary push bicycle. I shall be much obliged if you will give me any assistance, through the medium of your valuable paper, in finding out for me what other urban districts have provided motor cycles for similar officials." We have frequently noted in our columns the purchase by local authorities of motor cycles for the use of officials engaged on the roads, but in the absence of a record such as is necessary to enable us to furnish the information desired by our correspondent, we insert his letter in the hope that surveyors of urban districts in which machines have been provided will communicate with him.

* Paper read at a meeting of the American Association for the Advancement of Science.

BRISBANE'S SEWERAGE SCHEME.

CITY ENGINEER'S CRITICISM.

The city engineer and surveyor of Brisbane, Mr. J. Kemp, recently submitted to his council a report regarding the sewerage of that city, in connection with which a deputation recently waited on the Minister for Works. Mr. Kemp says:—

"It was stated by the Minister that the proposed outfall sewer would suffice for twenty-five or thirty years. Now, in engineering practice it is almost an axiom in designing works of this class that those portions of a scheme which do not admit of easy and economical enlargement or extension in the future should be designed sufficient for the ultimate population. The main outfall sewer, which is practically all in tunnel, is essentially a part of this scheme which does not admit of either easy or economical enlargement in the future, and at the rate the population is increasing this may be necessary within twenty years, as the population provided for is only 278,000. The life of the sewer may be anything from 50 to 100 years or over, but it is not usual to grant a loan for a work for a longer period than fifty years. I will show, actually, that it is more economical to build the sewer in the first instance of sufficient capacity for the estimated ultimate population, and also that a more sanitary sewer is so obtained.

"I assume that the loan will be for a period of fifty years, and that the amount, with interest at the rate of 4 per cent per annum, will be repayable in equal average annual instalments of principal and interest. Judging by the amount of the tenders already received for a portion of the sewer, the total cost, including the tunnels, will approximate £1,000,000. A sewer of double the capacity could now be built for one-third more, or about £1,333,000. It could probably be built for much less, because the cost of shafts, plant, establishment charges, and engineering and supervision is already included in the tenders received. The annual charges on £1,000,000 borrowed and repayable on the above basis would be £46,000. At the end of twenty-five years it would be necessary to duplicate this sewer, which would bring the annual charges up to £92,000 for the second half of the term. The total amount to be repaid in fifty years would be £3,450,000. On the other hand, if the sewer is built double the capacity, it would, in all human probability, suffice for fifty years, and the annual payments on the above basis would amount to £61,333, or a total for the whole period of £3,066,650, showing a saving of £384,000, or an average of £7,667 annually. Financially, if the sewer is designed of sufficient capacity for twenty-five years only, the loan should not exceed that period, in which case the annual payments would amount to £64,000, so that in either case it is anything but economical to build the sewer too small for the probable ultimate population, or, at any rate, for the full period of fifty years.

"Looking at the question from a sanitary point of view, the proposed sewer gives a velocity of only about 2½ ft. per second, whereas a sewer double the capacity, or a little over, would give a velocity of 3 ft. per second, thus increasing the self-cleansing power of the sewer, coupled with the more rapid transmission of the sewage to its destination—an important consideration in a climate like this. The annual charge for keeping one sewer clean instead of two would be considerably less, and likewise the production of foul gases.

"It is estimated that the proposed sewer will suffice for a population of 278,000. This figure is obtained on the assumption that a considerable portion of the sewage on the south side will be stored during the day, and discharged into the main trunk sewer under the river during the hours of least flow—presumably at night—so as to equalise the flow. This is an excellent and economical view, but I have grave doubts about its effects from a sanitary point of view. The sewage will probably be ponded up for twelve hours, and then discharged during the night in a more or less putrefactive condition into the main trunk sewer, the foul gases from which will permeate the area reticulated through vent shafts. Night time is the worst possible time for discharging sewage in this condition into the main sewers, because the foul vapours will be condensed by the cool night atmosphere and fall, in the form of dew, to the ground, to be evaporated by the sun's rays in the morning.

"All sewage should be transmitted as soon as possible after it is formed to the outfall works. In fact,

in general drainage by-laws it is usual to prohibit the discharge of sewage from a cesspool or septic tank direct to the sewer. If it were not for this arrangement the sewer would not be sufficient for more than 220,000 people. Query: Is not the gain from an engineering point more than counterbalanced by the defects from a sanitary point of view? The position of the disposal works in relation to what must inevitably become the seaside resort and lungs of the metropolitan area requires the gravest consideration. I refer to the beach between Sandgate and the Brisbane River. The possibility of reaching this beach for a 3d. tram fare will force this matter through without doubt. In this case, too, the condensation and vaporising of the foul gases generated in the process of purification and sludge disposal would take place for the reasons already given, and adversely affect a considerable area all round the outfall works."

CHICAGO'S SEWAGE DISPOSAL PROBLEM.

EXPERTS' PRELIMINARY REPORT.

Filtration of the water is the only way by which protection and improvement of the supply for the city of Chicago can be obtained. Furthermore, diversion of the sewage into the drainage canal and extension or alteration of the location of the intake would not result in drinking water of suitable quality. These conclusions are presented in the preliminary report of Dr. George A. Soper, New York, John D. Watson, M.INST.C.E., Birmingham, and Arthur J. Martin, M.INST.C.E., Westminster, the board of experts to the Harbour and River Improvement Committee of the Chicago Real Estate Board, following a study of the sewage disposal problem on the ground for two weeks.

Some of the eighteen principles and lines of action set forth are, states the *Engineering Record*, as follows:—

The principle of diverting the sewage from the lake should be adhered to, in spite of any degree of sewage purification or water purification which may be employed.

Full advantage should be taken of as large a volume of diluting water as may be obtainable from the lake.

It is desirable to concentrate as much of the sewage as practicable at a point beyond the built-up sections of the city and in the vicinity of the drainage channel.

To avoid excessive cost, and in order to relieve the drainage channel as far as practicable, it will be desirable to treat the sewage of some parts of the city in the areas in which the sewage is produced.

Practically no sewage should be discharged into the Chicago River, nor the drainage channel, without some form of treatment, except in times of storm.

The minimum requirement in the treatment of the sewage at the main station should be the removal of the suspended solids by screens and settling basins.

Arms of the Chicago River which have no present or future value for navigation, and which are now in a foul and stagnant condition, should be filled in.

All considerable flows of especially foul liquids, such as those from the stockyards, should receive special treatment before they are discharged into the Chicago River or the drainage channel.

London Municipal Electricity Undertakings.—An official return of the London County Council shows that, with the exception of Woolwich, the fifteen borough councils having municipal electricity undertakings are now making profits. Last year rates were reduced by 1d. in Battersea, 1½d. in Hackney, 1d. in Hammersmith, ¾d. in Hampstead, and 1½d. in St. Pancras.

West Hartlepool's Sea-water Bath.—A salt-water swimming bath, presented to the town of West Hartlepool by Mr. W. Cresswell Gray, was formally opened last week. The building is of reinforced concrete, and the swimming bath measures 100 ft. by 40 ft., the depth of water at the ends being 3 ft. 3 in. and 6 ft. 9 in. respectively, with a maximum depth at one point of 7 ft. 3 in. There are thirty-three dressing boxes, a lounge for bathers, and adequate accommodation for spectators on gala occasions. The water is pumped from the sea, and the temperature raised by a system of steam blowers.

Paraffin Bodies in Coal-Tar Creosote, and their Bearing on Specifications.*

By S. R. CHURCH and JOHN MORRIS WEISS.

In specifications for coal-tar creosote there is usually a paragraph stating that the oil shall be a pure product of coal tar, and free from adulteration with any oil or products from any other tar. The purpose of this clause is usually to provide against admixture with petroleum products, such as water-gas tar or oil-tar derivatives. In the present paper the writers wish to consider one requirement which is sometimes introduced with the object of enforcing this provision.

Coal tar is made up mainly of aromatic compounds, and the presence of bodies belonging to the saturated paraffin series has been regarded by some as direct and unmistakable evidence of contamination of coal-tar creosote by distillates from other tars.

Dean and Bateman proposed a sulphonation test for creosote oils, based on the principle that aromatic hydrocarbons dissolve in concentrated sulphuric acid to sulphonic acids, while bodies of the paraffin series remain unattacked. They applied this test to numerous creosote oils, and concluded that any oil yielding a sulphonation residue was contaminated with products of other source than coal tar.

A modification of this test, devised by J. M. Weiss, was proposed in an article by S. R. Church, which did not in any way change the results of the test, but merely made it easier of operation, so far as the detection of traces was concerned. Later, Bateman made further modifications in the test, which made it a still more convenient laboratory operation. This modification was endorsed by Church after trial, as more convenient and practical than the earlier proposals.

Chapin proposed the substitution of a dimethyl sulphate test to be used to determine paraffin hydrocarbons in creosote oil, as well as in creosote-oil dips. Reeve and Lewis have used this test, and have given a number of results obtained by it.

A brief description of the tests in question may be useful in this connection.

SULPHONATION TEST.

"Ten cubic centimetres of the fraction of creosote to be tested are measured into a Babcock milk bottle. To this is added 40 cubic centimetres of 37 times normal sulphuric acid, 10 cubic centimetres at a time. The bottle with its contents is shaken for two minutes after each addition of 10 cubic centimetres of acid. After all the acid has been added, the bottle is kept at a constant temperature of from 98 deg. to 100 deg. Cent. for one hour, during which time it is shaken vigorously every ten minutes. At the end of an hour the bottle is removed, cooled and filled to the top of the graduation with ordinary sulphuric acid, and then whirled for five minutes in a Babcock separator. The

in the form of a clear, almost colourless, supernatant liquid layer."

We will first briefly discuss the relative merits and demerits of the sulphonation test and the dimethyl sulphate test, and then consider in what manner the results of such a test should be interpreted, particularly as regards creosote oil specifications.

We have made some experiments using the dimethyl sulphate test, as recommended by Chapin, and the modified sulphonation test with fuming sulphuric acid and the Babcock bottle, as proposed by Bateman. Average samples of coal-tar oil and water-gas tar oil were distilled, and fractions taken from 240 deg. to 270 deg. Cent., and from 270 deg. to 300 deg. Cent. These fractions were then subjected to the dimethyl sulphate test and the sulphonation test, with the following results:—

	Sulphonation test residue.	Dimethyl sulphate test residue.
Coal tar distillate 240-270°C.	1.2%	0
" " " " 270-300°C.	2.0	0
Water gas tar distillate 240-270°C.	1.0	0
" " " " 270-300°C.	6.8	0

Further tests on other oils were also made, with the following results:—

	Sulphonation test residue.	Dimethyl sulphate test residue.
Water gas tar distillate 240-270°C.	2.4%	0.0
" " " " 270-300°C.	1.2	0.0
Mixed tar distillate 240-270°C.	2.6	0.0
" " " " 270-300°C.	3.0	0.0
Blast furnace tar distillate 240-270°C.	17.6	23.0
" " " " 270-300°C.	23.2	38.0
Oil tar distillate 240-270°C.	11.1	22.0
" " " " 270-300°C.	18.8	28.0

It can be seen from these results that the dimethyl sulphate method showed no residue in many oils that gave measurable residues by the sulphonation method, and we feel that the former test is of no value so far as the detection of small amounts of saturated hydrocarbons in the presence of aromatic hydrocarbons is concerned. Undoubtedly, if there were considerable amounts of petroleum or blast-furnace tar distillates present, where there might be a sulphonation residue of from 10 to 20 per cent, the dimethyl sulphate test would detect it; but where there is only a question of comparatively small admixtures of material, it eli

SULPHONATION RESIDUES OF OILS FROM AUTHENTIC SAMPLES OF TAR.

Oils derived from	to 210°	210 to 225°	225 to 235°	235 to 245°	245 to 255°	255 to 265°	265 to 275°	275 to 285°	285 to 295°	295 to 305°	305 to 320°	320 to 330°
Semet-Solvay coke oven tar	0	0	0	0	0	0	0	0	0	0	0	0
Koppers coke oven tar	0	0	0	0	0	0	0	0	0	0	0	0
United Otto coke oven tar	0	0	0	0	0	0	0	0	0	0	0	0
Horizontal gas retort tar	0.2	0.2	0.4	0.6	0.8	0.8	0.8	0.8	0.8	0.4	0.4	0.4
Inclined gas retort tar	2.0	2.0	2.0	4.0	5.6	6.4	5.2	6.4	6.0	5.6	5.2	4.0
Vertical gas retort tar	5.8	3.6	3.6	4.6	5.6	5.6	6.2	4.8	6.0	4.0	4.4	2.2
Water gas tar, 1	0.4	0.4	0.4	0.4	0.4	0.4	0.8	0.8	0.8	0.8	0.4	0.4
Water gas tar, 2	3.2	5.2	6.0	6.4	7.2	9.2	1.4	10.0	11.2	13.6	13.6	12.4
Oil tar	9.2	22.8	26.4	26.4	26.0	33.2	31.6	35.6	42.4	36.0	32.0	32.0
Blast furnace tar	—	11.6	11.4	16.4	17.2	20.4	21.2	22.0	20.8	20.4	18.0	16.4
Lignite tar	7.0	7.0	9.8	11.6	13.4	11.8	17.0	20.4	20.4	19.6	19.0	12.0

unsulphonated residue is then read off from the graduations."

DIMETHYL SULPHATE TEST.

"Five cubic centimetres of the fraction is pipetted into a narrow 25-cubic centimetre burette, and shaken with 8 cubic centimetres of dimethyl sulphate after closing the burette with a smooth, close-fitting cork. Separation of the residual oil occurs in a short time

low in sulphonation residue, this test would not seem to be of any value.

We have experienced great difficulty in obtaining dimethyl sulphate; moreover, we find that it rapidly changes on standing, so that fresh supplies must frequently be had. Another objection to this reagent is the danger attendant upon handling it.

In a great deal of our laboratory work on oils distilled from various kinds of tar the results have been clouded by uncertainty as to the authenticity of the sample. Some time ago, therefore, we procured

* Presented before Section D of the American Association for the Advancement of Science at the Atlantic meeting, January, 1914.

samples of tars from typical coke ovens and gas plants under such conditions as to make accidental contamination or admixture practically impossible. These tars were distilled to pitch, and the distillate oils recovered. The oils were subjected to a number of tests, partially along the lines of Dean and Bateman's work (loc. cit.). It is not our intention to give the details of this work at present, except in so far as they affect the question of the sulphonation test.

Coal tars may be divided into two classes:

(1) Coke-oven tars, which may be further sub-divided according to the type of oven in which the coal is carbonised.

(2) Gasworks tars, which may be divided similarly into horizontal, inclined and vertical gasworks tars.

In this investigation, we had one or more samples from each of the different types of installation, both coke-oven and gasworks, and have, we believe, examined a sufficient number of samples to draw correct conclusions.

The examination of the oils, which is of interest in this connection, was a Hempel distillation (made in accordance with the Forest Service method for analysis of creosote oil), taking fractions at the following points: 210 deg., 210-225 deg., 225-235 deg., 235-245 deg., 245-255 deg., 255-265 deg., 265-275 deg., 275-285 deg., 285-295 deg., 295-305 deg., 305-320 deg., and 320-330 deg. Cent. These fractions were then subjected to the sulphonation test, using Bateman's modified method, as described above. In the appended table are given the results of these tests of the various oils examined, representative tests of each type of installation being selected. Where there were any great variations between oils of the same origin, the tests of the two most widely divergent materials examined are given.

A consideration of the creosote oil specifications in active use indicates a tendency toward the use of the sulphonation test. The requirements of the test vary widely; in one case the sulphonation residue is limited to 10 per cent, in others to 1 per cent, while still others specify that, in the fraction 300 deg. to 360 deg. Cent., it shall not exceed 0.25 c.c.

In a Forest Service circular, C. P. Winslow gives the requirement for Class 1 and Class 2 coal-tar creosotes, which are the only ones considered by him as pure coal-tar creosotes, that there shall be no sulphonation residue. In "mixed coal-tar creosotes" he allows, in Class 1, 10 per cent of the 305-320 deg. Cent. fraction as a sulphonation residue, and in Class 2, 20 per cent of the fraction 305-320 deg. Cent., expressing it in the form that "the volume of the sulphonation residue in cubic centimetres should not be greater than one-tenth or one-fifth, respectively, of the weight of the fraction in grammes."

In the opinion of the writers, the requirement of no sulphonation residue is unfair as a basis of classification of pure coal-tar creosotes, and a very high limit for mixed creosotes, such as 10 to 20 per cent, is useless, as it makes it unnecessary, *per se*, to have any coal-tar creosote at all present, in view of the fact that a great majority of the water-gas tar distillates have considerably less than this amount of sulphonation residue in any fraction. If a requirement for no sulphonation residue should be enforced, only straight coke-oven tars could be used to produce such creosote oils, and this is certainly a commercial impossibility for the most part. If a limit of 1 per cent is set, the coke-oven tars and some of the horizontal gasworks-tar oils would meet the requirement, but some of the latter would require the admixture of coke-oven tar oils to bring the percentage below this limit; also, if a tar distiller should be handling considerable quantities of inclined or vertical gasworks tars, oils containing as low as 15 to 20 per cent derived from these tars might fall outside of the 1 per cent sulphonation residue limit.

The writers feel that a fairer limit for such specifications would be about 2 per cent, as this would not bar any normal coal-tar creosote oils, and would, at the same time, prevent the admixture of petroleum products (other than those from water-gas tar), blast-furnace oils, &c. The admixture of water-gas tar distillates will, of necessity, have to be taken care of in some other way than by the sulphonation test, as it is very plain that certain mixtures of coke-oven tar oil and water-gas tar oil of a low sulphonation residue would show a lesser sulphonation residue than most oils obtained wholly from gasworks coal tars.

We believe, moreover, that we have demonstrated the sulphonation test of itself to be of comparatively little value in detecting the admixture of oils of petroleum origin, particularly those derived from water-gas tar, with creosote oil.

In a later paper we intend to publish additional data from our analyses of authentic tars, indicating the value of certain other tests, as means of determining the origin of oils used for creosoting.

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INTERNATIONAL ENGINEERING CONGRESS, 1915.

Among the general subjects to be treated before next year's International Engineering Congress at San Francisco, probably the one having the broadest interest is that of Materials of Engineering Construction, which enters into all phases of engineering activity.

The list of topics which will be treated in this section is as follows:—

- (1) Timber.
- (2) Preservative Treatment of Timber.
- (3) Substitutes for Timber in Engineering Construction.
- (4) Brick in Engineering Structures.
- (5) Clay Products in Engineering Structures.
- (6) Probable and Presumptive Life of Concrete Structures made from Modern Cements.
- (7) Aggregates for Concrete.
- (8) Slag Cement.
- (9) Waterproof Concrete.
- (10) Cements containing Additions of Finely-ground Foreign Material.
- (11) Economics of the World's Supply of Iron.
- (12) The Life of Iron and Steel Structures.
- (13) The Employment of Special Steel in Engineering Construction.
- (14) The Place of Copper in the Present Engineering Field, and the Economics of the World's Supply thereof.
- (15) Alloys and their Use in Engineering Construction.
- (16) Aluminum in Engineering Construction.
- (17) The Influence of the Testing of Materials upon Advances in the Designing of Engineering Structures and Machines.
- (18) Cement Testing.
- (19) Testing of Metals.
- (20) Testing Full-sized Members.
- (21) Proof Testing of Structures.

The papers to be presented from the United States have already been arranged for from the recognised leading authorities on the various topics. Arrangements for the papers from foreign authors are being rapidly concluded, and the aggregation of papers which will be presented will constitute a broad review of the field and be of the highest value. Marked interest in the congress from foreign countries continues, and there is every evidence that the attendance from abroad will be large.

Full information concerning the congress, the price of subscription, and the arrangement for purchase of volumes of the proceedings, may be obtained by addressing the Committee of Management, as follows: International Engineering Congress, 1915, Foxcroft Building, San Francisco.

Preservation of Ancient Monuments.—In the report of the Inspector of Ancient Monuments recently issued by the British Government, instructions are given to the foremen in charge of the various works of preservation. It is interesting to note that the powder Pudlo is suggested as a medium for waterproofing the ancient buildings under the care of the Government.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Why is it that in a recent issue of "Royal Automobile Club Journal" it is stated that "the Denbighshire roads are generally bad, and will not be up to the level of neighbouring counties till the county council recognises the changed conditions of modern traffic," and if this statement is a fact whether the county council have risen to the occasion and are improving their roads on modern lines?

What was the reason that the Kenilworth Urban District Council had allowed their water supply to remain liable to serious risk of pollution from an adjoining brook for so many years, and that it required the services of a medical inspector of the Local Government Board to discover this danger of pollution, and what steps are the urban district council taking to remedy this state of affairs?

What is the apparent difficulty with regard to the much-needed relief road at Croydon? Is it a fact that the Local Government Board are not satisfied with the contribution of land and money promised by the Ecclesiastical Commissioners, or is it that the opposition to the scheme has been able to bring further arguments before that board, after the inquiry which was held last year? Does it not seem rather a pity that such an important and useful scheme should be now "hung up" at the eleventh hour?

How many surveyors are aware that the "National Health Week" is to be held in this country from November 15th to the 21st of this year, and what steps are they taking to assist in this useful movement, which it is hoped will popularise the subject of sanitation?

Why cannot the example of the Hampshire Automobile Club be followed by other clubs throughout the country in issuing the following letter to their members and others who own or use motor cars: "Dear Sir (or Madam).—The county surveyor asks for the assistance of members of the club as follows—namely, that cars passing men at work on the roads, repairing or tarring same, should be driven quite slowly. The surveyor asks this on account of a recent occurrence when a workman was knocked down and dragged by a car some yards and narrowly escaped with his life. The surveyor points out that in repair work, if there is a steam roller working at the same time, the men cannot easily hear the approach of traffic.—Yours faithfully, Chas. E. Godwin, hon. secretary."

Is it a fact that there are several large contractors for road construction and maintenance in this country who are prepared to reconstruct roads "at a price," and to keep them in repair afterwards at a fixed charge of 7d. per square yard "for all time," or is this statement mere hearsay?

What are these terrifying diseases "Aukylostomiasis" and "Bilharziasis," which, according to Viscount Kitchener's report, appear to be prevalent in some parts of Egypt, and what are their English names, if they have any? Why should the ova of this germ be found in mummies of the twentieth dynasty still alert, and all alive for mischief, after nearly 3,000 years of quiescence? Should not the medical officer of health and the surveyor of England be glad that he has not to tackle this problem? Are not the fearsome names of these diseases sufficient to kill the fellahin of the Delta even if they only know they are in their neighbourhood, and what steps are being taken to eradicate these diseases?

What will be the result if the Middlesex County Council succeed in obtaining their Act of Parliament under which they will be empowered to make a charge on all motor omnibuses using the proposed new Great West Road out of London of 3d. per vehicle-mile, and is it a fact that under a conservative estimate this tax will bring in about £100 per annum per mile of road? Will not this restriction of traffic be the means of bolstering up the tramways owned by the county council, and does not this

"preferential proposal" savour of a disguised Tariff Reform movement? Will not the "people" have to pay this tax in the form of increased fares, and does the proposal seem fair in these democratic days?

Whether the surveyors in this country are satisfied with the requirements contained in the Road Board's revised specifications and general directions relating to the tar treatment of roads, and whether they have been able to adopt these specifications, or whether local conditions make it difficult for them to do so?

Is it a fact that the Permanent Committee of the International Road Congresses, whose headquarters are at Paris, have decided to increase the subscriptions of the members attending the next International Road Congress at Munich, and, if so, to what extent? Would not such an increase diminish the number of attendances and tend to reduce the usefulness of these congresses?

When will the Engineering Standards Committee issue their report on the definitions of "Bitumen" and "Asphalte," and decide for us the vexed question as to whether either or both are to be regarded as natural materials, and under what circumstances should they be regarded as artificial substances? Is the committee waiting to confer with the American engineers on the subject, and, if not, why should there be this delay?

When will the "traffic question" be seriously considered in this country, and who is to do it? Why is it that the "rule of the road" is for vehicles to keep to the left and pedestrians to keep to the right, and does not this rule cause the pedestrian to be always in danger because if he steps off the footpath he is liable to be run over by a vehicle coming from behind him, whereas if he, too, "kept to the left" he would be facing the traffic. "What department of the Government is really responsible for traffic regulations"? is the question which now exercises the mind of the "man in the street."

Sheffield Society of Architects and Surveyors.—At the recent annual meeting of this body the retiring officers were re-elected as follows: Messrs. A. F. Watson (president), C. B. Flockton (vice-president), R. W. Fowler (treasurer), J. R. Wigfull (hon. secretary), W. G. Buck, F. E. P. Edwards, J. R. Hall, C. F. Innocent, H. L. Paterson, H. I. Potter, C. S. Sandford, E. Winder, F. H. Wrench.

Housing at Chester-le-Street.—Official sanction has been given to a scheme of the Chester-le-Street Urban District Council for the erection of 168 workmen's dwellings. The council proposed to build 116 houses with only two bedrooms, and the rest with three bedrooms, but the Local Government Board have suggested that the number of two-bedroom houses should be reduced, and 150 houses built with three bedrooms.

New Baths at Pontefract.—New swimming and slipper baths erected by the Pontefract Corporation on the Headlands estate were formally opened last week. The baths, which have cost about £8,000, exclusive of land and equipment, include a large pond of regulation size—75 ft. by 25 ft.—and a children's bath 25 ft. by 15 ft., six slipper baths, and one vapour bath for each sex, with steam laundry, the heat being supplied from the adjacent refuse destructor.

Blackburn's New Motor Fire Engine.—Blackburn has just placed its second motor fire engine in commission. Like the first motor, which has been in service about twelve months, the new machine is of the Merryweather "Hatfield" type, with pump to deliver 450 gallons per minute. Arrangements are also made for throwing a "first-aid" jet for dealing with small fires, and a 55-ft. escape is carried. At the official trial at Blackburn the pump was thoroughly tested with one, two, three, and four jets and with nozzles of various bores, and a single jet of water was sent to a height of 190 ft. Afterwards the motor was taken to the bridge which spans the canal at Highfield-road, in order to carry out a deep-lift test. With the pump drawing from a vertical depth of 21 ft., water was sent through the nozzle in 13 seconds, and 170 lb. pressure was obtained, a fine jet being thrown to a great height.

Control of Ashpits, Ashbins, and House Refuse by By-Laws.

EFFECTS OF THE PUBLIC HEALTH ACT, 1875, AND THE PUBLIC HEALTH ACTS AMENDMENT ACT, 1890.

By R. H. QUINE, D.P.H. (VICT.).

The storage of house refuse on private premises and its collection are matters of the greatest importance to all local authorities, as affecting the health and the pocket of the community. The critical observer visiting the different parts of the kingdom must be profoundly impressed by the entirely unsatisfactory manner in which house refuse is generally treated. One frequently sees extremely untidy and insanitary conditions about the house from this cause, and it is evident that enormous sums of the ratepayers' money must be wasted every year in antiquated methods in emptying badly designed and constructed or inconveniently situated receptacles. Slack methods and low standards of backyard cleanliness, with bad or doubtful conditions, are the rule rather than the exception.

While there are elaborate by-laws regulating the relatively unimportant subjects of thickness of walls, strength of floors and roof timbers, &c., there is an absence of anything like complete and efficient by-laws to regulate house refuse, and no intelligent and uniform general policy seems to be adopted by local authorities. This is due partly to divided responsibility, partly to puzzlement and lack of knowledge as to how to handle an apparently simple, but really very difficult question, partly also to the almost entire absence on the part of cleansing departments of statistics, or information as to the relative speed, labour, cost of collection, or relative weight, volume, and quality of refuse produced by the various appliances which they have been using for years. There is a lack of knowledge of the efficiency of their tools which would ruin any merely commercial undertaking. There does not appear to be any intelligent guiding power ruling the installation of the whole town plant for handling and working refuse. There is often, indeed, conflicting policy and cross purposes between departments within the authority. Three departments may be concerned in this matter.

All these things point to something being very seriously wrong on this subject, and create the impression that of all the duties imposed by law on the local authority, those dealing with house refuse are probably the least efficiently carried out.

An inquiry into the reason of all this and the remedy is desirable.

Let us first of all be quite clear on the legal position. In estimating the meaning and intention of any Act, it is well to have in our minds a very clear idea of the Act itself, and of the purpose behind it.

The danger and nuisance of dirt and untidiness around the dwelling was clearly recognised in 1875, as well as the importance of properly storing and removing house refuse, and the Public Health Act of 1875 was intended to ensure tidiness and cleanliness, and to prevent possible danger. It is well to remember that at the passing of the 1875 Act microbes, as a common cause of disease in man and decay in food, transferable by flies, cats, wind, &c., were not known or thought of in connection with house refuse. Had the microbial dangers been then known as now, the Act would no doubt have been more stringent. Even with the limited knowledge of that date the Public Health Act, 1875, enacts (in sec. 35) that every person who builds a house must provide an ashpit "with proper cover and with proper doors"—the intention of the cover and the door being obviously to keep out that which ought to be kept out, and to keep in that which ought to be kept in, and to give access for depositing and removing refuse, and for inspection.

In order that the above duty imposed on the builder of the house should be carried out, sec. 40 of the Act compelled the local authority to do two things:

(1) To see to it that the ashpit is provided and is properly constructed.

(2) To see to it that the ashpit is not only provided and constructed, but is kept so as not to be dangerous to health.

These two duties are different. They are not

optional, but compulsory, and so important are they both regarded that the most ample powers are given to the local authority in regard to them. To that end sec. 36 enacts that if there be no ashpit provided, the local authority may itself provide one and recover the cost from the owner. The Act even goes further, and in sec. 41 it enacts that if there be an ashpit which is in any way defective, the local authority may itself alter, or amend, or repair it, and recover the cost from the owner.

In order that the local authority itself should have no excuse for not enforcing duties on builder and owner, and even occupier, it is empowered to make by-laws. Sec. 157 of the Act empowers the local authority to make by-laws regulating the construction of the ashpit, and (in order that it may be kept and used properly) sec. 44 of the Act enables the local authority to make by-laws for the prevention of nuisance from dust, ashes and refuse. Note that this is not for abatement of nuisance, but for its prevention. It is thus seen that the whole spirit as well as the letter of the 1875 Act is quite clear in insisting on the provision by the builder of receptacles for refuse and ashes, properly constructed and covered with proper means of access, and that afterwards the same shall be properly used and kept by the parties responsible for using and keeping them.

The owner is made responsible for the cost of erection, alteration, amendment, repair and renewal, and the local authority is made responsible for providing that the work be promptly and properly done. This clear policy of constructing things right at the start, and providing that they should be kept right, and nuisance and danger prevented, is the real policy and meaning of the Public Health Act, 1875. It is a policy of active foresight, in devising means and precautions to prevent evil. It is in no sense a slack and lazy policy of allowing nuisances to occur, and then abating them when they obtrude themselves, or the mischief is done.

After being in force for a quarter of a century, it was made clear that at least three serious defects existed in the 1875 Act in relation to house refuse:

(1) The Act provides such properly constructed and kept ashpits only for those houses erected after the date of the passing of the Act, and does not deal with those houses erected before the Act.

(2) By the use of the word "ashpit" it might be thought to limit the receptacles and the making of by-laws controlling them to the old form of ashpit—the type of large, solid, fixed, permanent structure, in which first construction was the important point, and to make no provision for the use or control of the smaller, movable, fragile type of receptacle which came later, and the keeping of which is of equal importance with the construction, and which so urgently required controlling.

(3) The occupier was not sufficiently controlled.

In order to remedy these and other defects in the 1875 and other Acts the Public Health Acts Amendment Act was passed in 1890, and it enacted with regard to ashpits:—

(1) In sec. 23, that any by-laws governing the construction and keeping of ashpits made under the 1875 Act could be made to refer to houses built before the 1875 Act, thus bringing all houses (whenever built) under a common standard of sanitation and control in this matter.

(2) In sec. 11 it enacted that the term "ashpit" should not merely mean and refer to the old form of ashpit, but should mean and include any ashtubs, boxes, or any other receptacle whatsoever, thus giving to such things the legal status of the ashpit of the old form, and at the same time bringing every kind of receptacle used for the reception of ashes and refuse under the control of the local authority, and subject to any by-laws made by them. The local authority being already compelled to regulate how the old "ashpits" should be constructed and kept, and how nuisance from dust, ashes and refuse may

be prevented, is now further compelled to regulate how all receptacles, of whatever nature, should be constructed and kept so as to conform to decent sanitary principles and conditions, and cause neither nuisance nor danger.

(3) In sec. 26 it empowered the local authority to make by-laws imposing duties on the occupier, so as to facilitate collection.

Let us see how these two Acts worked out in practice.

The effect of the 1875 Act was that every local authority was made responsible for four classes of work in connection with house refuse:

(1) To see that refuse receptacles properly constructed were provided for new dwellings by the builder.

(2) To compel the owner to provide, renew, alter, amend, and repair refuse receptacles, or itself to do the work if necessary.

(3) To see that refuse receptacles were used and kept properly by occupiers, so that collection might be facilitated and nuisance from dust, ashes and refuse prevented.

(4) To see that refuse receptacles were emptied promptly by the local authority.

To carry out these duties the local authority divided up the work between its various departments.

On the surveyor's department lay:—

(a) The burden of making building by-laws, governing the construction of new erections of all kinds, including ashpits.

(b) The burden of seeing that such by-laws were carried out, whether it was a new ashpit for a new building or a new ashpit in connection with an old dwelling.

If there was any new structure, the surveyor's department had to see to it.

On the sanitary department lay the burden of:—

(a) Making by-laws as to how all receptacles should be kept, so as not to be dangerous to health; also making by-laws which would prevent nuisance from dust, ashes and refuse.

(b) Of seeing that the by-laws so made were adhered to.

On the cleansing department (whether as a separate department or a sub-department under the surveyor's or the sanitary department) was laid the burden of removing from the premises all refuse in the most sanitary manner, and (naturally in the interests of the ratepayer) with the greatest economy of time, labour and cost.

The manner in which the various departments carried out these duties is interesting. It may be said that some of the duties were well done, some very badly done, and others altogether neglected.

THE SURVEYOR'S DEPARTMENT.

By-laws regulating the construction of ashpits became general, and the supervision of the construction was of very fair efficiency. There are two reasons for this:—

(1) By-laws regulating the construction of all sorts of buildings were being prepared, and it was easy and convenient to include with them by-laws regulating the construction of ashpits. Architecture and surveying being already developed sciences, it was easily possible to get the construction part of the work properly drawn out.

(2) It was also easy and convenient, after the construction by-laws were made, to keep a very firm and complete control on the execution of the work. In the first place, plans had to be submitted showing details of the proposed structure, and conforming to the by-laws; faults could thus be checked or amended. Then the building surveyor constantly inspected the work during construction, and finally, before a house could be occupied, a certificate of habitation had to be obtained from the local authority, which could refuse it if the building by-laws were not adhered to. This control by plans, by inspection, and by certificate—is very important, and its significance will appear later.

It will thus be seen that the work entrusted to the surveyor's department was, on the whole, well done, and carried out the intention of the 1875 Act. Where it was weak was in the design of the ashpit from a sanitary point of view. The reason of this was that the science of modern sanitation hardly existed. It was difficult then, as it is to-day, to find men who could accurately define how an ashpit should be constructed and kept so as not to be dangerous to health.

It was even more difficult to find men who could frame by-laws to effect these objects.

THE SANITARY DEPARTMENT.

Long after the passing of the 1875 Act medical officers of health and inspectors of nuisances had little or no training in sanitation, nor did means of efficient training exist. Modern sanitary science and the existence of the microbe were practically unknown. The medical officer frequently had his private practice, and left things pretty much to the inspector, who often had other duties. The whole aspect and outlook of the department seemed to be influenced by the inspectors of nuisances title, and to involve merely the abating of obtrusive nuisances that refused any longer to be hidden. Public health seemed to mean abatement and not prevention.

Such sanitary departments were made responsible for carrying out the preventive work of the 1875 Act in relation to ashpits, not only to declare to the surveyor's department the principles and conditions to be observed in construction and installing, but to make by-laws providing how they should be kept so as not to be dangerous, and how nuisance from dust ashes and refuse should be prevented. The result was obvious; they left the whole thing to the surveyor and the construction by-laws made by him, and made no preventive by-laws, but waited for nuisances, which, if not very obtrusive, were often not seen.

With the development of sanitary science a new race of medical officers and sanitary inspectors has sprung up, with different training and outlook. The more enterprising of these new men at once started to condemn the old form of large ashpit with its long accumulations and polluted walls. They urged the adoption of small tubs or ashbins and frequent emptyings, but, in the hurry of abating great evils, forgot that they might be introducing others almost as bad, and forgot also to make the preventive by-laws demanded by the 1875 Act, which should extend to and regulate and control the construction and keeping of the new receptacles as well as the old ashpit, and prevent nuisance and danger from their use. They caused the old strictly governed receptacle to be discredited, while a crowd of new and cheap ones entirely without control were not only permitted, but encouraged.

The speculative builder and property jobber readily fell in with the new policy, not because of a love of sanitation, but because it saved the bother of preparing plans for the ashpit, which was not now enforced. It took the whole thing away from the eye of the surveyor and the critical building inspector, and, above all, it saved about 50s. in cost, which could be pocketed. According to the new idea, any sort of bin or tub would do. It could be bought for a few shillings and dumped down anywhere, and what happened afterwards was not their business. The matter appealed to the property owner much in the same way as it did to the builder.

To get rid of the old ashpit was a good work, but certain results followed.

The surveyor being already furnished with a set of by-laws which regulated the construction of the old ashpit, but which did not apply to the new tub or bin, found himself left high and dry by the tide which ebbed from his department and flowed towards the sanitary department. He was left with the by-laws and no ashpits to which to apply them, while the sanitary department had the new receptacles but no by-laws to govern them. The surveyor lost control, but the sanitary department did not gain it. Neither of the departments seemed quite to realise that any and every receptacle was really in essence an ashpit, and had to be governed and controlled by the local authority, and that it was subject, not only to construction, but also to such repair, alteration and amendment as would bring it within any by-laws which might be made to regulate it.

Gradually surveyors began to realise this, and new by-laws were made; but, unfortunately, they referred to construction only and not to keeping, and to new houses only and not to sanitary alterations of old houses, which were left to be dealt with by the sanitary department, whose officials, having no by-laws or any power of compulsion behind their recommendations, soon found themselves compelled to submit to all sorts of inferior and bad arrangements, and were even reduced to bargaining to get these.

Thus the two departments in many towns came to have different standards and different practice. Where that occurred, the department which had the care of the public health, strange to say, almost invariably

had the lower standard, and often, in the sanitary alteration of old houses, which, on account of bad surroundings, needed the best sanitation, things were permitted which would not be tolerated in the new houses being erected at the same time under the surveyor. This weakness was freely exploited by the unscrupulous, greedy, or poor owner, and by the property-owning interests on the local councils. Sanitary departments now realise that they ought either to have themselves obtained and kept the full powers of control over the new receptacles which they introduced, or have arranged with the surveyor to do so, and supplied him with the necessary information. They are finding out that when there is no co-operation in the making of by-laws, and no united action in enforcing them, and when two departments of a corporation are permitting different standards, there cannot be efficient control. The higher standard is maintained with extreme difficulty, tending to fall to the lower level, and incidentally local government is brought into contempt. The jerry-builder and property "scamper" always buy the cheapest thing allowed, and will put into their own pockets any extra profit permitted by slack rule. Slack rule compels the occupier and his family to live through the years under conditions which are not as good as they might be. It also allows the ratepayer to be saddled with a "cheap and nasty" installation very costly to work—all to save the temporary owner a few shillings.

(To be concluded.)

ENGINEERING JOTTINGS.

V.—UNUSED NATURAL MEDICINAL WATERS.

By HERBERT G. COALES, ASSOC.M.INST.C.E., F.S.I.

This heading is suggestive of fresh industries—or municipal undertakings—hinging on the finding and tapping of medicinal water for the unfortunate rheumatic, gouty or dyspeptic subject to drink and pay for. And that is the suggestion.

On the one hand, there is the continuous exodus of people to take the waters and experience the cure at foreign watering places, and, on the other, the possibility of the existence of equally curative waters at home, unused and ignored. Many of the British medicinal springs, which were once quite unappreciated, are now the centres of large and growing towns. Why should not the same thing occur again in respect to other undiscovered or unused springs? It cannot be said that there are not any of the latter, for most counties contain one or more of such. Some are known to contain healing virtues, while some only bear the reputation; yet who can doubt that other springs lie within reach to be tapped and utilised?

Just as herbs of various medicinal qualities have been used to cure the ills of man, so any other natural product should, when discovered, be commandeered in the same service. A little trouble should be taken to find waters with healing qualities. Money is often worse spent.

It would be very interesting if an Ordnance Survey special map were prepared, in the first instance, showing every known medicinal spring in the British Isles. That would form the nucleus of a very important record, to which could be added, from time to time, further information as it was collected. The comparison of such a map with the geological survey would, in all probability, suggest where other medicinal springs were likely to be found. The attendant expenses of an investigation would at least be no more onerous or wasteful than many another Government or local expenditure.

Analyses are available of all the medicinal waters at the chief health resorts; but other known and unused springs should be tested and tabled, and, in conjunction with the aforesaid map, studied too. Why should all our water analyses be confined to inquiries after hardness or contamination?

It is more than likely that buried in the earth are many ready-mixed medicines awaiting discovery and use. How do things now stand? There are the known and utilised springs, the known and unused springs, and the (as yet) undiscovered underground waters.

The doctor and chemist, working in conjunction with the engineer, are the people to tackle this question. It is known that hard water with bone-making attributes is good for children to drink, but bad for gouty adults. In the same way the medicinal waters should be studied and understood. It is a gross folly not

to take advantage of the available beneficent provisions of Nature.

Springs at a distance from existing towns could be collected and brought by pipes to any desired point. Galvanised-iron tubes could be used for one class of water, glass-lined for another. The supply could be regulated and controlled by the attendant at the town end, and duly paid for by the patients as usual.

It does not seem absolutely necessary that people should reside for a month or a fortnight in the vicinity of such springs. The water could be bottled, and distributed in the way of business like any other commodity. A curative spring, bubbling up in an out-of-the-way spot, far removed from any town, now affords a disagreeable drink, maybe, to a casual passer-by, or to the more determined man who comes to carry away a few jars full of the reputed wonderful water. But to experience a cure a course of it must be taken. Here, then, is the opportunity for enterprise; the water in the absence of dwellings on the spot must be consumed at one's home, and bottling must be carried on as is now done with some foreign waters.

The doctor and the chemist ought to agree what classes of impregnated waters would be beneficial for sufferers from various ailments. Then it should be the duty of the engineer and the geologist to make the necessary inquiries, and to investigate the various strata. It would appear quite possible that there may be many kinds of medicinal underground water which do not show themselves in the form of springs, but are in subterranean pockets or basins, and which, to be available, would have to be pumped.

The recent scare in reference to the Derwent water supplied to the city of Nottingham makes one realise that there are waters *and* waters, and should lead one to compile as many results of analyses as possible. Though unappreciated by science at present, a water hitherto unused may be a cure for many a disease or complaint.

It is said on good authority that some of the foreign water drunk by the confiding Britisher abroad is a manufactured article. Indeed, the impregnating salts required for converting ordinary water into medicinal are often bought in England. Would the man intending to make a journey abroad to drink the waters still go if he saw the salts put on board his own ship? Rather would he prefer to turn back, and go and drink the natural chalybeate, sulphuric or saline springs of his own country, and, possibly, take an interest in the finding of others.

St. Helens Engineer and Mechanical Traction. The borough engineer of St. Helens, Mr. Arthur W. Bradley, is considering the substitution of mechanical traction for horse power in relation to cleansing and highway work.

His One Request.—“Personally, all I ask from the users of the roads which I have the privilege and honour of supervising is the same consideration as was shown to the organist in the American mining camp, and contained in the notice conspicuously in front of him: ‘Don't shoot the organist; he is doing his best.’ And while doing my best, I am sometimes prompted to join with Robert Louis Stevenson, and say

Let the lave go by me;

All I want; the Heaven above

And the road before me.”

—Mr. W. L. Gibson, county road surveyor, Dunblane, in a recent paper.

Town Planning in Saskatoon.—Mr. C. J. Yorath, ASSOC.M.INST.C.E., commissioner and consulting engineer to the city of Saskatoon, in the province of Saskatchewan, Canada, has recently completed a town plan of Greater Saskatoon. The plan provides for through river drives and boulevards along both banks of the Saskatchewan River, which runs through the centre of the city; inner and outer encircling boulevards connected up with diagonal avenues leading from the centre of the city to the principal outlying towns and villages; a civic centre on the river front, and a complete system of tramways, sewers and water mains, so arranged that it can be built up in units as required. Mr. Yorath attended, as the city's representative, the town planning conference held by the Commission of Conservation in Toronto last week, and submitted a paper on “Town Planning and Civic Aesthetics.” The plans to which reference has been made were among the exhibits.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

THE MONTHLY PREMIUM.

The premium for May is awarded to

Mr. E. LOVATT,
Oak Tree House,
Talke, Stoke-on-Trent,

whose contributions have, in the opinion of the adjudicators, been the best received during the month.

Mr. F. NICHOLSON, to whom the premium for April was awarded, selected a 15-in. Brass Rolling Parallel Rule (made by Messrs. J. Halden & Co., Limited), which has been duly sent to him.

QUESTIONS.

This week answers are invited to the following questions:—

398. Road Construction. Should the stones in a macadam road be all of one gauge, or are varying sizes preferable? Give reasons. (Junior.)

399. Fireproof Construction.—What fireproof preparations can be used for protecting timber, and what independent coverings may be applied for the same purpose? (S.A., 1905.)

400. Structures.—What is meant by a redundant member in a truss, and why are such members introduced? Sketch two simple trusses, each having at least one redundant member. (I.C.E.)

401. Specific Cravity.—A bullet of lead, whose specific gravity is 11.4, weighs 1.09 oz. in air and 1 oz. in olive oil. Find the specific gravity of the olive oil.

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

396. Strength of Materials.—A horizontal uniform bar 18 in. long, is laid over two supports, each 4 in. from its ends. Find two points at which the bending moments are zero.

The following additional reply to this question has been received:

A bar of uniform section supported in the manner shown in Fig. 1 would have a shear diagram, due

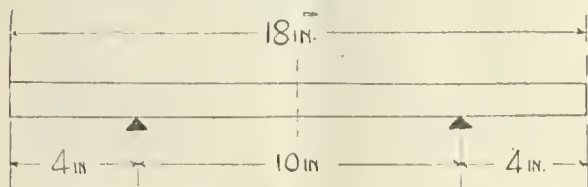


FIG. 1.

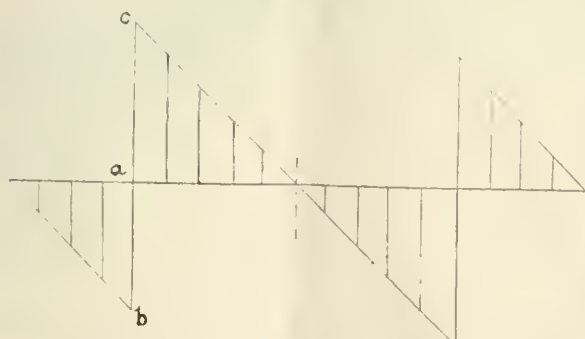


FIG. 2.

to its own weight, as in Fig. 2, where the dimension *ac* is equal to half the weight of the central span,

and *ab* is equal to the weight of the overhanging portion.

Considering the overhanging portion alone, the maximum bending moment will be equal to—

$$\frac{w x^2}{2} \dots \dots \dots (1).$$

and will occur at the supports, and would be uniform over the central span—as indicated by the dotted line in Fig. 3—but for the opposing moment due to the weight of the bar over the central span. The intensity of this moment at any point distant *y* from a support is given by the formula—

$$\frac{w (l y - y^2)}{2} \dots \dots \dots (2).$$

and where the diagram of this equation crosses the diagram of expression (1) will be the point at which no bending moment occurs. To find this position mathematically, it is only necessary to combine expressions (1) and (2) in an equation so that their difference shall be zero. Then, using the known values, calculate the corresponding value of *y* (Fig. 3).

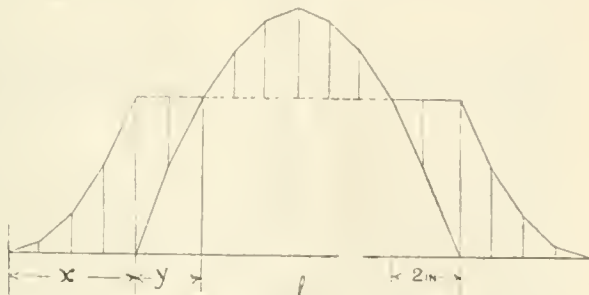


FIG. 3.

$$\frac{w}{2} x^2 - \frac{w}{2} (l y - y^2) = 0.$$

Hence—

We may discard the factor $\frac{w}{2}$ leaving—

$$x^2 - l y + y^2 = 0$$

$$\therefore y^2 - l y = -x^2$$

Inserting the arithmetical values, we get—

$$y^2 - 10 y = -(4)^2$$

By adding the square of half the coefficient of *y* to both sides of the equation, we get—

$$y^2 - 10 y + (5)^2 = 25 - 16$$

$$= 9$$

Finally, extracting the square root, we get—

$$y \pm 5 = 3$$

$$\therefore y = 2$$

So that, in this instance, the neutral point is exactly 2 in. inside each support, as shown in Fig. 3. (E. E. W.)

397. Testing Cement.—Explain in detail, giving sketches where necessary, how a sample of cement would be tested in practice. (B. W., *Tadcaster.*)

Tensile Tests.—Cement is seldom subjected to tension in practice, and is not usually employed "neat," yet the tensile test of neat cement is the general test for strength employed, as under carefully arranged conditions it gives a good index as to quality. Neat and properly cooled cement is mixed with 20 per cent of its weight of water, and filled into moulds under thumb pressure only to form briquettes. The form of the briquette and the holding clips of the testing machine have considerable influence on the distribution of stress over the breaking section of the briquettes, and they have therefore been standardised. The form of briquette adopted by the Engineering Standards Committee is shown in Fig. 1, the minimum section being 1 in. square. A very high tensile resistance is not necessarily an advantage, because it may be due to the

cement being "hot" or to the presence of an excess of lime; but if the cement will pass the tests for fineness of grinding and for proper cooling, it is a valuable quality. The "Standard" specification of ultimate tensile strength for the square-inch section of a briquette, which, after filling into the

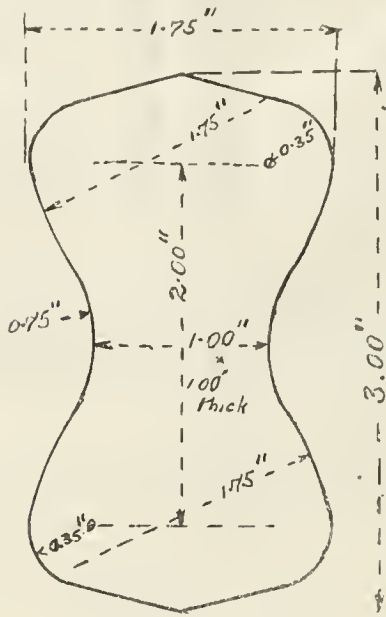


FIG. 1.

mould has been kept for twenty-four hours in a damp cloth in the atmosphere, and then placed in fresh water until tested, gives the following figures:

7 days from mixing 400 lb. per sq. in. of section.
28 " " " 500 lb. " " "

the results to be determined by the average of six briquettes for each period. The tensile breaking load of a briquette is considerably affected by the rate at which the load is applied; the rate has therefore been standardised, and the Standards Committee specify a rate of 100 lb. in 12 seconds—i.e., 500 lb. per minute.

Compression Tests.—Compression tests are seldom made, as the tension test is more satisfactory and simple. The chief drawback to compression tests is the difficulty in securing a satisfactory bedding for the material. If they are to be made, however, 3-in. or 4-in. cubes can be tested in an ordinary testing machine, and these should give an ultimate strength of from eight to eleven times the tensile strength.

Fineness Tests.—Coarse particles in the cement have a damaging effect as they have little strength or cementing value, and would be tantamount to the addition of sand or other inert matter. Fineness of grinding is therefore essential, and to test this quality the cement is sieved. The Standards Committee specification requires that the residue on a sieve with 5776 meshes per square inch and wires 0.0044 in. diameter shall not exceed 3 per cent, and that on a sieve of 32,400 meshes per square inch and with wires 0.002 in. diameter shall not exceed 2 1/2 per cent.

Specific Gravity.—This is a valuable test, as it detects an underburnt cement, and also a cement which has been exposed to the air, and which has absorbed a good deal of moisture and carbonic acid, and thereby lost its capability of combining with water. In both the conditions mentioned, the cement has a low specific gravity. The specific gravity test requires to be carefully done, but it is at least reliable, which is more than can be claimed for the test of a certain weight per given volume. In good practice, the specific gravity is specified to be 3.10 after delivery, and is determined by the displacement of level of turpentine in a glass vessel having a long, narrow, graduated neck. A quantity of cement, which has been carefully weighed, is dropped into the bottle, when the weight of the cement in grammes divided by the volume of turpentine displaced in cubic centimetres gives the specific gravity. Another method is to fill a narrow-necked bottle with water up to a marked level and weigh it; pour some water away, and drop in a weighed quantity of cement; then fill up with water to the original level, and weigh bottle and contents again.

The weight of water of equal volume to the cement used is then equal to the weight of cement minus the difference between the first and second weights of the bottle and contents, and the specific gravity of the cement is equal to the weight of cement divided by the weight of an equal volume of water as found above, or

Specific gravity =
$$\frac{\text{weight of cement}}{\text{1st wt. of vessel + weight of cement} - \text{2nd wt. of vessel.}}$$

Soundness Test.—This test is usually carried out by what is known as the Le Chatelier process, which consists of the apparatus shown in Fig. 2. It is a

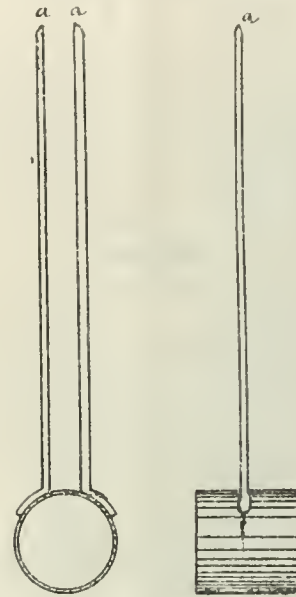


FIG. 2.

small split cylinder of brass, 30 mm. long, 30 mm. diameter, and of 0.5-mm. metal. Two long pointers, aa, are fixed one on either side of the split, of 165 mm. length from the tips to the centre of the

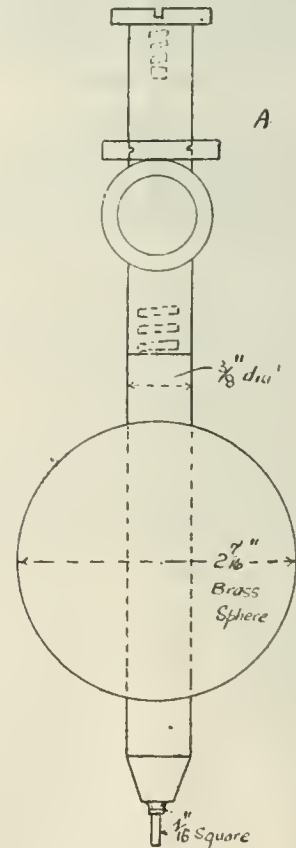


FIG. 3.

cylinder. The split edges of the cylinder are held closely together, while it is placed on a piece of glass and filled with the usual cement paste. A glass plate and a small weight are then placed on the mould, and it is put into water at about 60 deg.

The Surveyor

And Municipal and County Engineer.

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Fahr. for twenty-four hours. The cement will then be set, and the distance between the tips of the pointers measured on a millimetre scale. The apparatus is then placed in cold water, which is raised to boiling-point and kept boiling for six hours. When cool, the distance between the pointers is again measured. Under this test a bad cement will turn into soup, while an unsound one, owing to the presence of an excess of free lime or unslaked particles, will crack and expand, and this will be indicated by the movement apart of the pointers. The "Standard" specification allows an expansion of not more than 6 mm. in cement that before mixing had been exposed to the air for seven days.

Time of Setting Test. By varying the constituents cement can be made to set slowly or quickly according to the purpose for which it is required. Slow-setting cements allow greater latitude in mixing, while in tidal work rapid setting is essential. A briquette or pat of cement is made up in the usual way, and is tested by the indentation of a weighted "needle" of the form shown in Fig. 3. It has a flat end $\frac{1}{8}$ in. square, and weighs 2½ lb. The cement is considered to be "set" when the "needle," after being lifted by means of the loose hollow washer A, and gently applied to the surface of the cement, fails to make an impression. (Reader.)

Motorists and Roadmen.—A letter has been addressed to members of the Hampshire Automobile Club enclosing a request from the county surveyor, Mr. W. J. Taylor, that motor cars should be driven very slowly when passing men at work on the roads.

Coast Sand Dunes, Sand Spits, and Sand Wastes. (By Gerald O. Case. London: St. Bride's Press, Limited, 24 Bride-lane, E.C. 5s. nett.) While a good deal of attention has been directed in recent years to the question of coast erosion, but little has been said of the changes made by the wind on sandy shores. . . . The subject is certainly of sufficient importance to deserve more attention than it has hitherto received, and in discussing the nature of the groynes, embankments, &c., as well as of the vegetation best suited to arrest the movements of sand, Mr. Case has made distinct progress towards the solution of a difficult problem.—*Journal of the Society of Arts.*

NORTHANTS AND EAST MIDLANDS SURVEYORS' ASSOCIATION.

MEETING AT KETTERING.

A meeting of the recently-formed Northants and East Midlands Surveyors' Association took place at Kettering on the 23rd ult.

Assembling at the Free Library, the members were cordially welcomed to the town in the museum at the Free Library by the chairman of the urban district council (Mr. J. Loake, J.P.), who was supported by the vice-chairman of the council (Mr. E. C. Gravestock), and the clerk (Mr. J. Bond).

Mr. Alfred Fidler (borough surveyor at Northampton) proposed a hearty vote of thanks to Mr. Loake and to the Kettering Urban Council.

Mr. T. Reader Smith then took the chair.

Mr. Walton Maughan, of Northampton, who has taken an active share in the inauguration of the association, said the idea of the institution was to enable the members to get to know each other personally, so that they could work well together for mutual education and for the advantage of the public authorities employing them.

Mr. Alfred Fidler was unanimously elected president, Messrs. Williams (Daventry) and T. Reader Smith (Kettering) were unanimously appointed vice-presidents, and the committee were elected as follows: Messrs. Madin (Rushden), W. W. Band (Newnham), J. E. Wilkes (Northampton), T. Lloyd (Thrapston), and E. Y. Harrison (Wellingborough); while Mr. W. Maughan (Northampton) was, amidst applause, appointed hon. secretary.

Those members present at the meeting included Messrs. Alfred Fidler, M.INST.C.E. (Northampton), W. B. Madin (Rushden Urban Council), T. Yorke (Raunds Urban Council), G. F. Bearn (Wellingborough Rural Council and Finedon Urban District Council), W. W. Band (Daventry Rural Council), T. Northen (Rutland County Council), G. Dolphin (Uppingham and Gretton Rural Councils), F. W. Smart (Shire Hall, Bedford), J. W. Lloyd (Rushden Urban Council), G. E. Marlow (Desborough Urban Council), A. Harris (Rothwell Urban Council), T. F. Parker (Kettering), T. Lloyd (Thrapston Rural Council), C. H. Dorman (Northampton), G. Belson Chilvers (Oundle Urban Council), C. W. N. Jack (Northampton), C. G. Atkinson (Wellingborough), J. B. Williams (Daventry Borough Council), T. W. Millner (Blisworth), H. B. E. Brown (borough surveyor's office, Northampton), H. L. Harrison (Bedford County Council), L. J. Rogers (Wellingborough Urban Council), A. C. Wallingford (surveyor to the Soke of Peterborough), T. R. Smith (Kettering Urban Council), W. Manger, W. Maughan (Northants County Council), H. George, J. W. Whiteman (Bedford County Council), G. F. Hartigan, W. K. Leslie (borough surveyor's office, Northampton), E. Y. Harrison (Wellingborough Council), and others.

After the meeting the party proceeded in motors and brakes to the large blast furnace works of the Kettering Iron and Coal Company, Limited, at the northern portion of the town, being taken round in parties under the guidance of Mr. H. J. Preston (the managing director), Mr. F. H. Preston, Mr. G. Barratt (secretary of the company), and Mr. A. E. Linnell (works manager). The members then adjourned to the company's offices, where they were entertained at tea by Mr. Preston. At the conclusion, Mr. Alfred Fidler proposed a hearty vote of thanks to Mr. Preston. Mr. H. J. Preston suitably replied.

The party, under the guidance of Mr. T. Reader Smith, next proceeded to the electric light station and refuse destructor works, which were explained by Mr. W. A. Walker, and then on to the new baths in course of erection.

Aberdeenshire Road Schemes. Sir George Gibb, chairman of the Road Board, accompanied by Mr. H. P. Maybury, chief engineer of the board, arrived in Aberdeen last week (the *Glasgow Herald* states) for the purpose of inspecting roads in the northern counties. Accompanied by several county councillors and the road surveyor of Kincardineshire, Sir George Gibb and Mr. Maybury visited the Laureneekirk district, where improvements are in contemplation. They will also examine the proposed scheme for the improvement of the North road from Aberdeen to Keith, which affects the Aberdeen, Garioch, and Huntly districts of Aberdeenshire.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act ii., 2.

ROAD TERMINOLOGY.

To the Editor of THE SURVEYOR.

SIR, Will you kindly allow me to repeat, for the benefit of "Not so Dusty," the statement made in my letter of May last—viz., that "natural bitumen should never be mixed or laid in connection with any coal-tar product, as the latter destroys the good properties of the bitumen"?

If "Not so Dusty" recommends, or has recommended, the mixing of natural bitumen with coal-tar products, and oil for road work or any other purposes, then I say distinctly he cannot be aware of the action which certain bodies contained in coal-tar products have on bitumen.

I have, as "Not so Dusty" says, every faith in the accuracy of my statements, and it may perhaps interest him to learn that my information has been gained first hand and as the result of over thirty years' personal experience in the refining and manufacture of bitumens, asphalts and pitches of all kinds for road paving and a variety of other purposes.

I can also assure "Not so Dusty" there is no need for him to disclose his identity, and it is not surprising that certain well-known facts may at present "seem paradoxical" to him, but the leading authorities and those who have made a study of the subject would, I think, be able to satisfy "Not so Dusty" that to have full knowledge of the behaviour and life of bitumens and asphalts is only to be acquired after, practically speaking, a lifetime's work.

His sneer at Mr. D. A. Sutherland, F.I.C., F.C.S., and several other of his remarks are not, in my opinion, in the best of taste, and I cannot see that anything would be gained by replying to any further such letters from your correspondent.—Yours, &c.,

ENGINEER.

June 3, 1914.

SOME RECENT PUBLICATIONS.*

SANITARY ENGINEERING. A practical manual of town drainage and sewage and refuse disposal. By Francis Wood, M.I.N.S.T.C.E., F.G.S. Price 8s. 6d. nett. London: Charles Griffin & Co., Limited.

This is the third edition of Mr. Wood's well-known book, and he has taken the opportunity to bring it up-to-date by dealing with a number of improvements and alterations which have been made in the design and construction of sewers, particularly in the application of concrete, also in destructors and the ventilation of sewers or oxygenation of sewage, together with a study of rain storms, and the volume and rate of discharge into sewers of rain water. As stated in connection with the first edition, this book is primarily intended for engineering students, but many engineers no doubt will find something of value in the matter included in this volume.

The various subjects treated, including hydraulics, house drainage, land drainage, the various systems of sewerage, sewer construction, ventilation, refuse disposal, and so forth, are dealt with in a very clear and simple manner, and this book should prove useful to many engineers who wish to have a handy means of reference to a work by an author who has had personal experience in the matters with which he deals.

The only criticism we have is that the subject of sewage disposal is not brought up-to-date. Several methods of treatment described in the book are now almost, if not entirely, obsolete. The Local Government Board's requirements, as set forth, are those which were in use prior to the publication of the Fifth Report of the Royal Commission on Sewage Disposal, and no mention whatever is made of the many developments, both in the preliminary treatment and filtration of sewage and in methods of sludge disposal, which have been brought out during the past few years.

The publishers of "Sell's Directory of Registered Telegraphic Addresses," that well-known and almost

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

indispensable reference book, have obtained official authority to publish the list of firms in Australia using registered cable addresses, and arrangements have been made for the names, together with the postal and cable addresses and other particulars, to appear in the next volume of the directory.

REFLECTING SIGNALS FOR TRAFFIC PURPOSES.

MR. WALTON MAUGHAN'S INVENTIONS.

After making a large number of experiments with the object of obtaining efficient reflecting signals, suitable for various purposes, Mr. Walton Maughan, whose name is known to our readers in connection with studies of road traffic, has embodied the results of his work in a number of devices for reflecting rays of artificial or natural light so as to locate and define stationary and moving objects. These devices are intended for use on roads and railways, and for docks and shipping, and, generally, wherever safety may be increased by defining the position or shape of a building or other object, or by erecting a signal which will convey definite information in a simple manner.

As regards the form of the device, it may be a tube (plain or lens fronted), a lens, bar, disc, or other shape; and the material of which it is made may be glass or polished or plated metal. These devices will be so made that, in the words of Mr. Maughan's patent specification, "the position and nature of any object, form, signal, or lettering can be ascertained in darkness or in defective daylight, by means of artificial light, or enhanced by sunshine or natural light, directed or deflected thereon, striking such forms of construction . . ."

The reflecting device may be solid or hollow, forming a transparent or translucent body or substance, which can be coated either inside or outside, and backed or filled with solid or liquid reflecting agents, either open to the air or sealed in vacuum. The object of the sealing in vacuum is to protect the reflecting agents from the destructive agents met with on roads and railways, and in marine work. Such reflectors may render safer any dark or dangerous places on a road, and reveal hidden dangers, acting either as signals or by outlining an object. The scope of these inventions is wider than that of ordinary direct reflection, and in suitable forms they are intended to be applied to the edges of wharves and station platforms, and the kerbing of roads at dangerous bends and corners. They may also be applied to staircases, doorways and gangways, so as to make the fullest use of defective daylight or artificial light.

In their application to road signs these devices may conveniently be in the form of straight or curved tubing, preferably lens-fronted, or small shapes of silvered glass, and can be adapted to the shapes of letters and numbers, for warning purposes, the numbering of houses, and so on. The inventor specially draws attention to the low cost of maintenance, which is "practically negligible," and to the permanence of the glass tubing with the silvering in a vacuum, and therefore protected from the atmosphere.

Bournemouth's New Drive.—Bournemouth's new undercliff drive and promenade were formally opened on Wednesday by the Earl and Countess of Malmesbury. The drive extends from Bournemouth Pier to Boscombe Pier, and cost £60,000.

Finchley Housing Scheme.—The Finchley Urban District Council have received a letter from the Local Government Board approving generally of their housing scheme. It is proposed to borrow £93,443 for the purchase of land on the Woodhouse Estate, North Finchley, and the erection of 300 dwellings, of which 240 are to be let at 8s. 6d. a week and 60 at 7s. 6d. The estate is to be laid out on town planning lines, and 5 acres are to be kept as an open space.

Liverpool Water Engineership.—Under the new age limit relating to the retirement of Liverpool Corporation officials on superannuation, Mr. Joseph Parry's occupancy of the position of city water engineer terminated at the end of May. He was succeeded on June 1st by Mr. J. R. Davidson, who for the past sixteen years has held the position of principal assistant engineer. Mr. Parry's connection with the corporation will not, however, be completely severed, as he is retained in a consultative capacity.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Bristol T.C. (May 26th. Major J. Stewart).—£2,114 for purposes of street improvement; also for the approval of the transfer of certain consolidated stock, and the appropriation of the proceeds towards defraying the cost of the acquisition of a part of the Drill Hall, Queen's-road, for the extension of the Municipal Art Gallery.—It was explained by Mr. Williams, of the borough surveyor's department, that the proposed street improvements related to widenings in Bourneville-road, Whitehall, Old Market-street, Redcross-street, and other thoroughfares.

Crompton U.D.C. (May 21st. Mr. F. H. Tulloch).—£1,500 for completing the laying out of Dun Wood Park, including the construction of an approach road from Milnrow-road and of a bridge over the river Beal, and of £4,012 for the provision of a refuse destructor and steam disinfecter in Limey-lane, including the execution of certain works of sewerage.—The proposed loan for Dun Wood Park, it was explained by the surveyor, Mr. F. F. Gartside, was on account of excess expenditure for necessary works. The dust destructor, he stated, would consist of a two-cell plant, with room for a third cell to be installed when requisite.

Newton Abbot R.D.C. (May 27th. Mr. H. A. Chapman).—£3,000 for a housing scheme at Cludleigh, where it is proposed to erect two blocks of six cottages each.—The architect, Mr. S. Segar, stated that the ground floor would consist of large living-room and scullery, with three bedrooms upstairs.

Norton R.D.C. (May 26th. Mr. W. M. Cross).—£1,432 for the purpose of providing a water supply for Westow township.—Mr. G. S. Cattle, clerk, said the present water supply was mainly from wells, and was in many cases unsuitable, and the water was often polluted. The council had considered various schemes for supplying this Wold village. A gravitation scheme had now been formulated, an adequate supply of water having been secured from springs at Mount Farrant. A lease of ninety-nine years had been granted at a rent of £15 per annum, which included $\frac{1}{4}$ acre of land on which to erect a reservoir. The springs had been tested to supply 3,888 gallons in twenty-four hours. It was proposed to spread the cost of the scheme over thirty years, and a rate of 2s. in the £ on houses and 6d. in the £ on land would be necessary.

Plympton R.D.C. (May 19th. Mr. F. O. Stanford).—£2,510 for sewerage and sewage disposal for the parish of Plymstock.—It was stated that at present a portion of the village of Plymstock was drained into a cesspit. The old sewers were to be connected up with the proposed scheme. The discharge into the cesspit at present had no outfall, and was unsatisfactory. Their new scheme would tap the whole of the houses in the village.

St. Helens T.C. (May 28th. Major C. E. Norton).—£42,191 for the gas undertaking.—The town clerk, Mr. W. H. Andrew, stated that the proposal of the Gas Committee was to put up sixty-four of the Glover-West vertical retorts in place of the 168 old horizontal retorts, which would bring the capacity of the works to 3,500,000 cub. ft. per day. The new system would enable the corporation to increase the make of gas per ton of coal, and increase the economical working of the undertaking. The demand for gas was increasing, being 392,000,000 cub. ft. in 1904, and 555,000,000 cub. ft. last year. Mr. S. Glover, gas manager, and inventor of the new style of retorts, produced plans, and offered the necessary explanations.

Scarborough T.C. (May 26th. Mr. Edgar Dudley).—£368 for the purchase of certain land forming part of Columbus Ravine, and £1,125 for the purchase of property in Low Conduit-street, Coverley's-court, and St. Mary's-street, for the widening and improving of Low Conduit-street.—The first-named sum, the town clerk, Mr. Sidney Jones, explained, is needed to complete the Columbus Ravine improvement, which connects the North-west Ward with the north side, and the other improvement will give better access to Princess-street in the East Ward, and remove an insanitary area.

Sleaford R.D.C. (May 29th. Mr. W. M. Cross).—For the purposes of a water supply scheme—viz., Evedon, £346; Ewerby, £1,100; Haverholme Priory,

£467; and Kirkby Laythorpe, £246.—The parish of Kirkby objected to inclusion in the scheme, and to the apportionment of the cost of the works. The clerk, Mr. C. E. Clements, stated that the council had made terms with Lord Winchelsea for a supply of water from his bore at Evedon, and the cost had been fairly apportioned over the four parishes.

Todmorden T.C. (May 20th. Mr. F. H. Tulloch).—£1,650 for the purchase of a motor fire engine and motor ambulance.—The town clerk, Mr. H. Garrett, stated that the proposed new fire engine was to be of 75-horse power, and would cost £1,150. It would be much more powerful than the present horse-drawn engine. The horse-drawn ambulance, the town clerk added, had been found to be too slow a method for conveying patients to accident hospitals at Halifax, Manchester, and other surrounding towns.

Wigton U.D.C. (May 19th. Mr. R. H. Bicknell).—£550 for works of street improvement in Longthwaite-road, George-street, Union-street, and Station-hill, and £310 for the extension of the water mains to Brookfield, and along Cemetery-road.—With respect to the proposed paving, the inspector stated that the Local Government Board did not sanction a loan for this kind of work for so long a period as twenty years. It would probably be for five years. He asked if it would not be worth their while to consider the question of using concrete slabs from either Shap or Threlkeld. He did not think they would cost more than 3s. 2d. a yard. Slabs were easily lifted if they wanted to get at a gas pipe, whereas concrete was not satisfactory after it had been once broken. It occurred to him that it was hardly worth while borrowing for a period of five years, but that was the time they would get for the £225 if they wished to continue it. With regard to the kerbing and channelling, they would get a longer period. He did not like concrete channels himself. The surveyor, Mr. J. J. Davison said they found that concrete was better than Lazonby kerb. In reply to the inspector, Mr. Davison said that along crossings they intended to put whinstone cube setts for the wheels of carts, &c. Between gratings and doorsteps they proposed to put cobbles. The inspector said that the Local Government Board had not got a period for cobble paving. It was forgotten about 300 years ago. With reference to the water mains, the surveyor said they would be laid with a 3-ft. cover.

APPLICATIONS FOR LOANS.

Beaconsfield U.D.C.—£9,600 for the erection of forty houses.

Isle of Wight R.D.C.—£1,620 for a recreation ground.

Lincoln T.C.—£9,680, excess expenditure in respect of the construction of the Bracebridge Heath reservoir.

Llandudno U.D.C.—£750, contribution to the Colwyn Bay through road scheme.

Maidenhead T.C.—£3,000 for a depot and stables.

Malvern U.D.C.—£1,600 for the electricity undertaking.

Padstow U.D.C.—£2,000 for the erection of eight cottages.

Rowley Regis U.D.C.—£1,130 for the purchase of a school site.

Southampton T.C.—£5,000 for water supply works.

Southgate U.D.C.—£40,000 for the provision of 160 workmen's houses; £1,800 for an underground convenience.

Staines U.D.C.—£310 for sewerage works.

Sunderland T.C.—£8,000 for building a training college.

Swanage U.D.C.—£7,500 for the purchase of a site for a recreation ground.

Uxbridge U.D.C.—£7,000 for the provision of twenty-eight workmen's dwellings.

Wolstanton U.D.C.—£1,000 for the purchase of a site for municipal offices.

LOANS SANCTIONED.

Axminster R.D.C.—£11,000 for works of sewerage and sewage disposal.

Bandon R.D.C.—£1,500 for the provision of dwellings.

Bromley (Kent) R.D.C.—£2,046 for a housing scheme.

Castleford U.D.C.—£1,463 for road widening.

Cheadle R.D.C.—£1,900 for water supply works.
Chiswick U.D.C.—£1,140 for road widening.
Finchley U.D.C.—£1,197 for the purchase of land for open spaces.
Middlesbrough T.C.—£10,240 for laying out a recreation ground.
Stirling T.C.—£14,000 for the St. Mary's-Wynd improvement.

FORTHCOMING INQUIRIES.

	JUNE.	£
8.— Ealing. For surface-water sewerage (Mr. R. H. Bicknell)		5,800
8.— Evesham. For a housing scheme (Mr. H. S. Bidwell)		1,800
8.— Neath. For works of water supply (Major J. Stewart)		2,896
9.— Cleckheaton. For the provision of a recreation ground (Mr. F. H. Tulloch)		2,803
9.— Hanwell. For the provision of a public convenience (Mr. R. H. Bicknell) ...		1,400
9.— Hastings. For sea defence, sewerage, and public convenience purposes (Mr. P. M. Crosthwaite)		4,727
9.— Hedon. For works of water supply (Mr. F. O. Stanford)		1,502
9.— Ipswich. For a tuberculosis dispensary and school clinic (Dr. A. S. MacNalty)		—
9.— Merthyr. For street widening (Major J. Stewart)		550
9.— Newark. For town hall extension (Mr. Edgar Dudley)		2,105
9.— St. Mellons. For private street works (Major J. Stewart)		600
9.— Shildon. For the extension of the recreation ground (Mr. H. R. Hooper)		550
10.— Bexhill. For works of storm-water drainage (Mr. P. M. Crosthwaite) ...		250
10.— Harrogate. For private street works (Mr. F. H. Tulloch)		2,096
10.— Hexham. For works of water supply (Mr. H. R. Hooper)		1,880
10.— Kingston-upon-Hull. For the conversion of privies into water closets (Mr. F. O. Stanford)		20,000
10.— Kirkby-in-Ashfield. For the provision of a recreation ground (Mr. Edgar Dudley)		1,190
10.— Northwich. For housing purposes (Mr. Edward Leonard)		1,352
10.— Ogmore. For a housing scheme (Major J. Stewart)		13,424
10.— Portsmouth. For hospital extension (Mr. W. W. E. Fletcher)		30,200
10.— Salford. For the electricity undertaking (Mr. T. C. Ekin)		13,500
10.— Swinton. For works of sewerage (Mr. W. M. Cross)		10,858
10.— Winchcomb. For a housing scheme (Mr. H. S. Bidwell)		1,525
11.— Blaina. For a housing scheme (Mr. H. S. Bidwell)		25,000
11.— Ilford. For the provision of public baths (Major C. E. Norton)		21,100
11.— Lewes. For works of sea defence (Mr. P. M. Crosthwaite)		2,262
11.— Riccall. For works of water supply (Mr. F. O. Stanford)		3,810
11.— Romford. For sewerage and street works (Mr. M. K. North)		2,565
11.— Sheffield. For street and recreation ground purposes (Mr. F. H. Tulloch)		7,650
12.— Cudworth. For the provision of a refuse tip (Mr. F. H. Tulloch) ...		275
12.— Southend. For widening the Marine-parade (Major C. E. Norton)		2,203
12.— Whickham. For street and sewerage works (Mr. H. R. Hooper)		2,876
12.— Wigan. For works of sewage disposal (Mr. W. M. Cross)		—

12.— Worksop. For the provision of a public convenience (Mr. F. O. Stanford) ...	550
16.— Cambridge. For the provision of a recreation ground (Mr. Edgar Dudley)	854
TOWN PLANNING.	
16.— Edmonton. (Mr. Thomas Adams) ...	—

INSTITUTION OF MUNICIPAL ENGINEERS.

COUNCIL MEETING.

At a meeting of the council of the Institution of Municipal Engineers held in London on May 27th, the following applicants were recommended for admission:—

To Membership: Messrs. Thomas A. Prince, consulting highway surveyor, Leeds; W. Murdoch, city engineer, St. Johns, N.B.; L. E. Allen, engineer, County of Hastings, Ontario; E. C. A. Hanson, city electrical engineer, Saskatoon; Geo. D. Weaver, city engineer, Melfort, Saskatoon; A. W. E. Fawkes, waterworks engineer, city of Calgary, Alberta; and G. N. Hatfield, road engineer, City of St. John, N.B.

Transfer to Membership: Mr. H. W. Lovelock, assistant surveyor, Godstone Rural District Council.

Transfer to Associate Membership: Messrs. J. A. S. Menezes, assistant engineer, Public Works Department, Deccan Irrigation; H. P. Cocks, assistant surveyor, Horbury Urban District Council; D. Barton, assistant surveyor, Cheadle and Gatley Urban District Council; and W. J. Powell, surveying assistant, Birmingham Corporation electricity supply.

(Under the new by-laws these elections will be ratified at the next council meeting if no written objections are lodged within fourteen days.)

To Studentship: Mr. Hassan Foad, University College, London.

New Members, &c.—From the applicants recommended for admission at the last meeting two members were elected, and one associate member was transferred to membership.

Nominations for Council.—Nominations for ordinary members of council must now be deposited with the secretary by June 20th in each year. Nomination forms may be obtained on application.

Badge for Members.—Estimates for the supply of members' badges were considered, and the secretary was instructed to write to the district secretaries with a view to obtaining some idea as to the number of badges that should be ordered, for supply to members at a cost not exceeding 1s. each.

Defence Fund.—The question of appointing trustees for the administration of this fund was considered, and it was decided to defer the matter pending the result of certain inquiries which the secretary was instructed to institute. The opinion of the solicitors of the institution on the cases mentioned in the report of the April council meeting was before the meeting, and the secretary was instructed to convey such opinion to the members interested.

The next meeting of the council will be held at Manchester, on Saturday July 4th.

The Holsworthy Surveyor's Report.—The report of Mr. Frank J. Harris, surveyor to the Holsworthy, Devon, Rural District Council, to which attention was directed in our "Minutes of Proceedings" of last week, has been duly presented to the members of that body. It will be recalled that in the document in question Mr. Harris set forth in very plain fashion the administrative difficulties of the position he occupies, and concluded his observations by asking the council for a testimonial to enable him to apply for a more lucrative and certain appointment. At present, for the superintendence of the very considerable mileage of roads in his charge, although he is allowed no travelling expenses, no assistant, neither clerical assistance nor office accommodation, and not even a foreman, he is paid an annual salary of only £140. Mr. Harris' courageous attitude is, however, we are glad to learn, likely to result in an improvement of the conditions under which he is working, for the district council have decided that a committee shall consider the various points raised in his report. One member said he thought Mr. Harris deserved their sincere thanks for his statement, adding that they ought to do the best they could to help him, and that if he were not sufficiently paid his salary ought to be increased. The chairman, Mr. M. Yeo, was equally complimentary, remarking that there was no doubt Mr. Harris was "one of the best surveyors they had had."

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Birkenhead £13,000, Hull £91,000, Wilts; housing and town planning—Salford; roads and materials—Cheshire, Haddington, Winchester; sewerage and sewage disposal—Birmingham £33,000, Burton-on-Trent £30,000; water, gas and electricity—Newton Abbot.—Particulars of other works projected will be found in our "Local Government Board Inquiries" pages.

BUILDINGS.

Birkenhead T.C.—It has been agreed to carry out an extension of the Holt technical school, at an estimated cost of £13,000.

Gillingham T.C.—A scheme has been approved for the erection of public swimming baths, at an estimated cost of £3,500.

Glossop T.C.—A committee has received authority to prepare a scheme for the provision of public conveniences.

Howden R.D.C. A new isolation hospital is to be built at a cost of £3,500.

Hull T.C.—The council have approved a scheme prepared by the borough engineer, Mr. A. E. White, for the widening of the North Bridge and its immediate approaches, at an estimated cost of £91,000.

Maidenhead T.C.—The council have approved the plans of the borough surveyor, Mr. P. Johns, for new stables and a depot upon land adjoining the electric light works, at an estimated cost of £5,000.

Motherwell T.C.—A new pavilion affording accommodation for twenty-seven additional beds is to be added to the council's hospital, at an estimated cost of £4,500.

Padiham U.D.C.—The surveyor, Mr. John Gregson, has received instructions to prepare an estimate for a public mortuary.

Penzance T.C.—The tender of Messrs. N. Holman & Sons, Limited, at £363, has been accepted for the ironwork, and the tender of Mr. I. W. Legg, at £405, for decking, in connection with the scheme for repairing the Ross swing bridge on the quay.

Stoke Newington B.C.—The Town Hall Committee have submitted plans of a proposed scheme for the provision of private offices for the town clerk and the surveyor, an improved drawing office, storage accommodation, and a committee-room.

Tynemouth T.C.—The council last week adopted a report from the Town Improvement Committee in reference to the restoration of the seabanks at Tynemouth which were destroyed by a landslip eighteen months ago. The report embraced a scheme for the restoration of the highway near Percy-garden, and the improvement of the section of the seabanks adjoining, the work to be done upon the Hembique ferro-concrete system. It was decided, subject to certain conditions and stipulations arranged and provisionally agreed to, to accept the tender of Mr. R. Fisher, at £6,600, for section I, and the tender of Mr. W. T. Weir, at £2,729, for the other work. It was further agreed that the borough surveyor, Mr. J. F. Smillie, should be instructed to prepare working drawings and estimates, and obtain tenders for that portion of the whole scheme for protecting and improving the seabank from the works already proposed to the north of Sharpness Point.

Wilts C.C.—The tender of Messrs. Mussellwhite & Son, Basingstoke, at £27,172, has been accepted for the building of the new blocks at the county asylum.

HOUSING AND TOWN PLANNING.

East Cowes U.D.C.—A proposal is to be discussed for the erection of thirty cottages, at a cost of £225 each.

Hoyland U.D.C.—A scheme is under consideration for the erection of fifty workmen's dwellings.

Kendal T.C.—The council at their last meeting accepted an offer by Lord Henry Bentinck of 2 acres of land known as Two Stiles Field for the municipal housing scheme. It was explained that the price of the land was £170, this being the agricultural value

merely. Lord Henry placed the condition upon the sale of the land that the houses to be built by the corporation should be let at rents not exceeding 8s. per week, inclusive of rates. The borough surveyor, Mr. F. W. Oxberry, stated that the houses would pay for themselves.

Liskeard R.D.C. The Local Government Board is to be asked for sanction to borrow the necessary money for the erection of workmen's cottages at Morval and Bosconoc.

North Dublin R.D.C.—Official sanction has been received to a scheme for the erection of 107 workmen's cottages.

Salford T.C.—The Building and Bridges Committee have issued a report on a proposed application to the Local Government Board in respect of a town planning scheme for the town. A survey and inspection of the borough made in 1910 disclosed that more than 2,000 acres of land were then available for building purposes, and in 1913 the Building Committee decided upon the areas suitable for inclusion in a town planning scheme. The owners of the largest areas have expressed their willingness to co-operate. At a meeting of the committee on May 22nd last a resolution was passed that the council be recommended to ask for authority to prepare the scheme, and thus empower them to give the statutory notices to the adjoining local authorities and all persons owning land within the scheme.

Wallasey T.C.—The Local Government Board have decided to grant the application of the council to prepare a town planning scheme in Penkett-road. The Works Committee recommend the council to issue the necessary notices of their intention to apply for a town planning scheme in connection with the remaining undeveloped areas in the borough.

ROADS AND MATERIALS.

Axminster R.D.C.—The surveyor, Mr. G. A. Millard, has received instructions to prepare plans and specifications, and invite tenders for road improvement works at Axmouth.

Cambs C.C.—The question of providing motor cycles for the three road foremen has been referred for consideration to the Roads and Bridges Committee.

Chelmsford T.C.—Various road improvement schemes have been agreed to, including the wood-paving of part of Duke-street, at an estimated cost of £2,300, subject to a grant being received from the county council and the Road Board.

Cheshire C.C.—The Road Board have sanctioned a grant of £12,000 towards the cost of surfacing various roads with granite coated with Tarvia. The total estimated cost of the work is £42,364. A grant of £6,000 has also been made by the Road Board towards tar-dressing work, estimated to cost £15,065.

Croydon T.C.—Improvements are to be carried out in Shirley-road, at an estimated cost of £275.

Dorset C.C.—The county surveyor, Mr. W. T. Fletcher, has submitted to the council a report on the organisation of road labour in the Southern district, showing an economy for the year ending March 31st compared with the cost of the year before. After certain deductions, the cost of manual labour came to £646, as against £703 for the same services for 1912-13. Yarding flint also showed a saving of £39. Compared with the other districts at per mile, the South district manual labour works out at the lowest rate: North district, cost per mile, £10 13s.; South £8 18s.; East, £10 6s.; and West, £9 10s. Besides the question of cost, the South district now has twenty-three men who have worked together for a year, and have carried out their various works under methods which are practically the same all over the district, and in consequence the standard of work has considerably improved. All material is more evenly and economically spread than elsewhere in the county.

East Ham T.C.—It has been decided to carry out widening and improvement schemes, at an estimated cost of £2,492.

Haddington C.C.—The Western District Committee have agreed to purchase road-making plant at an estimated cost of £2,947, for the improvement chiefly of the Great Post road.

Helston R.D.C.—A proposal for the repair of the Helston to St. Keverne road, for a distance of 8 miles, at an estimated cost of nearly £1,000, has been referred to committee.

Kent C.C.—The council recently gave authority for the purchase of six 600-gallon tar boilers at £70 each, and six sand dryers at £57 10s. each, for pitch-grouting work; also two 80-gallon tar boilers at £16 10s. each.

Maidenhead T.C.—Braywick-road is to be repaired at an estimated cost of £2,500, a loan for this sum having been granted by the Road Board.

Mansfield T.C.—The council have adopted provisionally a scheme for the construction of a road from Pelham-street to Toothill-lane. The Duke of Portland has promised to give the necessary land, and it is proposed to build a bridge over the Maun and make the road. A considerable hollow will have to be filled up, and this will for the time being form a tip in a central position for the corporation.

Paddington B.C.—A sum of £2,750 is to be spent in improving the gradients of the bridge over the Grand Junction Canal at Great Western-road.

Wilkesden U.D.C.—A scheme has been approved for the widening of High-street, Harlesden, and Station-road, at an estimated cost of £6,250, the cost to be borne by the urban district and the Middlesex County Council.

Winchester R.D.C.—The county council have approved a scheme of the rural district council to lay wood paving on the Winchester and Southampton main road at St. Cross. It is proposed to lay sectional Jarrah blocks on 6-in. beds of concrete from Stanmore-lane in a southerly direction for a distance of 388 yds., and the estimated cost is £3,000.

SEWERAGE AND SEWAGE DISPOSAL.

Birmingham T.C.—It has been found necessary to provide a main valley sewer to meet the needs of the Erdington district, and the Public Works Committee recommend that this be done at an estimated cost of £33,000.

Burton-on-Trent T.C.—A scheme has been adopted for duplicating the rising main at the sewage farm, at an estimated cost of £30,000.

Hoyland U.D.C.—Extensions are to be effected at the sewage disposal works, at an estimated cost of £1,344.

Liskeard R.D.C.—New sewers are to be constructed at Pelynt, at an estimated cost of £966.

Nuneaton R.D.C.—The Local Government Board have sanctioned a sewerage scheme for Arley, at a cost of nearly £3,000. The area of the outfall site is 3 acres, and effluent will pass over the land before finding its way into the stream.

Ulverston U.D.C.—Consideration is being given to a proposed sewerage scheme for Sontergate, which is estimated to cost £700.

WATER, GAS, AND ELECTRICITY.

Ashton T.C.—The Baths Committee are considering the question of installing a system of filtration in connection with the water used in the public baths.

Audley U.D.C.—The question of making considerable alterations and extensions at the gasworks has been referred to the Gas Committee.

Bolton T.C.—The Waterworks Committee have instructed the waterworks engineer to prepare plans, specifications and bills of quantities for the construction of reservoirs at Eagley and Hordern. It is the intention of the committee to proceed with the construction of two reservoirs as quickly as possible, and they are to be completed by 1923.

Chester T.C.—It was decided last week to take steps to purchase the local waterworks undertaking from a private company.

Haverfordwest T.C.—The surveyor, Mr. W. Bevan, has been instructed to prepare an estimate of the cost of an extension of the water main to Merlin's Bridge.

Hereford T.C.—It is stated that the prospects of the electricity undertaking are now assured. Last year there was a surplus of £106, as against a deficit in the year before. A scheme is proposed for extending the machinery at a cost of £530, building a new chimney at £500, and constructing new mains at a cost of £240.

Lincoln T.C.—The nett profit earned by the electricity undertaking last year was £2,715.

Newton Abbot R.D.C.—The council have referred to the parish council a report on the experimental operations recently carried out for the improvement of the Bovey Tracey water supply. The works were carried out in the vicinity of Yarrer, and the results showed that, making liberal deduction for the usual dry season, and allowing only 12,500 gallons per day as the available yield of the existing source, there would be an average of 68,000 gallons per day available over a period of five months, which left 7,000 gallons per day to be drawn from the storage, to make up 75,000 gallons per day required. The amount drawn from storage would be 850,000 gallons, leaving a balance of 2,000,000 gallons for contingencies. The water from the adits was of unquestionable purity, and the analysis was satisfactory. The only point about which there might be some question before the Local Government Board was any action which the water might have upon metals. The estimate of the cost was £2,679.

Ulverston U.D.C.—It has been decided to proceed with a water supply scheme at Head Craggs, at an estimated cost of £665.

Ware U.D.C.—Messrs. Blake & Scott, of 5 Victoria-street, Westminster, have received instructions to enquire into and report upon the water supply of the town.

Wigan T.C.—The profits on the gas undertaking last year were £9,708, including the cost of street lighting, which amounted to £5,600.

MISCELLANEOUS.

West Bromwich T.C.—After charging interest on loans and sinking fund instalment, the nett profit of the working of the tramway undertaking last year amounted to £261.

PERSONAL.

Mr. W. Moore, assistant to the city surveyor of Hereford, has received an increase of salary.

Mr. George Faulds, assistant surveyor to the Earby Urban District Council, has received an increase of salary.

Mr. Leonard Tait, of Morpeth, has been appointed surveyor and sanitary inspector to the Norton (Yorks) Urban District Council.

Mr. W. H. Jukes, surveyor to the Tipton Urban District Council, has received an increased salary of £30, making £250 per annum.

Mr. A. T. Williams, a member of the surveyor's staff, has been appointed assistant surveyor to the Bridgewater Rural District Council.

Mr. T. Waddington, surveyor to the Hebden Bridge Urban District Council, has resigned with a view to commencing practice at Grimsby.

Mr. W. Fawcett Wilkins, borough surveyor of Dunstable, has been installed Master of the Cordwainer Ward Lodge of Freemasons, No. 2,241.

Mr. H. Leadbetter, of the Rotherham borough surveyor's office, has been appointed senior draughtsman to the Wood Green Urban District Council.

Mr. W. A. Harrison, assistant surveyor to the Long Eaton Urban District, has resigned his position to take up a Government appointment in Ceylon.

Mr. C. G. Bradley, surveyor to the Goole Urban District Council, has been appointed borough surveyor of Bridlington, at a salary of £275, rising by annual increments of £25 to £350 per annum.

Mr. A. Dunning, surveyor to the Wigmore Rural District Council, has had his salary raised from £170 to £200 a year, the council at the same time complimenting him on the excellent condition of the roads in his district.

Mr. J. Haller, surveyor to the Carlton Urban District Council, who has been appointed chief engineering assistant to the Notts county surveyor, was on Saturday presented with a framed photograph of the members of the fire brigade, and a handbag from the general workmen of the Carlton Council, a necklet for his little daughter, from the fire brigade, a gold sovereign purse from "a few old friends at Carlton," and a ten years' service medal from the National Fire Brigades' Union.

Mr. Prevost Hubbard, ASSOC. AM. SOC. C. E., in charge Division of Roads and Pavements, the Institute of Industrial Research, Washington, and Lecturer in Highway Engineering Chemistry at Columbia University, and Mr. Arthur H. Blanchard, M. AM. SOC. C. E., consulting highway engineer, and Professor in Charge of the Graduate Course in Highway Engineering at Columbia University, have been elected by the council of the International Association for Testing Materials the American members of Commission No. 58 on Standardisation of Methods of Testing and Nomenclature of Road and Paving Materials.

DEATH OF MR. A. M. FOWLER.

PAST-PRESIDENT OF THE INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

We regret to announce the death, which occurred on Tuesday at his residence at Ascot, of Mr. Alfred M. Fowler, M. INST. C. E., who was president of the Institution of Municipal and County Engineers from 1894-5, his membership of that body dating back to its formation in 1873.

Mr. Fowler was eighty years of age, but until a fortnight ago was in attendance at his office in St. Peter's-square. A very energetic man, Mr. Fowler got through a tremendous amount of work and frequently travelled in one day between his offices in London and Manchester and on to Colwyn Bay. He carried on many important engineering undertakings in various parts of Great Britain, and at the time of his death he had in hand big contracts in Windsor and Staffordshire.

Mr. Fowler was appointed borough engineer of Salford in October, 1872. Previously he had occupied a similar post at Leeds. In 1877 he became borough engineer at Newcastle-on-Tyne. For many years he had been in private practice.

Metropolitan Water Board's New Offices.—The Metropolitan Water Board have adopted the design of Mr. H. Austin Hall, of Messrs. Warwick & Hall, architects, of South-square, Gray's Inn-road, for the erection of the new central offices of the board. The assessor to the board reported that the buildings could be erected for £90,000.

Assistant County Surveyorship of Cheshire.—The Main Roads Committee of the Cheshire County Council have appointed Mr. G. E. Ashforth, ASSOC. M. INST. C. E., chief assistant surveyor and engineer to the Durham County Council, to the office of assistant county surveyor and bridgmaster of Cheshire, at a commencing salary of £350 with travelling expenses.

A Roadmender's Letter.—Roadmenders in the employ of Guildford Rural District Council sent a petition to the council for higher wages and shorter hours. A roadman, Mr. T. R. Daly, who did not sign the petition, sent a letter which came before the council yesterday. He wrote: "Our troubles are primarily due to a colourless compulsory education and certain Acts of Parliament which promise the worker a 'new heaven and a new earth,' with 'rare and refreshing fruit' which would act as the balm of Gilead to soothe his parched lips, and that there would be 'no more complaining in our streets.' But, alas! the workman has found those promises illusory—'sounding brass and a tinkling cymbal'—and that he is taxed indirectly to pay for their administration."

FOR OTHER ADVERTISEMENTS

See End of Paper.

ROAD FOREMAN seeks re-engagement to Council or Contractor. Thoroughly experienced in road construction, tar-painting, tar-grouting, and laying tarmac; capable of taking jobs through; 10 years' references, five years as foreman; total abstainer, age 36.—Box 1,429, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,678)

WANTED, immediately, few Engineers for pipe laying and street work, chiefly in towns, and preferably with experience of contractors' work. Apply, with copies of testimonials, and state salary required, to British Insulated and Helsby Cables, Limited, Prescot, Lanes. (1,677)

WATFORD URBAN DISTRICT COUNCIL.

WATERWORKS.

CONTRACT NO. 10, PUMPING STATION.

The Watford Urban District Council is prepared to receive Tenders for the Erection of a Pumping Station, including Engine-house, Basement, Machine Shop, Boiler-house, Coal Store, Filter-house, Lime Store and Softening Tank.

Persons desirous of Contracting for the work may see the Plans, Specification, and Conditions of Contract upon application to the Engineer, Mr. D. Waterhouse, Council Offices, High-street, Watford.

The Schedule of Quantities, Specification and Form of Tender may be obtained from the Engineer upon the payment of a deposit cheque of £10, payable to the Watford Urban District Council, which will only be returned upon the receipt of a *bona-fide* Tender and the Specification supplied to him.

Sealed Tenders and Schedule, addressed to the undersigned Clerk to the Council, endorsed "Waterworks Contract, No. 10," must be delivered under cover to me at Watford not later than noon on Monday, July 6th, 1914.

The Council does not bind itself to accept the lowest or any Tender.

W. HUDSON,
Clerk and Solicitor.

Council Offices,
14 High-street,
Watford.

June 3, 1914. (1,680)

URBAN DISTRICT OF FINCHLEY.

SEWAGE FILTERS.

The Council of the above-named District invites Tenders for the Construction of Four Clinker Sewage Filters, &c., at the Sewage Farm, Summers-lane, Finchley.

Plans may be seen, and Specification, Schedules, and Form of Tender obtained, on application to the Council's Engineer, Mr. C. J. Jenkin, M. INST. C. E., M. I. M. E., on payment of the sum of £2 2s., which will be returned on receipt of a *bona-fide* Tender for the whole of the Works, together with the fully-priced Schedule and the return of all papers supplied.

Sealed Tenders, endorsed "Tender for Filters," to be forwarded to the undersigned not later than 4 p.m. on Monday, the 22nd day of June, 1914.

The Council does not bind itself to accept the lowest or any Tender.

E. H. LISTER,
Clerk of the Council.

Council Offices,
Finchley, N.

June 3, 1914. (1,682)

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

Tenders are invited from Contractors for the execution of Foundation Works to certain roads within the County, consisting of excavation and supplying and laying hardcore at various depths.

Specification, Schedule of Prices, and Form of Tender can be obtained from the undersigned.

Tenders are to be delivered to the County Surveyor's Office at Chelmsford not later than Monday, June 15, 1914.

PERCY J. SHELDON, M. INST. C. E.,
County Surveyor.

County Surveyor's Office,
Chelmsford.

June 3, 1914. (1,679)

THE SEWAGE COMMITTEE of the CORPORATION of BURY are prepared to receive Tenders for the supply and erection of three Revolving Sprinklers at their Sewage Disposal Works, Bury.

Full particulars, Specifications, and Form of Tender can be had by intending contractors from Mr. Joshua Bolton, Sewage Works Manager, Bury, on and after June 10th, 1914.

Tenders, endorsed "Tender for Sprinklers," must be delivered at my office on or before Wednesday, June 17th, 1914.

JOHN HASLAM,
Town Clerk.

Corporation Offices,
Bury.

(1,681)

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

SOUTHEAST MEETING.

The programme of the meeting of the institution to be held at Southend-on-Sea to-morrow, Saturday, June 6th, is as follows:—

- 11 a.m.—Members will assemble at the Palace Hotel. Reception by his Worship the Mayor (Alderman Joseph Francis, J.P.).
- 11.35 a.m.—Leave hotel to inspect the following works in course of construction: (a) Pier extensions (electric cars to pier head, kindly provided by the Pier Committee); (b) Esplanade improvement and sea wall; (c) large swimming bath.
- 1.30 p.m.—Lunch at the Palace Hotel by kind invitation of the Mayor.
- 2.15 p.m.—Discussion on paper by Mr. E. J. Elford, M.INST.C.E., on "The Main Sewerage and Sewage Disposal Works, and other Recent Municipal Works, Southend-on-Sea."
- 2.45 p.m.—Leave hotel to inspect the following works: (d) Reinforced-concrete loading pier; (e) tramway boulevard; (f) sewage disposal works.
- 4.45 p.m.—Tea on the site of the sewage works at the invitation of Mr. E. J. Elford, followed, if desired, by further discussion on paper.

J. A. WEBB,
Hon. District Secretary.

Great Stanmore.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham on Saturday, June 13th.

PROGRAMME.

- 11 a.m.—District executive meeting.
- 11.30 a.m.—District meeting.
Reception in the council chamber by the chairman of the council, Mr. Councillor J. Pearson, J.P.
District business.
Paper by Mr. Arthur J. Price, engineer and surveyor, on "The Municipal Works at Lytham," which will be taken as read.
Discussion.
- 1 p.m.—Lunch at Clifton Hotel.
- 2.15 p.m.—By the kindness of the Blackpool, St. Anne's, and Lytham Tramway Company, cars will be provided to enable the members to visit the West End outfall sewage works (in course of construction), the East End sewage and destructor works and slaughter-houses.
- 4.30 p.m.—Afternoon tea will be provided for the members at De Grey's Café.

ANNUAL GENERAL MEETING AND TOWN PLANNING, HOUSING AND ROAD CONFERENCES.

The forty-first annual general meeting of the institution will be held at the Town Hall, Cheltenham, on Wednesday, Thursday, Friday and Saturday, June 24th, 25th, 26th and 27th. Conferences will take place with delegates from the various corporations and local authorities of the United Kingdom and representatives of the different bodies interested in the subjects of town planning, housing and roads. An important exhibition of plans, maps and models of town planning and housing schemes has been arranged, and it is believed that the collection will be one of great educational and practical value. The exhibition will be open during the four days of the meeting. Ladies are invited to attend the meeting, visits and annual dinner, and the permission of the president may in their case be assumed, but due notice must be given on the reply form.

IRISH DISTRICT.

Mr. M. Sellars, hon. district secretary of the Irish District, is endeavouring to arrange for a two-days' District meeting in Cork towards the end of July, and the council appeal to English members to give this meeting strong support. Two dates are suggested—viz., July 17th and 18th, or July 24th and

25th, and it would be a convenience if English members would say which date would be preferable.

EASTERN DISTRICT.

An Eastern District meeting will be held at Bedford on June 20th, and one at Tilbury on July 25th.

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

EAST MIDLAND DISTRICT.

It is hoped that a District meeting will be held in South Leicestershire in the near future.

J. W. DUDLEY ROBINSON, B.SC.(LOND.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

NORTHERN DISTRICT.

Meetings will be held in Cumberland in June, at Alnwick on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

SOUTH-WESTERN DISTRICT.

A South-Western District meeting will be held at Tisbury, Wilts, on Saturday, June 13th.

PROGRAMME.

- 12.15 p.m.—Meet at the Victoria Hall. Short business meeting, at which will be presented a paper, "Wiltshire Roads: Past and Present," by E. Plummer Davies, engineer and surveyor, Tisbury Rural District Council (member).
- 1.15 p.m.—Luncheon.
- 2.40 p.m.—Proceed by motor cars and motor buses to the waterworks at Lawn.
To Fonthill Arch (by Inigo Jones).
To eight new cottages on Fonthill Hill.
To Little Ridge. Inspect extensive additions to the residence of Mr. Hugh Morrison, J.P., county alderman.
To Old Tithe Barn, Place Farm, Tisbury, one of the largest barns in England.
- 4.45 p.m.—Tea.

C. OWEN BAINES,
Hon. District Secretary

Paignton.

NORTH-WESTERN DISTRICT.

A meeting of this district, followed by a social evening, will be held at the Mitre Hotel, Manchester, on Friday, July 3rd. On the following day a visit will be paid to the waterworks of the corporation of Ashton-under-Lyne. Full programme will be issued later.

EASTERN AND NORTH-EASTERN DISTRICTS.

A visit will be paid by these districts of the institution, on Saturday, June 27th, to the quarries of the Enderby and Stoney Stanton Granite Company, Scarborough. Full programme will be issued later.

A meeting will be held at Newmarket in September, when visits will be paid to the municipal works of the town. Full programme will be issued later.

A joint Eastern and North-Eastern District meeting will be held at Hunstanton in July.

B. WYAND,
Secretary.

39 Victoria-street, S.W.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier.*

WEST RIDING OF YORKSHIRE HIGHWAY SURVEYORS' ASSOCIATION.

A meeting will be held at Wetherby on Thursday, June 11th, when an inspection will be made of Mephafte grouting in progress on the Great North Road. Tea will be provided by the Anglo-Mexican Petroleum Products Company.

Meet at council offices, Wetherby, 3 p.m.

Will members please notify the hon. secretary of their intention to be present, so that the proper arrangements may be made for tea?

A. GORDON KILNER,
Hon. Secretary.

Council Offices,
Wetherby.

INSTITUTION OF WATER ENGINEERS.

SUMMER GENERAL MEETING.

The nineteenth summer general meeting will be held at Stockport on Thursday, Friday and Saturday, the 11th, 12th and 13th of June next, under the presidency of Mr Thomas Molyneux, Assoc.M.Inst.C.E., corporation waterworks engineer.

By kind permission of the mayor and corporation, the meetings will be held in the Town Hall, Stockport, and at the opening of the proceedings on Thursday the institution will be welcomed to Stockport by his Worship the Mayor (Councillor Thomas Worthington Potts, J.P.).

Ladies will be cordially welcomed at the meetings and visits, and all official functions except the annual dinner.

The programme will include the presentation of premiums awarded by the council for papers presented during the year 1913.

PAPERS AND COMMUNICATIONS.

The following papers have been promised for reading and discussion at this meeting, and advance copies will be sent out as soon as printed to members who signify their intention of attending the meeting, also, so far as the stock will allow, to those who, being unable to attend the meeting, are anxious to assist in the discussion by correspondence:—

- (1) "The Character of Mechanically Filtered Water," by Prof. Sheridan Delépine, of the University of Manchester.
- (2) "The Aëration and Filtration of Water for Swimming Baths," by L. Holme Lewis, M.I.MECH.E. (member).
- (3) "Notes on Scraping a 15-in. Water Main," by J. S. Barrowclough (member).

A lecture, entitled "The Geological Structure of the Stockport District," will be delivered by Prof. George Hickling, D.Sc., of the University of Manchester.

The president-elect (Mr. Thomas Molyneux) will deliver his presidential address on Thursday, June 11th, and will also supply a description of the Stockport waterworks, with map of the district of supply, which will be circulated among those present at the meeting.

VISITS TO WORKS.

On Thursday afternoon, June 11th, starting from the Town Hall, Stockport, visits will be made to the Wilmslow pumping station and softening works, and to the Alderley balancing reservoir (reinforced concrete, under construction), where afternoon tea will be provided by the president and Mrs. Molyneux.

On Friday, June 12th, starting from the Midland Hotel, Manchester, at 10 a.m., visits will be made to the recently completed Kinder reservoir and filtration plant, where lunch will be provided by the corporation of Stockport, and to the Lyme Park reservoirs; also to the works of Messrs. Mirrlees, Bickerton & Day, Limited, Hazel Grove (Diesel oil engines under construction), where afternoon tea will be provided.

On Saturday afternoon, June 13th, members will be free to visit the Colliery Exhibition or the Victoria Park Baths (at the latter will be seen an installation for filtering the water used in the swimming baths).

SOCIAL FUNCTIONS.

The annual dinner will be held at the Midland Hotel, Manchester, on Thursday evening, June 11th, when the Mayor of Stockport, the Lord Mayor of Manchester, and other distinguished guests will be entertained by the institution.

In addition to the luncheon provided on Friday at the Kinder works, the corporation of Stockport will entertain the members at luncheon on Thursday, June 11, at the Town Hall Stockport.

The committee of the Manchester Engineers Club have kindly offered to elect the members attending the meeting as hon. members of the club during the three days of the meeting. Admission on presentation of programme card.)

PERCY GRIFFITH,
Secretary.

20 Victoria-street, S.W.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

SEWAGE WORKS MANAGER.—June 6th.—Caerphilly Urban District Council. 30s. per week.—Mr. A. O. Harpur, surveyor.

CLERK OF WORKS.—June 6th.—Ystradgynlais Rural District Council. £3 3s. per week.—Mr. A. Jestyn Jeffreys, clerk, Queen Chambers, Neath.

TOWN PLANNING ASSISTANT.—June 6th.—Corporation of Sheffield. £90 per annum.—City Engineer and Surveyor, Town Hall.

SURVEYOR'S ASSISTANT.—June 6th.—Earby Urban District Council. £65 per annum.—Mr. J. E. Aldersley, engineer and surveyor.

TEMPORARY ASSISTANT.—June 8th.—Burnham (Somerset) Urban District Council. £2 10s. per week.—Mr. W. H. Chowins, engineer and surveyor.

SURVEYOR.—June 8th.—Helston Rural District Council.—Mr. A. E. Ratcliffe, clerk.

SURVEYOR'S ASSISTANT.—June 8th.—Long Eaton Urban District Council. £120—£150 per annum.—Mr. E. Williams, clerk.

ENGINEER AND SURVEYOR.—June 8th.—Cheadle and Gatley Urban District Council. £250 per annum.—Mr. Arthur Briggs, clerk, Council Offices, Cheadle, Cheshire.

CLERK OF WORKS.—June 8th.—Corporation of Wakefield. £2 10s. per week.—The Town Clerk.

SURVEYOR'S ASSISTANT.—June 9th.—Margam Urban District Council. £90—£120 per annum.—Mr. D. E. Joens, clerk.

INSPECTOR OF ROADS.—June 9th.—Corporation of Aberdeen. £200 per annum.—Mr. W. Dyack, burgh surveyor, Townhouse.

RESIDENT ENGINEER.—June 9th.—Rhymyuey Valley Sewerage Board. £5 per week.—Mr. T. I. Thomas, clerk, 36 High-street, Bargoed, Glam.

GAS ENGINEER AND MANAGER.—June 10th.—Corporation of Macclesfield. £300 per annum.—Chairman of the Gas Committee.

INSPECTOR OF NUISANCES.—June 10th.—Corporation of Birkenhead. £160—£180 per annum.—Mr. J. Fearnley, town clerk.

SEWAGE WORKS MANAGER.—June 11th.—Hungerford Rural District Council. 35s. per week.—Mr. W. Stephenson Raine, engineer and surveyor.

ENGINEERING ASSISTANT TO COUNTY SURVEYOR.—June 12th.—Essex County Council. £400 per annum, with a travelling allowance of £100.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

ENGINEER AND SURVEYOR'S CLERK.—June 13th.—Corporation of Neath. 35s. per week.—The Engineers, Council Offices.

SURVEYOR'S CLERK.—June 13th.—Axminster Rural District Council. £52 to £65, according to ability.—Mr. Geo. A. Millard, district surveyor.

JUNIOR ASSISTANT.—June 13th.—Batley Town Council. £2 per week.—Mr. J. H. Craik, town clerk.

SURVEYOR AND WATERWORKS ENGINEER.—June 15th.—Hebden Bridge Urban District Council. £130 per annum.—Mr. Sam Ogden, clerk.

COUNTY SURVEYOR'S ASSISTANT.—June 15th.—West Suffolk County Council. £130—£150 per annum.—Mr. W. Lionel Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

WATER SURVEYOR.—June 16th.—Deal Urban District Council. £130 per annum.—Mr. Alfred C. Brown, town clerk.

JUNIOR ENGINEERING ASSISTANT.—June 17th. Corporation of Coventry. £80 per annum. Mr. J. E. Swindlehurst, city engineer and surveyor.

COUNTY SANITARY INSPECTORS. June 20th. Lancashire County Council. £200, with £25 for expenses and railway fares. County Medical Officer of Health, County Offices, Preston.

SURVEYOR'S CLERK.—June 22nd. — Denton Urban District Council. 30s. per week. Mr. W. Richards, clerk, Town Hall, Denton, near Manchester.

CITY SURVEYOR. August 4th. Municipal Council of Sydney, New South Wales. £1,000-£1,300 per annum.—Mr. Thomas H. Nesbitt, town clerk, Town Hall, Sydney.

ASSISTANT ENGINEER.—Public Works Department of the Gold Coast Government. £300-£350.—Crown Agents for the Colonies, Whitehall-gardens, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter

SUNDERLAND.—June 23rd.—Designs for a secondary school for 600 scholars, for the Corporation of Sunderland. Premiums, £100, £50, and £25.—Mr. J. W. Moncur, borough engineer and surveyor, Town Hall.

MIDDLETON.—July 16th.—Designs for a town hall, the cost of which must not exceed £18,000. Premiums £100, £50, and £25.—Town Clerk.

LONDON.—September 7th.—Designs for elementary schools, for the London County Council.—Education Officer, Education Offices, Victoria-embankment, W.C.

BELPER.—Designs and estimates for the erection of a bridge over the River Derwent, for the Belper Rural District Council.—Mr. Robert C. Cordon, surveyor, Duffield, near Derby.

CHESTER.—Designs for working-class dwellings, for the Corporation of Chester. Premiums, £50, £25, and £10. Mr. Patrick Abercrombie, M.A., Liverpool University School of Civic Design, has been appointed assessor.—Mr. J. H. Dickson, town clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

LEEDS.—June 8th. For excavating and pipe-laying work, for the corporation.—Mr. C. G. Henzell, water-works engineer, Great George-street.

FOREHOE. June 8th. For the erection of three pairs of cottages, for the rural district council.—Mr. J. O. Bond, architect, 29 Castle Meadow, Norwich.

BEDWELTY.—June 8th.—For the construction of foundations for additional hospital blocks, for the urban district council.—Mr. D. H. Price, surveyor.

BRADFORD.—June 8th.—For building a new entrance to public market, for the corporation.—City Architect.

LANARK.—June 8th.—For alterations to county sanatorium, for the county council.—Messrs. Alex. Cullen, Lockhead & Brown, Hamilton.

PETERBOROUGH.—June 8th.—For the erection of an engine-house, for the rural district council.—The Surveyor.

LOOE. June 8th.—For the reconstruction of a house, for the urban district council.—Mr. C. Martin, surveyor, East Looe.

BRIGHTON.—June 8th.—For additions to municipal offices, for the corporation. Mr. T. Garrett, architect, 34 Ship-street.

WAKEFIELD. June 8th.—For the erection of conveniences, for the corporation.—Mr. J. P. Wakefield, city surveyor.

KENT.—June 8th 1914.—For the erection of a handicrafts building and a bath-room, for the Education Committee.—Mr. F. W. Crook, secretary, Sessions House, Maidstone.

NEWPORT (Mon.). June 9th. For the construction of a public convenience, for the corporation.—The Borough Engineer.

MANCHESTER.—June 10th.—For the extension of the Education Offices, for the Education Committee.—Education Offices, Deansgate.

EXETER.—June 10th.—For building a manual instruction centre, for the Education Committee. Mr. J. Jerman, architect, 1 Bedford-circus, Exeter.

WEST RIDING. June 12th.—For alterations and additions to a school, for the Education Committee.—Education Architect, County Hall, Wakefield.

RHONDDA.—June 12th.—For the construction of a steelwork bridge with trestles over Princess Louise Bridge, Llwynypia, 10 ft. wide in three spans, and the supply of two handstands, for the urban district council.—Mr. E. Taylor, engineer, Council Offices, Pentre, Rhondda.

MOUNTMELICK. June 13th.—For laying 5-in. cast-iron water main, for the rural district council.—Mr. J. J. Williams, clerk.

GLASGOW.—June 13th.—For the erection of a public convenience, for the corporation.—Office of Public Works, City Chambers, 64 Cochrane-street.

LLANDUDNO.—June 13th. For the erection of twenty-four workmen's dwellings, for the urban district council. Mr. W. T. Ward, deputy engineer and surveyor.

SALE.—June 13th.—For the erection of a school, for the Administrative Sub-Committee for Education.—Messrs. Hoy & Sisley, architects, 199 Deansgate, Manchester.

DEVON.—June 15th.—For the construction of a bridge over the river Yarty, for the county council.—Mr. W. P. Robinson, county surveyor, 22 Queen-street, Exeter.

PENRITH.—June 15th.—For supplying and laying 1,000 yds. of 3-in. cast-iron piping, with valves and hydrants, for the rural district council.—Mr. Joseph Graham, engineer, 28 Castle-street, Carlisle.

STAFFORD.—June 16th.—For building two reinforced concrete bridges and retaining walls, and the construction of a new roadway, for the rural district council.—Mr. Frank Idiens, surveyor, Crabbery-street, Stafford.

FELTWELL.—June 18th.—For the erection and maintenance of a pumping station, for the Commissioners of the Feltwell New Fen Drainage.—Mr. E. J. Silcock, engineer, Sanitary House, 33 Tothill-street, Westminster, and 10 Park-row, Leeds.

CROYDON.—June 19th.—For sinking and boring a well, for the corporation.—Borough Engineer.

CHESTER.—June 20th.—For the erection of a tuberculosis ward at the isolation hospital, for the corporation.—City Surveyor.

ARUNDEL.—June 21st.—For the erection of ten cottages, for the corporation.—Mr. A. Holmes, town clerk.

BRIDGWATER. June 22nd. For laying 6,800 yds., or thereabouts, of cast-iron pipes, 3 in. diameter, and other works appertaining thereto, for the rural district council.—Mr. W. A. Collins, 56a Eastover, Bridgwater.

CHELMSFORD.—June 22nd.—For the erection of an engine-house and cottage, for the corporation.—Borough Engineer.

EVESHAM. June 22nd.—For the erection of twenty-four cottages, for the rural district council.—Mr. E. Holloway, surveyor.

PORTSMOUTH.—June 23rd.—For the erection of a school, for the Education Committee.—Mr. C. C. Vernon-Lukpen, architect, 40 Commercial-road, Portsmouth.

BLAENAVON.—June 23rd.—For the erection of fifty houses, for the urban district council.—Mr. E. W. Edwards, surveyor.

LONDON.—June 23rd.—For the construction of an embankment wall in the Thames in front of the new county hall, for the county council.—Chief Engineer, Spring-gardens, S.W.

LONDON. June 30th.—For the construction of two storage reservoirs in the Thames Valley, together with intake works on the banks of the Thames, and certain contingent works, for the Metropolitan Water Board.—Chief Engineer, Savoy-court, London, W.C.

Iron and Steel.

MADRAS.—June 17th.—For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer, and Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

Roads.

WARRINGTON.—June 8th.—For 400 tons of tarred macadam and 1,000 yds. of 18-in. stoneware pipes, for the corporation.—Borough Surveyor.

MANCHESTER.—June 8th.—For road reconstruction in granited rock asphalt, and other works, for the corporation.—Surveyor to the Withington Committee, Town Hall, West Didsbury.

SELBY.—June 8th.—For making a street and sewer, for the urban district council.—Mr. Bruce Gray, surveyor, New-lane, Selby.

TANGIER.—June 8th.—For the construction of about 10 miles of road, for the Moroccan Adjudications Commission.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, E.C.

SUTTON-IN-ASHFIELD.—June 8th.—For making up twelve streets, for the urban district council.—Mr. W. Burn, surveyor.

AMBLE.—June 8th.—For the construction of cement concrete footpaths and whinstone-sett channels, for the urban district council.—Mr. W. Burton, surveyor.

LEEDS.—June 8th.—For paving and flagging certain streets, for the corporation.—Highways and Permanent Way Department, 155 Kirkstall-road.

MANSFIELD.—June 8th.—For making up a street, for the corporation.—Mr. T. P. Collinge, borough engineer and surveyor.

TOTTENHAM.—June 9th.—For the repair of tar and asphalt paving, for the urban district council.—Mr. W. H. Preseott, engineer, Town Hall.

CORK.—June 9th.—For the supply of 300 tons of whinstone or granite paving setts, for the Harbour Commissioners.—The Clerk, Custom House-street, Cork.

LEWISHAM.—June 9th.—For making up certain roads, for the borough council.—Borough Surveyor.

ILFORD.—June 9th.—For paving with granite setts, for the urban district council.—Mr. H. Shaw, engineer and surveyor.

ENFIELD.—June 10th.—For the supply of 1½-in. hand-broken Clee Hill Dhu, or best blue Guernsey granite, for the urban district council.—The Surveyor.

HAWARDEN.—June 10th.—For the supply of road stones, for the rural district council.—Mr. W. Newton, district surveyor, Drury, Buekley, Chester.

CRANBROOK.—June 10th.—For steam rolling and scarifying, for the rural district council.—Mr. D. Paine, district surveyor, Stonelynk Farm, Fairlight, Hastings.

ROCHDALE.—June 10th.—For making up a road, for the corporation.—Borough Surveyor.

RUSHDEN.—June 10th.—For making up part of a street, for the urban district council.—Mr. W. B. Madin, engineer and surveyor.

HORNSEY.—June 10th.—For making good a certain road, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

ST. HELENS.—June 10th.—For tar macadamising a road, for the corporation.—Mr. A. W. Bradley, borough engineer.

RYTON.—June 10th.—For road construction works, for the urban district council.—Mr. John P. Dalton, surveyor.

HASTINGS.—June 12th.—For steam rolling certain roads, for the rural district council.—Mr. D. Paine, district surveyor, Stonelynk Farm, Fairlight.

RUNCORN.—June 15th.—For the supply of granite macadam, setts, kerbstones, and sanitary pipes, for the rural district council.—Mr. G. F. Ashton, clerk.

WANDSWORTH.—June 15th.—Tenders are invited for the purchase of the following disused rolling stock—viz.: Seven water vans, and two water carts.—Mr. P. Dodd, borough engineer, 215 Balham High-street, London, S.W.

KING'S COUNTY.—June 15th.—For the supply of a steam roller and steam rolling plant, for the county council.—Mr. Charles P. Kingston, secretary, Court-house, Tullamore.

ST. HELENS.—June 15th.—For making up certain streets and passages, for the corporation.—Mr. A. W. Bradley, borough engineer.

DEPTFORD.—June 16th.—For work of making up and paving, for the borough council.—Borough Surveyor.

EPSOM.—June 16th.—For making up Leigh-road, School-road and Spencer-road, for the rural district council.—Mr. T. E. Ware, surveyor of highways, Waterloo-road, Epsom.

LEWES.—June 19th.—For road rolling and the supply of 600 tons of 2-in. broken granite and 600 tons of broken surface-picked flints, for the corporation.—Borough Surveyor.

LARNE.—June 25th.—For the construction of a new street, for the urban district council.—Mr. W. G. Younge, clerk.

Sanitary.

BASHFORD.—June 8th.—For laying sewers with manholes, for the rural district council.—Mr. S. Maylan, engineer and surveyor.

HIGHAM FERRERS.—June 8th.—For the construction of sewage disposal works, for the corporation.—The Surveyor.

KEIGHLEY.—June 8th.—For the construction of a 12-in. pipe sewer, for the corporation.—Borough Engineer.

BLAYDON-ON-TYNE.—June 9th.—For scavenging work, for the urban district council.—Mr. R. Biggins, sanitary inspector.

SOUTHALL-NORWOOD.—June 9th.—For laying concrete surface-water sewers, manholes, and appurtenant works, for the urban district council.—Mr. R. Brown, engineer, Town Hall.

DURHAM.—June 10th.—For the removal of household refuse, for the rural district council.—Mr. J. Menzies, sanitary inspector, Avenue House, Shincliffe, Durham.

BIRMINGHAM.—June 10th.—For the construction of about 600 yds. of 9-in. stoneware pipe sewer and other incidental works, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

HAWARDEN.—June 10th.—For scavenging Hope and Caergwle, for the rural district council.—Mr. Wilson, Abernorddu.

LANCHESTER.—June 10th.—For constructing sewers and manholes, for the rural district council.—Mr. J. R. Lupton, surveyor.

HALE.—June 10th.—For the conversion of thirty-nine privies into water-closets, for the urban district council.—Mr. G. F. Bulmer, sanitary inspector.

GOOLE.—June 10th.—For the construction of branch sewers and connections consisting of about 6 miles of stoneware pipe sewers, with manholes and appurtenances, for the urban district council.—Mr. Robert Tyson, clerk.

BURY.—June 11th.—For the construction of brick sewer, and reconstruction of manholes, for the corporation.—Mr. J. A. Settle, borough engineer.

BRANDON AND BYSHOTTLES.—June 11th.—For laying a sewer, for the urban district council.—Mr. G. G. Donkin, surveyor, Langley Moor.

HERTFORD.—June 12th.—For alterations to sewerage and sewage works, for the Joint Hospital Board.—The Surveyor, Town Hall, Ware, Herts.

WYCOMBE.—June 13th.—For the construction of sewage disposal and purification works at Princes Risborough, for the rural district council.—The Engineer.

HAYES.—June 13th.—For the construction of sewerage at Yeading, for the urban district council.—Mr. D. C. Fidler, engineer and surveyor.

HENDON.—June 15th.—For works of sewage disposal and sewerage, for the urban district council.—Mr. S. S. Grimley, Council Offices.

KENSINGTON.—June 15th.—For the construction of manholes and side entrances; with incidental works, for the borough council.—Borough Engineer.

CARLISLE.—June 15th.—For laying sewer pipes with manholes and flush tank, for the rural district council.—Mr. J. Graham, engineer, 28 Castle-street, Carlisle.

MANCHESTER.—June 15th.—For the construction of main drainage work No. 11. (2), Gorton intercepting sewer, for the Rivers Committee.—City Surveyor.

BRIGHOUSE.—June 16th.—For sewage works extension, for the corporation.—Mr. S. S. Haywood, borough engineer.

LIVERPOOL.—June 16th.—For the construction of a main sewer, known as the northern outfall sewer, between Brasenose-road, Kirkdale, and the existing Walton outfall sewer, on the Walton Hall estate, for the Health Committee.—City Engineer.

MATLOCK.—June 22nd.—For the completion of the main sewerage, consisting of main outfall and subsidiary sewers of earthenware, steel and cast-iron pipes, with manholes, ventilation and flushing tanks, for the urban district council.—Messrs. J. Diggle & Son, engineers, 14 Victoria-street, Westminster, S.W.

Stores.

NORTHFLEET.—June 9th.—For the supply of road materials, tar, castings, steam rolling and scarifying, and horse hire, for the urban district council.—Mr. Chas. E. Hatten, clerk.

CLECKHEATON.—June 10th.—For the supply of granite, dross, cement, cartage, stoneware pipes, kerbs, setts, fodder, tar, pitch and oil, for the urban district council.—Mr. John H. Linfield, clerk.

STOKE-ON-TRENT.—June 11th.—For the supply of stores, for the Gas Committee.—Mr. E. B. Sharpley, town clerk.

CROYDON.—June 19th.—For the supply of Portland cement, for the corporation.—Borough Engineer.

Miscellaneous.

WEYBRIDGE.—June 8th.—For the supply of a motor fire engine, for the urban district council.—Mr. Robert Ellwood, clerk.

LEWISHAM.—June 9th.—For the supply of seven dust vans, for the borough council.—The Borough Surveyor.

MANCHESTER.—June 10th.—For the supply of drain pipes and 1,000 creosoted sleepers, for the corporation.—Mr. R. Williamson, cleansing department, Town Hall.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance.
‡ Provisionally accepted.

EXETER.—Accepted for paving a portion of Sidwell-street with creosoted wood blocks, for the corporation.—Mr. T. Moulding, city engineer and surveyor:—
Acme Flooring and Paving Company (1904), Limited, London, N.E., £3,293.

FAREHAM.—For the supply of granite, basalt, or other hard stone, for the rural district council.—Mr. J. F. Whitaker, surveyor, Fareham, Hants:—
British Macadams, Limited, London.*
Road Maintenance and Stone Supply Company, Limited, London.*
Rowe & Mitchell, London.
Enderby and Stoney Stanton Granite Company, Limited, Leicester.
J. Wainwright & Co., Limited, Shepton Mallet.
Penlee and St. Ives Stone Quarries, Limited, Bristol.
Johnstone Brothers, London.
Roadstone Supply Company, Shepton Mallet.
Hudsons, Limited, Brighton.

HESTON AND ISLEWORTH.—For laying wood paving, for the urban district council.—Mr. J. G. Carey, engineer and surveyor:—
W. Griffiths & Co., Limited, London £9,647
J. Mowlem & Co., Limited, London 9,536
Improved Wood Pavement Company, Limited, London 9,489
Acme Flooring and Paving Company, Limited, London 9,410
Dick, Kerr & Co., Limited, London* 9,307

KENSINGTON.—For laying creosoted deal blocks in certain streets, for the borough council.—Mr. A. R. Finch, borough engineer and surveyor:—
Fulham-road from Arthur-street to Drayton-gardens.—J. Mowlem & Co., Limited, 9s. 5½d. per square yard; Acme Flooring and Paving (1904) Company, Limited, 9s. 3d. per square yard; W. Griffiths & Co., Limited, 9s. 2d. per square yard; Improved Wood Pavement Company, Limited, 9s. per square yard.*
Old Brompton-road from South Kensington Station to Thurloe-square.—J. Mowlem & Co., Limited, 9s. 6d. per square yard; Acme Flooring and Paving (1906) Company, Limited, 9s. 3d. per square yard; W. Griffiths & Co., Limited, 9s. 2d. per square yard; Improved Wood Pavement Company, Limited, 9s. per square yard.*
Kensington Park-road from Archer-street to Elgin-crescent.—J. Mowlem & Co., Limited, 9s. 6d. per square yard; Acme Flooring and Paving (1904) Company, Limited, 9s. per square yard; W. Griffiths & Co., Limited, 9s. 2d. per square yard; Improved Wood Pavement Company, Limited, 9s. per square yard.*
Cornwall-road from Ladbroke-grove to St. Luke's-road, per square inch on 9 in. of concrete.—G. Wimpey & Co., 14s. 9d.; J. Mowlem & Co., Limited, 14s.; W. Griffiths & Co., Limited, 13s. 11½d.; Acme Flooring and Paving (1904) Company, Limited, 13s. 10d.; Improved Wood Pavement Company, Limited, 13s. 7d.*

Cornwall-road from Ladbroke-grove to St. Luke's-road, per square yard on 7 in. of concrete reinforced.—G. Wimpey & Co., 14s. 8d.; J. Mowlem & Co., Limited, 14s. 4d.; W. Griffiths & Co., Limited, 14s. 2d.; Acme Flooring and Paving (1904) Company, Limited, 14s. 2d.; Improved Wood Pavement Company, Limited, 13s. 9d.*

KIDSGROVE.—For the erection of a urinal, for the urban district council.—Mr. F. C. Crimes, engineer and surveyor:—
G. Goodwin, Tunstall £106
J. Cooke, Porthill 91
T. Godwin, Hanley* 79

KINGSTON-UPON-THAMES.—For the supply of 2,000 tons of Guernsey, Quenast, or other granite, the whole to be broken so as to pass through rings having 1½ in. or 2 in. internal diameter, according to percentages specified, for the corporation.—Mr. R. Hampton (Lucas, borough surveyor):—
H. Cooper & Co., London.—1½ in. and 2 in., 15s. 4d. per ton.
J. Mowlem & Co., London.—1½ in., 15s. 7d. per ton; 2 in., 15s. 1d. per ton.
Fry Brothers, Limited, Greenwich.—1½ in. and 2 in., 15s. 3d. per ton.
Enderby and Stoney Stanton Granite Company, Leicester.—1½ in., 15s. per ton; 2 in., 15s. 3d. per ton.
British Macadams, Limited, London.—1½ in. and 2 in., 15s. per ton.
Road Maintenance and Stone Supply Company, London.—1½ in. and 2 in., 15s. per ton.
W. Griffiths & Co., Limited, London.—1½ in. and 2 in., 14s. 11d. per ton.
Rowe & Mitchell, London.—1½ in. and 2 in., 14s. 10d. per ton.
Lavender & Bateman, Sutton Bridge.—2 in., 14s. 10d. per ton.
A. & F. Manuelle, London.—1½ in. and 2 in., 14s. 8d. per ton.
Mountsorrel Granite Company, Loughborough.—1½ in., 14s. per ton; 2 in., 13s. 6d. per ton.
London Granite Company, Limited, London.—1½ in. and 2 in., 14s. 3d. per ton.

KINGSTON-UPON-THAMES.—For the supply of 300 tons of bauxite, for the sewage works, for the corporation.—Mr. R. Hampton (Lucas, borough surveyor):—
G. Blackwell & Co., Limited, Liverpool.—£1 per ton.
Dunluc and Glentask Iron Ore Company, Limited, Onchan, Isle of Man.—18s. 9d. per ton.*
Societe Anonyme des Bauxite du Var, London.—16s. per ton (Price not including delivery.)

LITTLEBOROUGH.—For the construction of a 9-in. pipe sewer, for the urban district council.—Mr. G. H. Wild, surveyor:—
J. R. Crisp, Stalybridge.

LITTLEBOROUGH.—For making up certain streets, for the urban district council.—Mr. G. H. Wild, surveyor:—
J. R. Crisp, Stalybridge.

REIGATE.—For the execution of private street works, for the rural district council.—Mr. Arthur J. Head, surveyor:—
G. J. Arthur & Son, Dorking £295
E. Iles, senr., Croydon 277
W. Whitmore, Horley* 273
Surveyor's estimate, £278.

ROCHDALE.—For making up a street, for the corporation.—
Mr. S. S. Platt, borough surveyor:—
W. Shepherd & Sons, Rochdale.

SMALLTHORNE.—For drainage and paving works, for the urban district council.—Mr. J. W. Deane, surveyor:—
Sanders & Torrance, Stoke-on-Trent £159
J. Horobin, Cobridge* 155

WHITEHAVEN.—Accepted for the supply of cast-iron spigot and socket pipes, bends, junctions, and valves, cutting trenches, and laying pipes for a water supply, for the rural district council.—Mr. George Boyd, Whitehaven:—
Cochrane & Co., Dudley £140
J. B. Hodgson, Frizington, Cumberland 68

WREXHAM.—For making up certain streets, for the corporation.—Mr. J. England, borough engineer:—
G. P. Trentham, Limited, Birmingham, £648.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JUNE.

- 6.—Institution of Municipal and County Engineers: Meeting at Southend.
- 11.—West Riding of Yorkshire Highway Surveyors' Association: Meeting at Wetherby.
- 11-13.—Institution of Water Engineers: Summer Meeting at Stockport.
- 13.—Institution of Municipal Engineers: Western District Meeting at Tisbury. Mr. E. Plummer Davies on "Wiltshire Roads, Past and Present."
- 17.—Royal Institute of British Architects: Annual Dinner, Hotel Cecil.
- 20.—Institution of Municipal and County Engineers: Eastern District Meeting at Bedford.
- 24.—Institute of Sanitary Engineers: Visit to Luton sewage farm. Train from St. Pancras, 2.50 p.m.
- 24-27.—Institution of Municipal and County Engineers: Annual Meeting and Town Planning, Housing and Road Conference at Cheltenham.

JULY.

- 2.—Institution of Civil Engineers: Couversazione, 8.30-11.30 p.m.
- 3.—Institution of Municipal Engineers: North-Western District Meeting at Manchester.
- 4-11.—Royal Sanitary Institute: Annual Congress and Exhibition at Blackpool.
- 6-10.—Institution of Mechanical Engineers: Summer Meeting in Paris.
- 25.—Institution of Municipal and County Engineers: Eastern District Meeting at Tilbury.

SEPTEMBER.

- 19.—Institution of Municipal and County Engineers: Meeting at Cleethorpes.
- 26.—Institution of Municipal and County Engineers: Meeting at Scarborough.

APPOINTMENTS WANTED.

PREPAID Advertisements under this heading are inserted at the rate of ONE PENNY per word, with a minimum charge of 2s. THREE consecutive insertions given for the price of TWO.

ASSISTANT desires appointment in Urban or Rural Surveyor's Office. Good experience in building, surveying, levelling, and road making. Moderate salary.—Box 1,428, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,675)

(Continued on p. xxvi.)

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

ESSEX COUNTY COUNCIL.

HIGHWAYS COMMITTEE.

ENGINEERING ASSISTANT TO THE COUNTY SURVEYOR.

Applications are invited for the appointment of an outdoor Engineering Assistant on the staff of the County Surveyor. Candidates must be specially qualified to superintend the mixing and laying of bituminous macadam, either in asphalt or tar, whether by contract or direct labour; to be fully conversant with all the latest and most approved systems of wood and

stone paving, and to be responsible to the County Surveyor for the organisation and control of a large outdoor staff of workmen of every description connected with the modern construction of highways.

Salary, £400 per annum, payable quarterly, with travelling allowance of £100 per annum.

Age not to exceed 40.

The appointment will be subject to three months' notice given or received. No superannuation or pension is attached to the appointment.

A medical examination will be a condition precedent to any appointment.

Only those persons should apply who have had practical experience in the manufacture of bituminous macadam on a fairly large scale, and if not now so engaged must satisfy the Council that during the past twelve months they have been so engaged.

The name of the candidate selected will be submitted to the Road Board for their approval.

Applications, with copies of not more than three recent testimonials, both as to ability and character, to be received at the office of the County Surveyor, Chelmsford, not later than Friday, the 12th inst.

PERCY J. SHELDON, M.INST.C.E.

County Surveyor.

Chelmsford.

June 2, 1914.

(1,676)

SURVEYOR'S CLERK.

The Axminster Rural District Council require the services of a Clerk in the Surveyor's Office. Applicants must have had previous experience in a Surveyor's office, be quick and accurate at accounts, able to make neat tracings, and be willing and able to assist outdoors if required. Salary £52 to £65 per annum, according to ability.

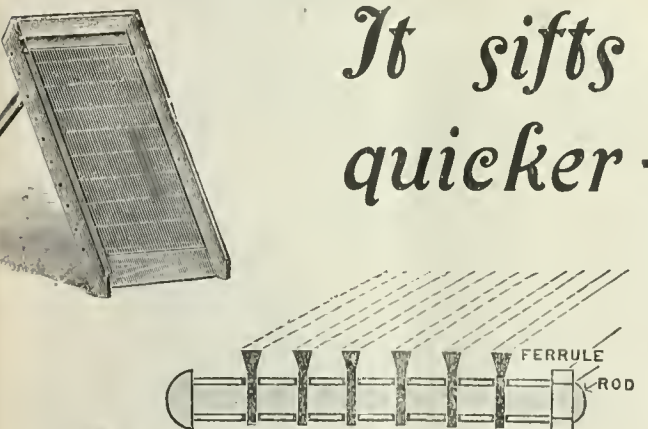
Applications, stating age and experience, accompanied by copies of not more than three testimonials, to be sent to the undersigned not later than June 13th, 1914.

GEO. A. MILLARD,

District Surveyor.

Axminster.

(1,673)



It sifts quicker

Because the steel blades cut and do not become clogged like the wires of the ordinary screen. As the sand or other material slides down, the sharp edges of the blades cut up the lumps. Once past the cutting edge, there is a clear drop. Actual tests have proved that

The Excelsior Patent Screen

will do as much work in 6 hours as an ordinary wire screen can do in 10. Used by Government and other leading contractors. It lasts longer and soon saves its cost.

Write for Catalogue 50 B.

PARKER, WINDER & ACHURCH, Ltd., BIRMINGHAM.

SUPERIOR QUALITY TOOLS.

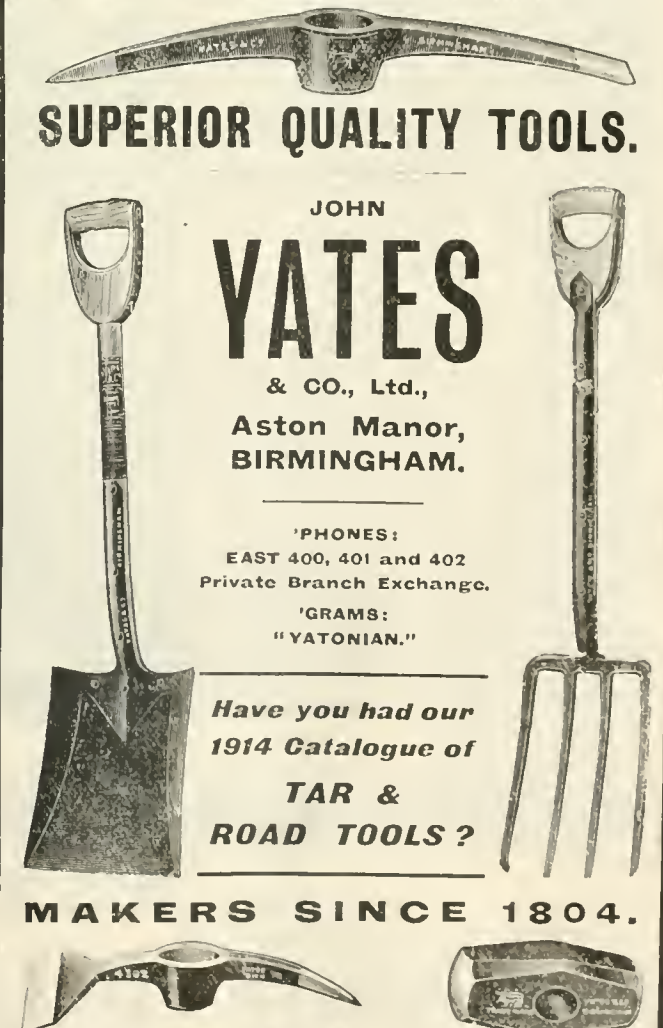
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'GRAMS:
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Have you had our
1914 Catalogue of
TAR & ROAD TOOLS?

MAKERS SINCE 1804.



BOROUGH OF DEAL.

The Urban District Council for the Borough of Deal invite applications for the appointment of Water Surveyor to supervise and regulate the Deal distributing mains, pipes, and fittings, to make inspections for the prevention of waste, and generally to perform the duties ordinarily attaching to the office.

The salary to be paid will be at the rate of £130 per annum, and the person appointed will be required to devote the whole of his time to the duties of his office.

The appointment will be subject to termination on either side by one calendar month's notice in writing.

Personally canvassing the Members of the Council will disqualify candidates.

Candidates must not exceed the age of 45 years. Applications must be sent in to me at my Offices, accompanied by two testimonials, on or before Tuesday, the 16th day of June next, marked "Water Surveyor."

ALFRED C. BROWN,
Town Clerk.

High-street,
Deal.

May 22, 1914. (1,640)

ENGINEER AND SURVEYOR'S CLERK.

Applications are invited from persons qualified to fill the above position.

Candidates must be thoroughly efficient and experienced shorthand and type writers, accustomed to book-keeping, preparation of accounts, and the usual clerical routine of the department.

Preference will be given to candidates having the requisite experience.

Salary 35s. per week.

Apply, stating age, experience, accompanied with three testimonials, to the undersigned on or before the 13th inst.

D. M. DAVIES,
Engineer.

Council Offices,
Neath.

June 2, 1914. (1,674)

HUNGERFORD RURAL DISTRICT COUNCIL.

APPOINTMENT OF SEWAGE WORKS MANAGER.

The above Council invite applications for the post of Sewage Works Manager.

Applicants must have had previous experience in the working of Air Compressors and Ejectors.

Wages 35s. per week.

Applications, with not more than three copies of testimonials, to be sent to the undersigned not later than the 11th June, 1914.

W. STEPHENSON RAINE,
Engineer and Surveyor.

Hungerford.

May 25, 1914. (1,646)

URBAN DISTRICT COUNCIL OF MARGAM. SURVEYOR'S ASSISTANT.

Applications are invited for the appointment of an Assistant in the Surveyor's Department. Salary £90 per annum, rising, subject to satisfactory service, by annual increments of £10 to £120 per annum.

Candidates must have had practical experience in a Public Office, and must be neat and expeditious Draughtsman, accurate Surveyor and Leveller, as well as thoroughly capable Quantity Surveyor.

Applications, stating age (not exceeding 35) and experience, accompanied by copies of not more than three recent testimonials, must be sent to me, endorsed "Assistant Surveyor," not later than 9th June, 1914.

The appointment will be subject to three months' notice on either side, and the person appointed will be required to devote the whole of his time to the duties of the office, and private work strictly debarred.

Canvassing, directly or indirectly, will be deemed a disqualification.

D. E. JONES,
Clerk.

Port Talbot.

May 28, 1914. (1,671)



The most successful compromise of Quality and real Economy in cost and upkeep ever yet achieved in Motor Car manufacture.

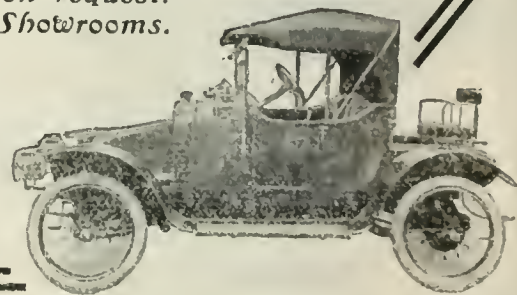
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Without Dickey Seat £232
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British Manufacture.

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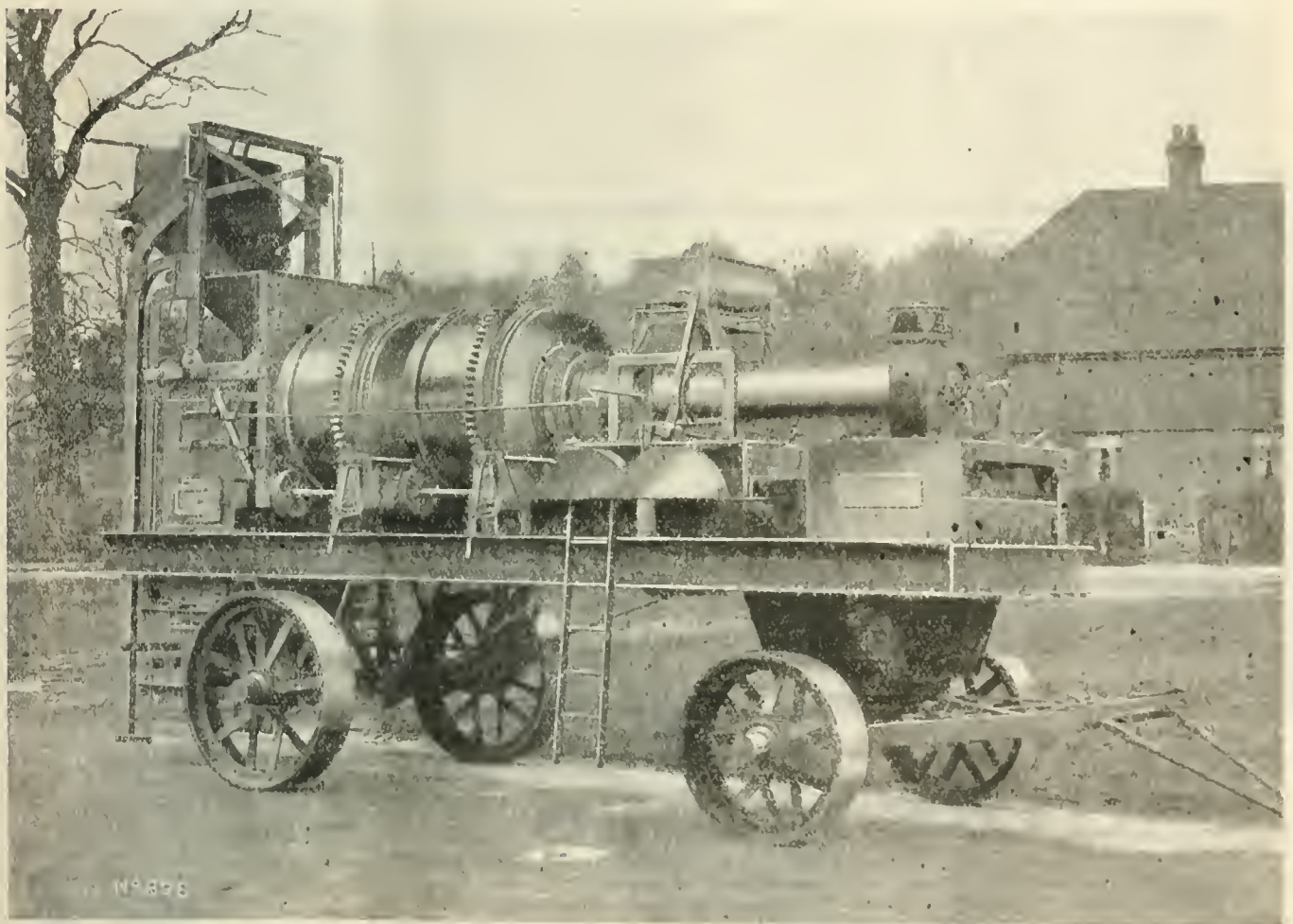
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RANSOME COMBINED DRYING AND MIXING MACHINES FOR TAR & BITUMINOUS MACADAM.

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- THE CORPORATION OF COVENTRY.
- THE BOMBAY MUNICIPALITY.
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VERMEHRICO, LONDON

REQUIRED by Constable, Hart & Co., Limited, Quarry Owners and Tar-macadam Manufacturers, the services of a gentleman, age 25 to 30, with the view of assisting in the general management. A knowledge of engineering and commercial work necessary, and preference will be given to those having had some experience of the technicalities of the tar-macadam trade. Apply, by letter only, stating salary, and giving references and details of past experience, to 41 Eastcheap, London, E.C. (1,659)

**CITY OF COVENTRY.
JUNIOR ENGINEERING ASSISTANT.**

The Corporation of the City of Coventry are prepared to receive applications for the appointment of Junior Engineering Assistant at a salary of £80 per annum.

Applicants for this appointment must have had experience in a Municipal Engineer's Office, and be good draughtsmen and able to survey and level accurately.

Applications in Candidate's own handwriting, stating age and full details of experience, accompanied by copies of not more than three recent testimonials (which will not be returned), endorsed "Engineering Assistant," to be sent to the undersigned not later than Wednesday, the 17th June, 1914.

Canvassing, directly or indirectly, will be deemed a disqualification.

J. E. SWINDLEHURST, M.INST.C.E.,
City Engineer and Surveyor.

Saint Mary's Hall,
Coventry.

May 29, 1914. (1,660)

**HEBDEN BRIDGE URBAN DISTRICT
COUNCIL.**

The above Council invite applications for the position of Surveyor and Waterworks Manager, at a salary of £130 per annum. The person appointed will be required to carry out all the duties attach-

ing to the said offices, except the clerical work, which is to be conducted by the Clerk's Department.

Particulars of the duties can be had on application to the undersigned.

Applications, stating age and experience, to be sent to the undersigned, together with two recent testimonials, endorsed "Surveyor," so as to reach the Offices not later than first post on Monday, the 15th day of June, 1914.

Canvassing Councillors will disqualify.

SAM OGDEN,

Clerk to the Council.

Council Offices,
Hebden Bridge.
May 30, 1914.

(1,664)

**LANCASHIRE COUNTY COUNCIL.
APPOINTMENT OF THREE COUNTY
SANITARY INSPECTORS.**

The Lancashire County Council are prepared to receive applications for the posts of Three County Sanitary Inspectors, each at a salary of £200 per annum, plus £25 per annum for out-of-pocket expenses, and also third-class railway fares.

Applicants must be between 25 and 45 years of age, and must possess a Certificate of the Royal Sanitary Institute or of some other recognised Examining Body, showing proficiency in sanitary knowledge, and also Certificates showing practical and theoretical knowledge in building construction and surveying, and must have had practical experience in matters connected with the housing of the working classes.

Applications must be sent in on or before Saturday, June 20th, 1914.

Form of application, terms of appointment, and list of duties can be obtained from the

County Medical Officer of Health,
County Offices, Preston.

HARCOURT E. CLARE,

(1,657)

Clerk of the County Council.



CORPORATION CAR DEPOT, DERBY.

**KINNEAR PATENT
STEEL ROLLING
SHUTTERS**

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- CAR DEPOTS
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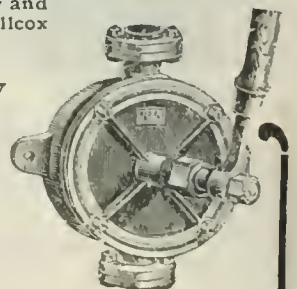
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The Surveyor

And Municipal and County Engineer.

Vol. XLV.

JUNE 12, 1914.

No. 1,169.

Minutes of Proceedings.

Sewage Disposal at Southend-on-Sea.

The possibilities of purifying sewage by dilution in large bodies of water have been investigated with great care, both in this country and abroad, during recent years, and the results of these investigations, particularly those recorded in the Eighth Report, with Appendix, of the Royal Commission on Sewage Disposal, demonstrate that, where the diluting water is of sufficient volume and contains sufficient dissolved oxygen, and the sewage is treated in such a manner as to remove the greater portion of the suspended solids, it can be satisfactorily purified without creating a nuisance. An excellent example of this method of sewage disposal exists in the case of the discharge into the Thames of the London sewage, all evidence of which has disappeared in the river at Southend-on-Sea, and it would certainly seem that disposal by dilution in the case of the latter much smaller town would have fulfilled all possible requirements, bearing in mind the enormous volume of diluting water available. This was the opinion of the borough engineer of Southend-on-Sea, Mr. E. J. Elford, M.A.S.T.C.E., as set forth in the extremely interesting and valuable paper which he read at the meeting of the Institution of Municipal and County Engineers held in his town last Saturday, and which we print in a special supplement to this issue. In spite of this, however, the town has been compelled to construct works of such elaborate and expensive character that they would suffice for any inland town having only a small stream to receive the final effluent, and, as stated by Mr. J. D. Watson in the course of the discussion upon the paper, the town of Southend might claim that no other seaside place purified its sewage to such a degree before it was discharged into the sea.

It will be seen from a perusal of Mr. Elford's admirable paper that a number of unusual engineering difficulties were encountered and successfully overcome, and several new devices and methods of construction were adopted. The details of the scheme are thus very interesting, and are worthy of careful study. On the other hand, it would be very unfortunate if other seaside towns should be compelled to follow the example set by Southend, and have to incur such enormous expenditure, much of which, in the light of present-day knowledge, is altogether unnecessary. The remarks made upon this point, and upon the question of a fixed standard for effluents, by Mr. Watson, in the course of the discussion upon the paper, were interesting and very much to the point, and we believe the views he expressed will receive the

support of all municipal engineers. We shall be glad to see the report of the Committee of the Association of Municipal Corporations, referred to by Mr. Watson, and to learn the reasons which they put forward to show the impossibility and inadvisability of making a statutory standard for sewage effluents. These reasons will undoubtedly confirm the recommendations of the Royal Commission with regard to the question of standards, and the need for a central authority with powers to decide upon the degree of purity required in effluents. We have on many occasions urged the importance of giving early effect to the recommendations of the Royal Commission by a new Act of Parliament, and we would suggest that the Association of Municipal Corporations might usefully devote its energies and influence to persuading the Government to bring in without fail in the next Session of Parliament a Bill to deal with this matter.

With regard to the details of Mr. Elford's scheme, we are specially interested in the straining and roughing filters arranged between the silt tanks and the percolating filters. Bearing in mind the area and depth of the percolating filters, the size of the filtering medium, and the capacity of the humus tanks, we should have thought that the roughing filters would not be needed, and we shall be much interested to learn in due course the results obtained with and without the roughing filters. On the other hand, the method adopted for the cleansing of these filters includes an arrangement for blowing air through the gravel of which the filters are composed, and we would suggest that this might be used not only for cleansing purposes, but for aerating the tank liquor on the lines of the latest developments which have been under investigation in America and at Winchester. We hope this opportunity for making a series of experiments on a practical working scale to ascertain the effects of aerating a settled sewage, and particularly the cost of the process, will be utilised, as a record of the results obtained would be of great value for comparison with the results which are being obtained elsewhere.

* * *

Water Engineers' New President.

Mr. Thomas Molyneux, the corporation water engineer of Stockport, who has just assumed office as president of the Institution of Water Engineers, has been a member of the institution—and its predecessor the old association—since the first year of its existence. His election to the presidency is therefore peculiarly appropriate, and

it was also fitting that he should devote the first part of his presidential address yesterday to a review of the progress of the institution since that time. In regard to the matters which are to the fore at present, Mr. Molyneux mentioned that a special committee of the council is still engaged on the standardisation of conditions of contract, and that, although the subject is one that requires very careful consideration and involves much labour, it is hoped that the report will be available at an early date. A committee has also under consideration the incidence of income tax as affecting waterworks undertakings, a subject which, as Mr. Molyneux observed, is perhaps more particularly interesting to those who are engineers of water companies, but which may also prove worthy of study by municipal water engineers. A third committee has been appointed to take into consideration the question of charges for domestic and trade supplies in the light of recent decisions in the law courts. The last of these questions is one of considerable importance both to water authorities and the public. The principle laid down by the Courts appears to be broadly that, in deciding whether any given supply is domestic, regard must be had to the nature of the purpose for which it is used, and if that purpose is domestic in character, even though it be connected with the carrying on of a lucrative trade, such as that of a restaurant, then the water authority are only entitled to charge as for a domestic supply. The result is that the proprietors of many businesses obtain a supply of water at the same nominal rate which applies in the case of the ordinary householder.

The latter part of the address was concerned with matters connected with the new president's own experience as a water engineer, and comprised some interesting observations regarding the watershed of the river Mersey, and the mechanical filtration of upland waters. In dealing with the use of reinforced concrete in the construction of covered reservoirs, he pointed out that the extra cost per cubic yard is not only due to the steel reinforcement, but to the extra care which has to be exercised in the selection of the material to be used and the placing of it in position, as watertightness depends not on several feet thickness, but on inches only. The aggregate must be of exceptional quality and of carefully selected size and shape, and the timbering must be carried out by skilled carpenters, the ordinary timberman not being sufficiently trained. No doubt in course of time, as the use of the material increases, the timberman will become educated to the work and highly skilled carpenters will not be required. It is also to be anticipated that, as the reliability of reinforced concrete is proved by repeated examples, the period allowed by the Local Government Board for the repayment of loans will be extended. Another matter of interest with which Mr. Molyneux dealt was the effect of the improvement of road surfaces on the cost of distribution. The more costly methods of road construction render it more than ever desirable that subways for the accommodation of mains should be constructed whenever practicable, and that when this cannot be done footways should be made wider so as to accommodate the several pipes and cables, and some definite plan should be agreed upon between the parties concerned for adjusting the relative positions of their mains.

The Imhoff Tank.

On several occasions during the past two or three years, when describing the number of cases in which this tank has been adopted, and the results of its operation, particularly in America, we pointed out that, so far as we were aware, it had not been put into operation in this country, and therefore anyone proposing to use it

would have to rely upon experience gained in other countries. As will have been noticed from our issue of the 29th ult., this lack of experience will shortly cease to exist, as a set of two Imhoff tanks has recently been constructed at the Withington sewage works of the Manchester Corporation. This is an event of considerable importance to engineers engaged in sewage disposal works, as, whatever opinions may be held by individual engineers with regard to the value of this tank compared with other types, it is very desirable to have exact data of the results obtained in this country. That the working of the tank at Withington will be carefully observed and the results accurately noted may be anticipated from the past record of the Rivers Committee of the Manchester Corporation, whose annual reports are so extremely well prepared and a source of valuable information in connection with the art of sewage disposal. In the absence of any properly equipped State institution for carrying out experimental and research work, it is a matter for congratulation that the first installation of these tanks is in the hands of such a capable and progressive local authority, who will not only carry out the necessary investigations on strictly scientific lines, but place the results of their observations on record for the benefit of the whole community.

In the details we published recently it will be noticed that the tanks are described as "Emscher" tanks after the district in Germany in which they were first constructed. We have preferred to use the term "Imhoff," which is the name of the patentee—one of the engineers of the Emscher District Drainage Board. In America, where this type of tank has been adopted in a number of cases in recent years, they are known as "Imhoff" tanks, and as "Two-story" tanks, to distinguish them from "One-story" tanks, such as ordinary septic or settling tanks. We have thought it desirable to refer to this matter of terminology, as we believe that this new type of tank is already confused with other types, and it would be well to have a definite and understood name for it. In conclusion it should be noted that the chief features which distinguish it from other tanks are the claims that (a) the sewage is not fouled in its passage through the tank, so that, in cases where the sewage arrives at the works in a fresh state, it passes out of the tank in the same state to the filters; (b) that a very high percentage of suspended solids is arrested and retained in the tank; (c) that the decomposition of the organic matters which takes place in the tank does not create any evil-smelling gases, and thus the risk of nuisance from smell is avoided; and (d) that the sludge when removed is easily dried and rendered spadeable by simple sludge-draining beds, and its disposal by use as manure, or for filling up low-lying areas, can be effected without creating a nuisance from smell. These are advantages which are well worthy of consideration, and we now await with much interest the publication in due course of the results to be obtained from the tanks at Withington.

* * *

Haulage of Road Material.

The principal feature of the annual Scottish meeting of the Institution of Municipal and County Engineers, which took place on Friday and Saturday last at Dunfermline, under the presidency of Mr. J. Bryce, of Glasgow, was a paper by Mr. W. L. Gibson, the county road surveyor for the Western District of the Perthshire County Council. Mr. Gibson took as his subject "The Advantages of Steam Tractor Haulage over Team Labour for Road Material." The matter is one upon which we have had something to say upon former occasions, but we have peculiar pleasure

in reproducing Mr. Gibson's paper in this issue, inasmuch as he was the first county road surveyor in Scotland to adopt tractor haulage. He has now had some ten years' experience of this method of transportation, and consequently his paper, and particularly the detailed statements of actual cost and comparative analyses of tractor haulage as compared with team labour which it contained, are of special value. The question is one which must be looked at from many points of view. The epigram that the bigger the load the cheaper the cost per ton-mile contains just as much truth as most epigrams, and no more. The inevitable damage to roads by tractor haulage is a factor which must be considered, and the ideal to be aimed at is to secure at one and the same time cheapness of transport and minimum damage to roads. In the opinion of Mr. Gibson, to which, as we have already said, great weight must be attached, these two aims are irreconcilable, so long as heavy traction haulage is employed. His verdict in favour of light tractor haulage can also be supported on other grounds. For example, convenience of working is an important consideration, and in this respect the light tractor is at a great advantage. In concluding his paper, Mr. Gibson suggested five points for the consideration of these road engineers and surveyors who might be contemplating the adoption of mechanical haulage. First, they must consider whether the roads are capable of carrying the maximum axle weight of the type of vehicle it is proposed to use. Then, in regard to the quantity of materials to be transported, the question of hire *versus* purchase arises. If, as is said to be the case in some fortunate districts, the present prices of cartage are so cheap that it would be no economy to adopt mechanical traction, the matter need not be viewed from any other aspect in such districts. Other matters which ought to be taken into account are the possibility of using a convertible tractor and roller, and the use of the engine for driving a small stone-breaker, or for some other suitable purpose. The whole of Mr. Gibson's paper will be found in another column, and we cordially recommend those of our readers who may be interested in the subject carefully to peruse its contents.

* * *

Town Planning. The fact that the town planning sections of the Housing, Town Planning, &c., Act, 1909, have, so far, not given rise to very much litigation is due to the delays which are inevitable in enforcing those schemes which have up to the present been sanctioned. It appears from the paper on "Town Planning from a Lawyer's Point of View," which Mr. John L. Jack, the town clerk of Dunfermline, read at last week's meeting of the Institution of Municipal and County Engineers in that town, that, in his view, the Act will in time open up a wide field for litigation. The powers which are given by the Act to the Local Government Board and to the local authorities are certainly very great. It is commonly agreed that the right to enforce a town planning scheme is a most valuable one to any community. On the other hand, it must not be forgotten that that right necessarily imposes great restrictions upon landowners in dealing with their properties. It has been made clear by the Local Government Board that, in order to work the Act, the views of the landowners should, as far as possible, be ascertained and complied with. At the inquiry which was held into the Dunfermline scheme some very interesting questions arose, and particularly as to what land proposed to be included in the scheme was likely to be used for building purposes, or was so situated with respect to land likely to be so used that it ought to be included. Objection was taken to the inclusion of certain lands on the ground that in all likelihood they would not be built upon for

at least twenty years to come. The answer, on behalf of the local authority, was that the words "likely to be used for building purposes" did not necessarily mean that it was likely to be so used within the next year or two; and further that the very lands under discussion had only a few months previously been included by Parliament within the city boundary, thus showing that Parliament had considered them to be urban in character. The Local Government Board adopted the view put forward by the corporation and included the lands. As Mr. Jack points out, this decision is eminently reasonable, and does not confer any hardship on the landowner. If his lands are not likely to be built upon in the near future, the mere fact that they are included in the scheme does not necessarily entail upon him any disadvantage. Considerations of space preclude us from reproducing Mr. Jack's paper this week, but we hope to do so in our next issue.

* * *

A Surrey Beauty Spot Threatened.

At a recent meeting of the Dorking Urban District Council it was stated by the chairman that the council were taking full steps to see what could be done with regard to the danger threatening the Nower, an open space of great natural beauty to which the public have for a long time had access with the consent of the owners. The danger is that a considerable portion of the estate of which the Nower forms a part is soon to be offered for sale, and, in view of the fact that the Glory Woods adjoin land which has already been built upon, and where further building is in progress, it is felt locally that an effort should be made to secure for the town the only other open space of considerable size, access to which is at present enjoyed by the public. The Nower is a park-like area, including a high ridge from which fine views of the surrounding country can be obtained, and a long sweeping slope down to the lower ground; and it is beautifully timbered. It is situated close to the town, and the ground is often dry enough for walking when the paths across Holmwood Common, where the soil is clay, are almost impassable. Holmwood Common is, moreover, at a distance of about three-quarters of a mile from the town, the high-lying portion much further; and Ranmore Common, in the other direction, lies about a mile and a-half away, at the top of a very steep ascent. The deduction of general interest to be drawn from this particular case is that even those towns which are situated in the heart of a country abounding in open spaces and woods to which the public have access find it desirable to have open spaces of their own at a short distance from their main streets.

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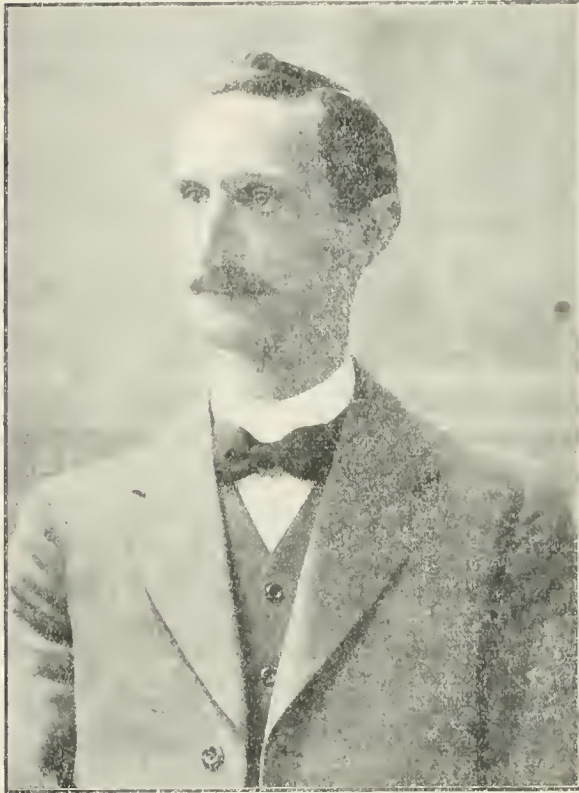
Helston Councillors Cry "No!"

The nerves of the rural councillors of Helston, in Cornwall, received quite a rude shock recently, when, it having been announced that Mr. C. E. Boaden, surveyor of the southern district, had resigned, a member had the temerity to propose that they should advertise for a successor at a salary of £100 instead of £70, which the officer had been receiving. There was a stentorian chorus of "Noes!" from all parts of the council chamber when the awful suggestion was made, and one can imagine that certain full-blooded protectors of the rural purse came nigh to a fatal attack of apoplexy at the mere idea of making an advance upon a salary of £70 a year. It is no surprise that the proposition found no seconder, and that rustic Helston remains free from the suspicion or danger of the outer influences of progress. All the same we are thankful for small mercies, for it seems that in the district there is one courageous Abdiel among the faithless ones. In all sincerity we are constrained to say more power to him!

Institution of Municipal and County Engineers.

THE SOUTHEND-ON-SEA MEETING.

Vice-presidents, past-presidents and members of council formed quite a substantial proportion of those who were present to support the president at last Saturday's meeting of the Institution of Municipal and County Engineers at Southend-on-Sea. In all there was an attendance of nearly 150, but the arrangements for handling the gathering were such that everything passed off with the greatest smoothness. If not ideal, the weather at any rate remained fine throughout the day, and the visits to works, which were a



MR. E. J. ELFORD, M.INST.C.E., M.I.MECH.E.,
Borough Engineer of Southend-on-Sea.

[Mr. Elford served his articles with his father, Mr. J. Elford, then borough engineer of Poole, and was afterwards engaged as an assistant under him for two years in connection with the Poole main drainage scheme, which was carried out at a cost of £82,000, and with other large and important works. From 1890 to 1892 he was assistant to Mr. T. de Courcy Meade, M.INST.C.E., now city engineer of Manchester, but at that time borough engineer of Hornsey, and during this period he was engaged on drawings for, and the supervision of, extensive drainage works at Highgate, a large storm-water sewer, sanitary depot, alteration to refuse destructor works, the provision and correction of an ordnance survey map of Hornsey and Highgate, as well as on important street and other works. Between 1892 and 1895 he was engineering assistant to the late J. Buchan, city engineer of Norwich, and afterwards to Mr. Buchan's successor, Mr. A. E. Collins, whom he assisted largely with the drawings, estimates and supervision of the new drainage works, as well as in the preparation of designs for public baths. In May, 1895, he was appointed engineer and surveyor to the urban district council of Portland, where he designed and superintended the construction of new water supply works costing nearly £45,000, and a main drainage scheme costing about £25,000. In 1902 he was appointed to Southend, and since that date he has been engaged in designing and carrying out many important works. Mr. Elford is a member of the Institution of Civil Engineers, a member of the Institution of Mechanical Engineers, and a member of the Institution of Municipal and County Engineers.]

prominent feature of the programme, were participated in with the keenest enjoyment. Those who at eleven o'clock assembled at the Palace Hotel for the mayoral reception included Sir James Lemon (Southampton), Messrs. J. Anstee (Guildford), H. L. Baker (East Ham), E. M. Bate (Frinton-on-Sea), J. Birch (East Ham), W. N. Blair (St. Pancras), J. H. Blizard (Southampton), H. Percy Boulnois (Westminster), W. L. Bradley (Tonbridge), A. T. Bridgwater (East Ham), T. F. Bunting (Maidstone), J. H. Brierley (Richmond), E. R. Capon (Epsom), J. R. Cartledge (Barnes), H. T. Chapman (Kent County Council), C. J. Cloke (Chiswick), R. Collins (Enfield), W. A. Collins (Bridgwater), W. R. Collins (Enfield), J. W. Cockrill (Great Yarmouth,

president), L. A. Cooper (Chiswick), H. B. Crossley (Acton), C. F. Dawson (Barking), J. Dewhurst (Chelmsford), W. J. Dresden (Battersea), R. H. Dyer (Southend-on-Sea), E. J. Elford (Southend-on-Sea), W. Fairley (Westminster), B. A. Farley (Malling), T. J. M. Flower (Bristol), C. A. Gill (Peterborough), W. Gornall (Hendon), E. Y. Harrison (Wellingborough), P. T. Harrison (Chelmsford), B. Haylor (Willesden), T. W. A. Hayward (Battersea), O. Hellowell (Withington), J. R. Hill (Ipswich), S. A. Hill-Willis (Tilbury), R. L. Honey (Chatham), L. R. Impey (Ipswich), A. C. James (Grays), R. H. Jeffes (New Malden), C. J. Jenkin (Finchley), R. J. Jenkins (Portsmouth), C. C. Kidd (Southend-on-Sea), T. Kidd (Swadlincote), P. G. Killeck (Finsbury), R. J. W. Layland (Billericay), M. Lea (Karachi), H. W. Line (London County Council), H. J. Marten (Streatham), S. Mathew (Chelmsford), J. R. Mead (Ipswich), A. J. Meeson (Brentwood), E. J. Messent (Kensington), A. E. Nichols (Folkestone), W. H. Prescott (Tottenham), A. E. Prescott (Eastbourne), F. W. Pearce (Twickenham), H. W. Rackham (Hendon), J. L. Redfern (Gillingham), J. W. D. Robinson (Westminster, secretary), E. E. Ryder (Bushey), F. Sadler (Acton), N. Scorgie (Hackney), E. C. Seabrook (Hendon), J. E. Sharpe (Cheshunt), G. G. Shepherd (Hford), R. H. Shaw (Hford), E. J. Silcock (Westminster), S. S. Small (Southend-on-Sea), C. Chambers Smith (Westminster), J. H. Smyth (Willesden), E. F. Spurrell (Holborn), T. R. Swales (Maldon), E. W. Swinstead (St. Pancras), J. Sutcliffe (Dertford), H. Taylor (Newcastle), P. G. Thorby (Southend-on-Sea), H. L. Torr (Southend-on-Sea), B. D. Tracey (London), H. T. Wakelam (Middlesex County Council), J. D. Watson (Birmingham), J. A. Webb (Hendon), H. C. Whitehead (Southend-on-Sea), E. Willis (Chiswick), H. F. Wilkinson (Tottenham), O. E. Winter (Hampstead), R. K. Wortley (Southend-on-Sea), members; H. M. Alderton (Chelmsford), G. F. Andrassy (Chelmsford), G. T. Allan (Southend-on-Sea), S. W. Ball (Willesden), C. S. Bilham (Southend-on-Sea), J. Bowen (Reading), F. Britain (Southend-on-Sea), J. H. Chapman (Southend-on-Sea), F. J. Crabb (Southend-on-Sea), A. S. Culham (Southend-on-Sea), H. A. Dowsett (Southend-on-Sea), E. F. Edwards (Southend-on-Sea), Alderman Francis (Mayor of Southend-on-Sea), A. J. Frankland (Southend-on-Sea), T. S. W. Harrison (Leigh-on-Sea), W. H. Hill (Kensington), W. E. Long (Southend-on-Sea), W. H. Makepeace (Stoke-on-Trent), Alderman A. Martin (Southend-on-Sea), S. W. Mott (Wickford), R. H. Nerney (Southend-on-Sea), C. G. Pugh (medical officer of health, Southend-on-Sea), S. M. Reed (Middlesex County Council), S. N. Richards (Southend-on-Sea), W. S. Roper (Southend-on-Sea), G. W. Shreeve (Chelmsford), P. G. Smales (Southend-on-Sea), T. W. Smith (Southend-on-Sea), A. Snodgrass (Teddington), J. R. Smith (Southend-on-Sea), J. W. Turner (Southend-on-Sea), C. E. Tweedale (Southend-on-Sea), J. G. Ward (Southend-on-Sea), A. F. Wicken-den (Southend-on-Sea) and H. J. Worwood (town clerk, Southend-on-Sea), visitors.

The Mayor (Alderman Joseph Francis, J.P.) said it was with real pleasure that he extended to them a very hearty welcome to the borough of Southend. It was one of the privileges of a mayor to welcome visitors to his town, and he could assure them no visitor was received more heartily than the one who was engaged in keeping the municipal machine going, and devoting his time and energies and abilities to improving that machine. In 1901 he had the privilege of entertaining some of the gentlemen present. Since that time many and great changes had taken place. They had added no fewer than 50,000 to their population, and they had spent more than £500,000 in public works and improvements of various kinds. He hoped, therefore, they would find something at least to interest them, and that when they left they would not say their day had been wasted; but, on the other hand, that they had had an interesting day—such an interesting day, in fact, that before very long they would be induced to come again.

The next hour was occupied by the members in making inspections of the pier-head extensions, the esplanade improvement and sea wall, and the huge swimming bath which is being erected on the front at Westcliff. The journey of something over a mile to the end of the pier was made on electric cars. From

Westcliff motor vehicles conveyed the whole party round the western outskirts of the town back to the Palace Hotel, where the mayor entertained the members to lunch.

HIS WORSHIP said it was his privilege for the second time to submit the toast of "The Institution of Municipal and County Engineers." On the former occasion, as some of them would no doubt remember, they had their luncheon in what was then a new building, and was known as the Kursaal, and he believed their president on that occasion was Mr. Mawbey, of Leicester. When he told them that at that time the Palace Hotel was not in existence, it would go to show they had made progress, and he thought what they had already seen of Southend was further proof of his statement, and he hoped there would be no possible doubt of it when they had made further visits that afternoon. There were those who did not speak favourably of institutions such as this—they did not see what was to be gained by members of the same profession meeting together and exchanging ideas; but he ventured to suggest that much good could come from an institution such as this, particularly when they visited towns of progress, and saw what was being done by their professional brethren in the particular district. The man who never went outside his own particular district was likely to have narrow ideas. He suggested that, in his individual interest, as well as the interest of the corporation, it was his duty to serve; it was to the advantage of everybody concerned that he should go and see what his neighbours were doing. In some cases they might profit by their mistakes, because he supposed they would admit that they all made mistakes, but it was not everybody who would admit that a mistake had been made. He should like to take that opportunity of paying his tribute to municipal officials. He had had the privilege of knowing all the officers of that borough since it was incorporated, and they had one—their borough accountant—who had been in office during the whole of that period. The other officers, with the exception of Mr. Elford, who of course, was well known to them, had been with them some years, and, it was hoped, would remain with them for many years to come. It was only fair to their officials to say that, although those who were members of the corporation, and were the spokesmen to the public, received credit for many works which were carried out, it was only fair to say that without the assistance of capable and loyal officials those works could not be carried out satisfactorily. Although he had said very little, he could assure them he was most sincere in wishing that this institution should go on and be a great success, and, as they said in the City of London, should flourish root and branch for ever.

The PRESIDENT, in his reply, thanked the mayor for the very kind and hospitable manner in which the institution had been received. He came from a rival watering-place; he was out to learn something, and Mr. Elford's paper, and what he had seen that day had taught him something which would be of use in the town he came from. He was glad to hear the remarks which the mayor had made respecting the institution, and the advantage of professional men meeting together to interchange ideas. Five years ago their institution was regarded by some as moribund, but since then it had increased its roll by 500 members. That day they were holding a meeting in Dunfermline, and he believed it would be as successful as that meeting in Southend. A fortnight ago they held meetings in Salisbury and in Ipswich, and in both towns they were received in the same generous manner as they had been received in Southend.

Sir JAMES LEMON said the mayor, with his well-known modesty, had not put a toast on the menu with reference to himself, but he was going to supply the deficiency and ask them to pass a hearty vote of thanks to his worship for his kind and generous hospitality. It was said that they did not expect these luncheons, but all he could say was they always got them. (Laughter.) He hoped the day would never come when they would be omitted.

The toast was drunk with musical honours.

The MAYOR, in response, said it was a real pleasure to a mayor to entertain visitors, and having had the privilege and pleasure of entertaining some of them years ago, he thought it would be nice to see them again this year, and with the assistance of their engineer, Mr. Elford, who, with his secretary, had done all the work, they managed to get them to revisit the town. He could not promise to be mayor in twelve years' time and provide the expected

luncheon, but he trusted that whoever was mayor would see that the luncheon and something else was provided.

The discussion of Mr. Elford's paper, "The Main Sewerage and Sewage Disposal Works, and other Recent Municipal Works, Southend-on-Sea," was then proceeded with, Mr. J. W. Cockrill, the president, occupying the chair.

DISCUSSION OF MR. ELFORD'S PAPER.

The PRESIDENT, in proposing a vote of thanks to Mr. Elford for his paper, observed that he was out to learn something, and there was much he had seen in Southend from which there was something to learn.

Mr. J. D. WATSON, Birmingham, Tame and Rea District Drainage Board, in seconding the vote of thanks, said the paper was one of the best of its kind he had ever read, and he felt it was—and ought to be—a model for papers presented to that institution. It contained an excellent description of the works; the description was clear and accurate, and well illustrated with informing drawings. The whole paper was an illuminating contribution, calculated to convey much knowledge of a very interesting kind. He thought that much praise was due to the designer of the works, and he was sure they would accord very heartily their thanks to him. Southend was in a very unique position with regard to this question of sewerage and sewage disposal. Usually the sewage of a town, especially when built on a hillside as it was there, was conveyed to the water front. In this instance it had to be conveyed to the hills. The front was so very valuable that it obviously would not have been to the advantage of Southend to have had sewage disposal works there, because, after all, however good the works might be, however free of nuisance they might be, they were still sewage works, and had that character which people did not wish to be associated with when they went to the seaside. There were two questions which came up very prominently with regard to sewage purification. One question was as regarded the amount of purification which ought to take place before sewage could be discharged into a river or the sea. He had always thought, and he thought now, that Southend had been very hardly dealt with. He felt that for the powers to be to have called upon Southend to effect the purification which they would see later on was somewhat unfair, especially when one remembered that the greatest town in the country, and in the world, did comparatively little to purify the sewage which was sent into the River Thames, and that Southend was on the estuary. He did not say that nothing should be done—far from it. He had only just come back from investigating a case where sewage was taken into a very great stream without purification of any kind, and he was able to trace evidence of that pollution for 100 miles. It was, in his view, necessary that something should be done. In every case the solids should always be removed before the sewage was allowed to enter even the biggest river, but neither Parliament nor the courts were satisfied with the proposition that Southend should remove all solid matter from the sewage before it was sent direct into the sea. They required as much to be done as was done in any town he knew of. The works themselves were excellently designed, and he thought they would find they had been as well executed, and that with the effluent which was being discharged no fault could be found. One thing which would have a good effect was that Southend would be able to say that there was no other watering place in England or abroad, so far as he knew, which purified its sewage to the same extent before it was discharged into the sea. If there was any detriment from sewage going into a great wide estuary like that it had been reduced to a minimum. The question which Mr. Elford alluded to, and which he (Mr. Watson) thought was a very important one, and one which affected every municipality in the country, was the question of standard. Mr. Elford stated clearly in his paper the standard of purification which ought to be effected, and which he must effect before the effluent was discharged. He (Mr. Watson) thought all stereotyped standards were objectionable. The law as it stood was even more strict than the standard which had been put upon Southend by their private Act. But two blacks did not make a white, and when they thought of it, it was impossible to have a standard which was applicable to all cases. The Royal Commission of Sewage Disposal had recognised that, and in all their recommendations they had suggested that a central authority should be established, and that to that authority powers should

be given to say whether the effluent was fit to be discharged into the river or not. Another suggestion had been made that the standard should be statutory. He would oppose that, and would advise all municipalities to oppose it. He might tell them that the Association of Municipal Corporations appointed a committee to consider that question about a year ago. He was one of the committee, and they made a report which had not yet seen the light of day—for what reason he could not tell—but he could assure them it would appear, even if he should have to take the responsibility, as chairman of the committee, of furnishing it himself. The committee advised the Association of Municipal Corporations to oppose any proposition to make the standard statutory, and they gave several reasons why it was quite impossible, as well as inadvisable, that such a course should be taken by Parliament. Those of them who had experience of sewage works knew quite well that they depended very largely upon conditions of climate to produce certain results. Their works were made for this climate, and not for tropical climates; nor, as a matter of fact, did they make sewage works to give good effluents during long periods of frost. The best sewage works, and the best sewage farm they had ever seen gave out variable effluents, and to keep a town to one particular standard, which must be observed day in and day out, year after year, was to ask for the impossible. Nature did not work for such a condition as that. Nature invariably, or almost invariably, gave to them a much greater volume of water in our rivers during the winter than they had during the summer, and the effluent was better during the summer than it was during the winter; but if an engineer were to be required to construct works which would always give an effluent of a purity which was equivalent to any particular standard, it would become necessary for him to spend a larger amount of money, to increase the area, and capacity of works, in order to be ready for all contingencies. Now he thought they were asking the communities to spend more money than was necessary when they asked them to do that. The money was required for other purposes. He thought they ought to say that there were other purposes for which the money was more needed than the purification of sewage if that purification was to be an exceptionally good purification. He was glad of that opportunity of being with the members of the institution to view the works. They were quite up-to-date works. They were as good works as they would expect to find in any inland town. They were such good works that they would find in juxtaposition the Humphrey internal combustion pump and the Stereophagus pump. Mr. Elford had adopted the newest possible methods, and when they had seen the works that day they would agree with him that they were works of a very excellent character.

Mr. T. W. A. HAYWARD (Battersea), in supporting the vote of thanks, said some of them had seen and heard a good deal of Mr. Elford of recent years. As he came down in the train he read the paper, and he could not help wondering how Mr. Elford had given the time to their institution in the midst of the heavy professional claims which Southend had made upon his time, energies and ability. One could not read the paper without feeling that Mr. Elford's work in Southend had been very arduous; yet, during the past six years, there was no man who had given more time to the council of the institution. Mr. Elford's labours in the matter of standardisation would be helpful to all of them, and he was glad of the opportunity to bear testimony to the very valuable work which he had done, and which would be helpful to the whole profession in days to come.

The president at this point being obliged to leave, Mr. Wakelam, district chairman, took the chair.

Mr. E. WILLIS (Chiswick) remarked, as regards the sewer and outfall conduit, that Mr. Elford had arranged for the two sewers to be in the same trench, and the effluent was discharged under a hydrostatic head. He would like Mr. Elford to tell them how much the hydrostatic head was, and the friction in the outfall sewer. Then, in connection with the grouting machine, there appeared to be a hand air pump. He could hardly think that could be the method of grouting. When he had carried out the grouting of a sewer the air was generated from an engine on the surface and conveyed through ordinary flexible tubing. There was one serious difficulty which Mr. Elford had managed to overcome, but which would not have occurred if the works had been done by administration in the earlier stages, as they were at the completion.

He referred to the serious loss caused by the falling in of the large excavation. He would like to have Mr. Elford's experience of the bitumen joints on the lead pipes. He had not used these at all, and it would be advantageous to have Mr. Elford's experience on that particular method of connecting. Mr. Elford called attention to the big savings which were effected by the works being carried out by administration. He thought there were many works where municipal engineers could do better for the local authority by carrying out the work by direct labour instead of by contract. He did not think that applied to all work, particularly to building work, where costly plant was necessary; but in sewer work very considerable savings might be effected by direct labour. He would like to know whether there were any other instances of the Humphrey pump being used for a high lift. Probably most of them had seen the Humphrey pumps at the Chingford reservoir, but there they were only lifting water 25 ft., whereas there they had to lift screened sewage against a head of 65 ft. At present only one pump had been erected, but he was convinced that there was a great future for the Humphrey pump if the high lift could be arranged.

Mr. E. J. SILCOCK (Westminster and Leeds) said he had the privilege of being called upon to support the sewerage scheme in connection with the Parliamentary proceedings. Some reference had been made by Mr. Watson to the requirements of purification at Southend, and Mr. Watson had said that, so far as he knew, Southend did more than any other town of a similar character. That was not strictly accurate, because at Southport they had very efficient purification works, also at Skegness, and although he quite agreed with the views expressed by Mr. Elford that in this case, the sewage being discharged into the estuary, purification had no connection whatever with oyster beds, he ventured to think that, as an investment, the town of Southend was perfectly justified in going to this great expense of purifying its sewage. As a health resort, and one where sea bathing was carried on, there could be no doubt they must remove the slightest suspicion that the water in which the public bathed was liable to pollution, and he thought that many other towns situate on the sea coast would in future find it to their advantage to purify their sewage rather than allow it to be discharged into the sea without any previous treatment. These works of sewage purification in Southend were, undoubtedly, of the latest construction and thoroughly up to date, and he regretted that the time at their disposal at the works would be so very short. He hoped they would be given an opportunity of coming down again, and having a further inspection of the works when they were in full operation. Reference had been made to the Humphrey pump. He thought that was the first application of it to sewage pumping. It was proposed to use it at the Leeds sewage works, but just before the corporation finally decided upon the type of pump they came to the conclusion that it would be better to utilise their electric power for pumping rather than launch out into a new system of which they had no experience, and the Electric Committee offered such favourable terms that they finally adopted electricity. He believed this system of pumping was one well adapted to sewage, and in future there would be many applications of the system to this class of work. Reference had also been made to the Stereophagus pump. That was a new type of pump. At their meetings they hesitated to give any sort of testimonial, but he would like to say he had had two pumps of this type pumping unscreened sewage for a year, and they had had no difficulty with it. He thought that type of pump was very applicable to the pumping of sewage, and could be used at isolated stations without using an air lift from power generated at a central station. That type of pump was quite new, and so far his experience of it had been very satisfactory.

Mr. T. J. MOSS-FLOWER (Westminster) said it was rarely they saw a town grow at the rate Southend had grown. Since 1881, including the added districts, the town had grown from 7,979 to 84,000. They must congratulate Mr. Elford upon having the opportunity of exercising his engineering skill in such a progressive town, and, on the other hand, they must congratulate Southend on having a man with the energy and capacity to grapple with the difficulties presented by such rapid growth. He would content himself with referring to just one or two points in the evidence that was brought before the Courts in opposition in the action of *Hobart v. The Southend Corporation*. The outfall was allowed to discharge for a period of four

hours after the ebb tide. Mr. Elford said he believed this evidence was given quite honestly, and that most of the pollution which took place was from the tailings of sewage after the penstock had been closed down. That was an important matter for anyone who had to deal with a sewage outfall into a river or into the sea. If they had a long outfall, and the tide rapidly falling at the time of the ebb, they had a large amount of sewage discharged on to the foreshore. It was important that no sewage should be discharged on to the foreshore. Then there were the difficulties Mr. Elford experienced in connection with contractors. One knew that half the troubles of engineers arose from contractors. It was a very easy matter for a contractor with knowledge to do that part of the work which could be done cheaply, and on which a large amount of money could be made, and to leave to the last the difficult part of the work on which there was little or no profit. They should see to it that the contractor did the latter work as well as that which could be done easily. Although the Act of Parliament insisted upon a high standard of purification, Southend was to be congratulated upon that fact. They had in these seaside towns to make clear that there was no suspicion of sewage being returned at any state of the tide to where people might be bathing. The least they could do was to screen the sewage so as to take the solids out, so that no flocculent matter could be seen floating about in the sea. Southend had an up-to-date method of sewage treatment, and though they might consider they had to purify their sewage to an unreasonable standard, it was well to be on top; they were meeting all the requirements, and they were not likely to be shot at by the powers that be.

Mr. J. E. SHARPE (Cheshunt) asked, with regard to the Mexphalte, the cost per yard and the term of free maintenance.

The CHAIRMAN (Mr. H. T. Wakelam) said he should like to say how much he was in favour of the vote of thanks. Mr. Elford deserved everything that had been said of him.

Leaving the Palace Hotel, the members proceeded in the motor vehicles to the sewage works, the journey being made by way of the new tramway boulevard. The inspection of the works, which proved full of interest, occupied the greater part of an hour, and was followed by tea, kindly provided by Mr. Elford.

Mr. HAYWARD, in proposing a vote of thanks to the borough surveyor, said he thought that would be regarded by all present as one of the red-letter days in the annals of the institution. Mr. Elford had provided for them food both for the mind and body. He was sure all of them had been highly gratified at what they had seen and heard, and that he was voicing the general feeling in expressing their indebtedness to Mr. Elford, and wishing him all prosperity in his future career.

The vote of thanks was carried with enthusiasm.

Mr. ELFORD, in acknowledgment, said the day had been a pleasurable one to him, and if their visit had been in any way a profitable one to them he was more than repaid.

It was found impracticable to continue the discussion on Mr. Elford's paper. Mr. HAYWARD put a question as to why, at the destructor, the material, after being put on the floor, was shovelled into the hopper and subsequently taken out of that and put on a lower floor before being shovelled into the furnace.

Mr. ELFORD said he thought that, owing to the difficulty of making oneself heard, it would be more desirable if he replied in writing.

The proceedings accordingly terminated.

SCOTTISH DISTRICT MEETING AT DUNFERMLINE.

The annual Scottish meeting of the Institution of Municipal and County Engineers took place at Dunfermline on Friday and Saturday last under the presi-



Mr. W. L. GIBSON,
County Engineer, Western Division, Perthshire.

[Mr. Gibson is a native of Glamis, Forfarshire, and received his early education at the public school there, after which he completed a two years' course of technical studies at the Harris Academy, Dundee. After leaving school he received a commercial training with the late Messrs. J. D. Cox & Co., Panmure-street, Dundee. Subsequently he received an engineer's training under the Glasgow Corporation in the engineer's office of the cleansing department, and later he spent three years in the county road surveyor's office (Perth district) as principal assistant. At the age of twenty-three Mr. Gibson was appointed surveyor and engineer to the Morpeth District Council, Northumberland. After nearly five years the Western District Committee of Perthshire County Council appointed him to his present position, which he has held since 1902, since when he has carried out many important works. Mr. Gibson is a member of the Institution of Municipal and County Engineers, and a member of its Road Committee for the Scottish district. He is also a member of the Executive Committee of the Scottish Road Surveyors' Association.]

denry of Mr. J. Bryce, Glasgow, vice-president. The members assembled on Friday morning in the Court

Room at the City Chambers, those present being Messrs. A. W. Allison (Crieff), R. Blackwood (Kilmarnock), T. Callen (Haddington), A. H. Campbell (Edinburgh), T. Cole (London), consulting secretary, G. Cunnison (Blairgowrie), J. W. Dickinson (Berwick-on-Tweed), R. A. Donald (Grangemouth), Geo. Donaldson (Fife County), R. Drummond (Renfrew County), W. H. Ellacott (Midlothian), J. R. Findlay (Leith), Wm. Forbes (Edinburgh), A. Forbes (Fife County), W. L. Gibson (Perth County), T. Goodwillie (Fife County), H. Goudie (Stirling), T. Gourlay (Kirkcaldy), A. D. Greatorex (West Bromwich), F. G. Holmes (Glasgow), H. Inglis (Airdrie), G. Landale (Musselburgh), J. Lee (Paisley), J. L. Lumsden (Kirkcaldy), Wm. A. Macartney (Johnstone), D. Mackenzie (Fife County), J. Murray McGregor (Ayr County), T. McLaren (Perth), H. McKillop (Perth), R. S. Macmillan (Clydebank), D. Maxwell (Carnoustie), J. C. Mitchell (Edinburgh), R. Moir (Midlothian), J. B. Peterson (Dundee), F. Pritty (Prestwick), J. Pritty (Selkirk), T. T. Ramsey (Linlithgow County), D. Ronald (Edinburgh), Geo. Ross (Clydebank), J. Scott (Perth County), T. H. Scott (Inverness), D. H. Shaw (Fife County), Peter Sinclair (Buckhaven), F. C. Smith (Arbroath), J. Walker Smith (Edinburgh), R. Spittal (Hamilton), A. Stevenson (Ayr County), J. Storrar (Midlothian), J. Thomson (Dundee), A. A. Turiff (Elgin), J. A. Waddell (Burntisland), Wm. Watson (St. Andrews), J. Watson (Lanark County), J. Weekes (Newport, Fife), C. F. Wilkes (Nottingham), G. Wyllie (Perth County), and J. Young (Ayr), members; McAllister (Airdrie), D. Beveridge (Kirkcaldy), W. Burt (Fife County), G. Somervail Carirac (Edinburgh), J. F. Combe (Grangemouth), Deas (Kirkcaldy), J. McHutchen Dobbie (Midlothian), Dunean (Arbroath), Fraser (Edinburgh), Frew (Airdrie), Wm. Gardner (Lanark County), Grieve (Perth), H. Hasterton (Fife County), C. P. Hogg (Glasgow), J. O. Jack (Dunfermline), J. Meikle (Ayr), Motherwell (Airdrie), M. Nicol (Kirkcaldy), Sir Wm. Robertson (Dunfermline), J. Spence (Coatbridge), Spence (Dundee), J. Spence (St. Andrews), W. Sym (Lanark County), Tainsh (Crieff), Raymond Unwin (Hamstead, London), H. W. Wallace (Kirkcaldy), Wilson (Arbroath), and W. Ross Young (Lanark County), visitors.

The CHAIRMAN expressed his pleasure at welcoming so many members. He was sorry to say that since their last meeting they had lost by death one of their members, Mr. W. Bell, county surveyor in Perthshire for the Aberfeldy District.

Mr. A. STEVENSON (Ayr County) proposed a vote of

condolence with the family of the late Mr. Bell. Mr. Bell was a man who in his own district had the respect of everyone who knew him, and in every transaction he always left the impression that he was thorough and well grounded in every department. He would be very much missed on account of his professional work in Aberfeldy District, and because of his work in connection with that institution and the sister body, the Road Surveyors' Association, as he had taken a very deep interest in all such work, and had done good service on committees in other ways.

The resolution was passed in silence.

NEW DISTRICT OFFICERS.

The CHAIRMAN said that certain changes had been made in the officers for the ensuing year—namely, vice-president, Mr. Allan Stevenson, county road surveyor, Ayr; district chairman, Mr. John Young, burgh engineer, Ayr; district representative, Mr. Thomas Nisbet, master of works, Glasgow; and hon. district secretary, Mr. D. A. Donald, Grangemouth. He was sure they would give them a hearty welcome to those positions. He would also like to refer to the promotion of Mr. Ronald, who had been hon. district secretary, and who had been given an eminent position in connection with the body which they so often maligned, the Local Government Board. It was pleasant to have friends at Court, and they were pleased to see Mr. Ronald in that position. In the name of the Scottish District he offered to Mr. Ronald their best thanks and their hearty congratulations on his promotion.

Mr. RONALD, in acknowledgment, said it had been a great pleasure to him to act as secretary of the Scottish District of the institution. The foundations of the new system were laid by Mr. Bryce, and, moreover, he had received every help from the district officers.

BY-LAWS FOR WATER SUPPLY.

The CHAIRMAN introduced the question of appointing a special committee to draft by-laws for water supply. They had already drafted building and sanitary by-laws, and he thought they might with advantage take up the question of water supply, and try to standardise the regulations on the subject.

Mr. J. LEE (Paisley) pointed out that a set of model by-laws had been drawn up by the Waterworks Engineers Association at Glasgow.

Mr. F. G. HOLMES (Govan) said he thought they should hesitate before appointing such a committee. There were so many different sets of people interested that it would be impossible to get imposed conditions which were desirable. One of the difficulties they had to deal with was the use of antiquated apparatus, particularly for water-closets. If they could not get power to order the removal of such apparatus after a number of defects had been reported within a given period they might as well save their time. No one knew better than the water engineers what was practicable and what was impracticable in these matters, and the best thing they could do was to get into communication with the Waterworks Engineers Association, and see what could be done. It was of no earthly use trying to do anything as long as these antiquated contrivances could not be removed.

Mr. A. H. GOUDIE (Stirling) said he was in favour of appointing the proposed committee. They could get a copy of the waterworks engineers' model by-laws, and if these proved satisfactory as applied to Scotland, they could recommend the institution to adopt them.

Mr. LEE thought the Waterworks Engineers' model by-laws would apply to most of the towns and small burghs, though there were some things which were not applicable to them. He did not think they contained power to order the removal of antiquated fittings, and he did not think it likely such a power would be obtained.

The CHAIRMAN said he had a good deal of sympathy with what Mr. Holmes had suggested, but much as they might desire radical changes they could only make by-laws consistent with the Act of Parliament.

The meeting decided to appoint a special committee, and the following were chosen to serve on it: Messrs. J. Young (Ayr), A. H. Goudie (Stirling), W. Watson (St. Andrews), P. C. Smith (Arbroath), R. Blackwood (Kilmarnock), D. A. Donald (Grangemouth) and C. Massie (Falkirk). Mr. Donald was made chairman of the committee.

SCOTTISH CLAIMS TO THE PRESIDENCY.

The CHAIRMAN said as he was the retiring vice-president he would like to say that he thought they should move with a view to having, if possible, a

president of the institution nearer to Scotland than had been the practice in the past. The president was almost always chosen from the South, and it was a long time since they had had a meeting of the whole institution in Scotland. At present the vice-president for Scotland or for Ireland was not eligible for the higher position, and he thought the constitution ought to be altered so that that should no longer be the case, and a Scottish or Irish vice-president should be eligible for the chair of the Institution.

Mr. A. D. GREATOREX (West Bromwich) agreed that the institution should have now and then a president from Scotland and from Ireland. At the last council meeting but one a resolution was passed that the president and vice-presidents should be elected by ballot, so as to give the Northern counties a chance of having a president in the near future. It had been felt that the English engineers in the North had not had a proper chance of getting a president, and that an opportunity should be given of having a Scottish or Irish president.

The CHAIRMAN expressed his pleasure that the opinion he had expressed had met with so much sympathy in England. They would bear in mind what Mr. Greatorrex had said, and take action when the time came.

The CHAIRMAN mentioned that there had been difficulty with the head office as to the cost of printing the by-laws, but the account had been cleared up with the assistance of some of the burghs in Scotland. He considered they ought to be treated more liberally with regard to finance. Scotland was not like a district in England; it was a nation, and the national feeling was strong. The membership in Scotland was contributing a considerable revenue to the institution, and he knew that their honorary secretaries in the past had been out of pocket rather than ask headquarters to pay for things.

Mr. RONALD said he considered that a grant should be made as a payment on account of working expenses, and the account cleared up once in six months.

Mr. T. COLE, consulting secretary, suggested that the Scottish district should put the matter in the most convenient form, and let their district representative bring it before the council.

The CHAIRMAN said they would leave it with the district representative. In Mr. Nesbit they had a gentleman who would not stand any nonsense.

It was also suggested that the council meetings should be held at times in places other than London.

Mr. GREATOREX (West Bromwich) mentioned that this question had been before the council on many occasions, but on account of the many committee meetings that were held before and after the council meeting, it would be necessary to carry to each town a cartload of papers. It was recognised that the present arrangement was a hardship to many of the members, especially those who paid their own expenses, and it had been suggested that the expenses should be pooled, everybody paying into a general fund. If the Scottish representatives could show the council a clear way out of the difficulty they would consider it.

Mr. COLE said the decision of the districts on the question of movable council meetings was somewhat confusing. The greater part of the districts thought the matter should be left to the council to consider whether it would be possible to hold meetings outside London.

The CHAIRMAN considered the matter might be left to the district representatives.

SUPERANNUATION.

Mr. GREATOREX, speaking with reference to superannuation, said the executive of the National Association of Local Government Officers had prepared a Bill, the financial portion of which had been revised in consultation with an actuary. The draft Bill had been finally approved by the Executive Council and was ready to be submitted to Parliament at a favourable opportunity. It included every public officer of all local authorities, and of every grade. The Executive Council wanted the assistance of all who were interested to secure the support of Members of Parliament and prospective candidates, and of all local authorities. Unfortunately, the late President of the Local Government Board did not support the Bill, or did not seem inclined to do so, and pressure should be brought to bear by local government officers and local authorities to get the support of the Local Government Boards of England and Scotland. He would suggest that members of

the Scottish District should get copies of the Draft Bill from Mr. Hill, the secretary of the National Association of Local Government Officers, who would give them every information they desired. The Bill, if it should become law, would be a very good thing indeed for all officers of local authorities, and more so for those in lower positions, because the higher the position of an officer the more he would have to contribute to the cost of the scheme.

Mr. W. A. MACARTNEY (Johnstone) observed that if they were affiliated to the National Association of Local Government Officers that was quite sufficient to enable them to claim an interest in the Bill.

Mr. GREATORIX replied that they were affiliated, and Mr. Blair, one of their past presidents, was vice-chairman, while Mr. Scorgie and himself were members of the committee.

DUNFERMLINE'S WELCOME.

Provost HUSBAND then welcomed the members to Dunfermline. He considered it a great honour to the town that such an important institution had chosen Dunfermline for their meeting. They had not much to show the members, but if they would visit Dunfermline again in 1919 they would then probably see a large scheme of town planning carried out. No doubt they knew that the corporation had had a good deal of difficulty with regard to that scheme, but they were hopeful that the difficulties were at an end. Only that morning he received the completed plans of the scheme, and he supposed Dunfermline was the first place in Scotland to get a scheme approved. They had a complaint to make against the Government of having delayed the work for twelve months, but the Government had promised they would thoroughly make amends for the delay they had caused.

Mr. J. BRYCE thanked the Provost for the welcome which he had given to the members of the institution.

LUNCHEON.

The members attending the meeting were then entertained to luncheon in St. Margaret's Hall by the provost, magistrates and councillors of the Royal Burgh of Dunfermline. Provost Husband presided.

Provost HUSBAND, in proposing the toast of "The Institution of Municipal and County Engineers," said they had all sorts of societies holding conferences, town clerks, borough officials, chief constables, and so on; but he could not imagine that any class of men would benefit more from such meetings than those who were engaged in the public service as engineers.

The toast was heartily received.

Mr. J. BRYCE, in responding, remarked that one reason for their visit was the knowledge that Dunfermline had some wonderful town plans to show them. He had seen some of those plans, and could say they were worth looking at, especially as they were the first of their kind in Scotland. Dunfermline had taken the lead in town planning, which they were all agreed was to be the great thing of the future. There was not a town in Scotland that was not suffering for the want of town planning in the past, and engineers were the persons who were practically interested in that work. Of course they must have the lawyers, but very grievous blunders might be committed if they had not competent engineers. He proposed the toast of "The City of Dunfermline."

The toast having been suitably honoured, the Provost briefly replied.

The meeting was resumed later in St. Margaret's Hall, under the presidency of Mr. Bryce, and consideration was given to, among others, a paper entitled "The Advantages of Steam Tractor Haulage over Team Labour for Road Material," by Mr. W. L. Gibson, county engineer of the Western Division of Perthshire. Mr. Gibson's paper is reproduced elsewhere in this issue.

DISCUSSION OF MR. GIBSON'S PAPER.

Mr. A. STEVENSON (Ayr County), in proposing a vote of thanks to Mr. Gibson, said probably no other surveyor in Scotland could have dealt with the question in such a thorough way. He had used steam tractors, and he knew that in specific instances the saving by the use of steam traction was about 60 per cent. The saving was particularly evident when the haulage was over long distances. The general results given in the paper were very satisfactory.

Mr. T. Y. RAMSAY (Linlithgow County) said there was not only economy in the actual haulage to be considered in adopting steam traction, but also the advantage of getting a more regular supply of mate-

rial. They might get 20 or 30 tons a day, or even double, and by having a proper supply of material they were able to do better work on the roads.

Mr. G. DONALDSON (Fife County) remarked that if Mr. Gibson could get a ton of metal hauled a mile for 6½d., he must be getting his labour very cheap in one sense and very dear in another.

The CHAIRMAN remarked that nothing was put down in the paper for damage to roads by motor haulage. Probably it was considered that there was no damage done; but if there were any it should be put in as part of the cost.

Mr. GIBSON, in reply, remarked that the difference in mileage and the absence of difference in cost was explained by weather conditions and the gradients of the roads traversed. The latter formed a very important factor in the cost per mile. In one case they might be hauling over a road with several steep gradients, while another quarry 2 or 3 miles distant might be practically on a level road. That accounted for the difference per mile in the cost of the materials. As to allowing for damage to roads the damage had to be considered both in tractor haulage and in team haulage, and he had not allowed for it in either case, as he considered it to be about the same with both forms of haulage.

The vote of thanks was heartily accorded.

Following the business meeting, visits were made to the main outfall sewer, tunnel works, and to the Pittencrieff Glen and museum.

In the evening the annual dinner of the Scottish District was held in the City Hotel, Dunfermline, Mr. J. Bryce, vice-president, in the chair.

On Saturday a visit of inspection was made to the naval base at Rosyth by permission of the Admiralty and Messrs. Easton, Gibb & Co. The visit was of much interest. The members returned to Dunfermline for lunch, and the afternoon was devoted to visits to the baths, gymnasium, and women's institute. The members were entertained to tea in Pittencrieff Glen by the Carnegie Dunfermline trustees.

(To be concluded.)

Owing to the small number of acceptances, the proposed Whitsuntide visit of the Institution of Municipal and County Engineers to Hamburg did not take place. We are also informed that the two days' meeting of the Irish District which it had been hoped to hold in Cork towards the end of July has been postponed, the time having proved inconvenient for most of the members of the district.

Institution of Civil Engineers.—The president, Mr. Anthony G. Lyster, and the council of the Institution of Civil Engineers will hold a conversazione at the institution on Thursday, July 2nd, from 8.30 to 11.30 o'clock.

Surrey Bridge Widening.—Surrey County Council on Tuesday decided to widen Windows Bridge at Long Ditton, one of the most dangerous places for motorists on the Portsmouth road. The cost is estimated at £2,500.

Coast Sand Dunes, Sand Spits, and Sand Wastes. (By Gerald O. Case. London: St. Bride's Press, Limited, 24 Bride-lane, E.C. 5s. nett.)—While a good deal of attention has been directed in recent years to the question of coast erosion, but little has been said of the changes made by the wind on sandy shores. . . . The subject is certainly of sufficient importance to deserve more attention than it has hitherto received, and in discussing the nature of the groynes, embankments, &c., as well as of the vegetation best suited to arrest the movements of sand, Mr. Case has made distinct progress towards the solution of a difficult problem.—*Journal of the Society of Arts.*

British Fire Prevention Committee.—Arrangements have been made for an extensive series of fire tests to be undertaken by the British Fire Prevention Committee in July; they will include tests with non-inflammable wood, with a fibrous partitioning material, with fire-resisting glazing, and with some petrol extinguishers. The committee will be issuing shortly some further reports in respect to tests and other work completed during the past few months. During the current month the British Fire Prevention Committee has made elaborate arrangements for showing some of the leading authorities of the Continent and the United States who are visiting England the progress made in this country in matters relating to fire research work and fire prevention generally.

Institution of Water Engineers.

SUMMER MEETING AT STOCKPORT: MR. THOMAS MOLYNEUX'S PRESIDENTIAL ADDRESS.

The nineteenth summer general meeting of the Institution of Water Engineers opened at Stockport yesterday, when Mr. Thomas Molyneux, Assoc.M. INST.C.E., corporation water engineer of that town, was formally installed as president of the institution in succession to Mr. C. Clemesha Smith, M. INST.C.E., water engineer to the corporation of Wakefield.

On taking the chair Mr. MOLYNEUX said he accepted the highest honour which they, as an institution, could confer upon him, with great diffidence, knowing, as he did, the responsibilities which devolved on the occupant of the presidential chair. While thanking them for the trust reposed in him, he felt sure that he would have the assistance of all the members during his term of office in keeping up the high standard it had attained in the hands of his predecessors.

Mr. Molyneux proceeded to state that he joined the old association in the first year of its existence, and, on looking back, he was struck with the great developments which had taken place both in its usefulness and its membership, and notably the *camaraderie* of its members, which had always been a feature of their meetings. The records of their work, as published in the "Transactions," were as practical as those of any kindred institution, and members had no doubt often received expressions to that effect from engineers who were not members. He would like to emphasise, particularly to the younger members and associate-members, that the council would welcome from them details of experience met with in the execution of their multifarious duties. Among the special subjects requiring further explanation and consideration was the use of steel pipes for waterworks purposes, and he was sure some of their members had had experience in this practice which would be of value to the institution, particularly in the light of present-day controversy.

As evidence of the steady progress of the institution the president mentioned that since 1904 the membership had grown from 300 to 422, last year's increase being 21. That, he observed, was all the more satisfactory in face of the increase of subscription, which a few of them thought might have an adverse effect, but which, on the contrary, appeared to have stimulated the growth of the institution, and, further, the council were using the powers which the members had given to them of electing candidates for membership with a full sense of their responsibility, and they might rest assured that any candidate accepted was well worthy of election in whatever class of membership he was placed. The increase of subscription had so far improved the financial position of the institution that a further sum had been invested, and there was still left a good working balance which would enable the council to give increased facilities and benefits to the members generally. The library had been thoroughly overhauled, and, by the weeding out of that which was useless, room had been made for standard works which were being purchased from time to time, as well as for a file of all the Acts of Parliament passed each year dealing with waterworks matters. The council hoped that members would take full advantage of the facilities offered for borrowing the books, pamphlets and Acts of Parliament in the library. With that in view, the catalogue had been thoroughly revised, extended and simplified, so that no difficulty would be experienced in selecting the books or pamphlets containing the information required.

A special committee of the council (the president continued) is still engaged on the standardisation of conditions of contract, and although the subject is one that requires very careful consideration and involves much labour, it is hoped that the report will be available at an early date. A committee has also under consideration the incidence of income tax as affecting waterworks undertakings, a subject which is, perhaps, more particularly interesting to those who are engineers of water companies, but which may also prove worthy of study by municipal water engineers. A third committee has been appointed to take into consideration the question of charges for domestic and trade supplies in the light of recent decisions in the Law Courts.

The members will be interested to know that the council have recently decided to publish the abstracts

of legal cases separately from the "Transactions" in future. Thus, in the new volume (XVIII.) just issued this item has been omitted, and members will shortly receive a reprint of all the abstracts already published together with more recent decisions, arranged in a convenient form for filing, and fully indexed to date. Arrangements will also be made by which members may purchase suitable lettered cases at cost price as soon as the bulk is sufficient to make a book of convenient size.

The institution has suffered the loss, by death, of five members during the year 1913. Among these special reference must be made to Mr. Simmelkjaer, who for some years occupied the position of hon. auditor, and to Mr. Easton Devonshire, than whom, I am sure, no one had the institution more at heart. Those who worked with him on the council will remember the whole-hearted manner in which he devoted himself to making the institution one of which any water engineer may be proud to belong. Those of you who joined our visits to Belgium and France will remember that it was entirely due to him that those visits were made possible and successful. I am therefore sure you will agree that in his untimely death the institution has lost a member whose services and personality will long be remembered with grateful appreciation and respect.

The position of hon. secretary, rendered vacant by the death of Mr. Devonshire, has, as you know, been filled by the appointment of Mr. Ashton Hill, a selection which cannot fail to give satisfaction to all, as it will secure the continued work and interest of a highly esteemed past-president.

I regret also to have to record the death of one of your past-presidents, which took place in March of this year. I refer to Mr. Griffith, of Leicester. In Mr. Griffith we have lost one who, until failing health prevented him, took a deep and lively interest in the institution and those who knew him personally will ever remember him with kindness and good feeling.

Having dealt with the more intimate matters concerning the institution, I propose now to occupy a short time in the relation of a few items of my personal experience as a water engineer.

THE WATERSHED OF THE RIVER MERSEY.

This corporation is, I believe, the latest, and may probably be the last, authority to utilise a fresh tributary of the river Mersey for water supply purposes. There are to-day no less than twenty-two water authorities dependent entirely or in part (as in the case of Manchester) on the head waters of this river. These authorities serve a population of 2,500,000, and have expended about £11,000,000 in storage reservoirs (combined capacity 12,465 million gallons), and in other works supplying upwards of 55,000,000 gallons of water daily for domestic and trade purposes, and in addition between 30,000,000 and 40,000,000 gallons per day as compensation water to the various streams, the waters of which are impounded. The total area of gathering grounds is something approaching 100 square miles, and there are also some 15 square miles utilised for the supply of canal reservoirs. Of the remaining gathering grounds some are occupied by towns or villages, and on others suitable sites for reservoirs are not available.

The watershed, which is on the westerly side of the Pennine Chain, and faces south-west, has a mean annual rainfall of about 45 in., and as the rock formations are for the most part impervious, the yields, as compared with the rainfall, are high, in some cases as much as 90 per cent of the rainfall flowing off individual gathering grounds, and 70 to 80 per cent being quite common.

I append, in the form of a diagram, the rainfall and percentage of yield on a large portion of this watershed as shown by actual rain and stream gauging. A period of ten consecutive-years has been plotted, each year commencing October and ending September, so as to allow of each year being divided into wet and dry seasons. The variation in the rainfall between the two seasons is surprisingly small, averaging only 1.4 in., but that of the proportionate yield varies from an average of 94 to 54 per cent.

This diagram illustrates the impermeability of the strata by the large yield in the winter months and

the apparent lack of effect of the heavy winter yields on those of the following summers, which vary almost solely according to the rainfall of the individual seasons, although the wet summers of the fourth, seventh and ninth years appear to have affected the yield of the following winters. The low yield of the summer months I attribute to evaporation and growing vegetation.

The reservoirs in the watershed are, in many cases, inadequate to provide for this variation, and were made intentionally so, as it was not considered advisable to store all the flood water, chiefly on account of the difficulty in rendering it fit for domestic use. It is a remarkable fact that in the early part of the year 1911, the last dry year in this part of the country, during the summer of which many of the water authorities had a difficulty in supplying the demands of their consumers, no less than 5,000 million gallons of water passed to waste owing to the reservoirs being full—that is to say, a quantity sufficient to have supplied the whole population with a further 13,000,000 gallons per day for a full year, or nearly 500,000 new consumers with 30 gallons per head per day for the same period.

These upland surface waters have, until comparatively recent times, been considered suitable for domestic use after sedimentation, without filtration, and the bulk of the water obtained from this water-

can be found, or existing reservoirs enlarged, it is not possible to greatly extend the available resources of our present watersheds, and so postpone that expensive alternative, the amalgamation of the constituent authorities, and the promotion of a scheme for bringing water from some distant source.

The equalisation of the flow from the river Mersey watershed has also a further special interest, as the Manchester Ship Canal is entirely dependent upon it. The problem of finding water for the increasing traffic in dry seasons would be minimised if more of the flood water were impounded.

MECHANICAL FILTRATION OF UPLAND WATERS.

As this subject was so ably and exhaustively dealt with by Mr. Dixon at the last winter meeting, and as I have described fully our installation at Kinder in my paper on the Stockport works, I propose only to refer to a few details which have not, I think, been dealt with previously.

Before mechanical filtration is taken up on a much larger scale, the design of the plant will, I suggest, have to receive further consideration. The unit commonly in use is 8 ft. in diameter, and capable of dealing with about 150,000 gallons of water per day, but there does not appear to be any reason, except mechanical difficulties which can undoubtedly be overcome, why the unit should not be much larger.

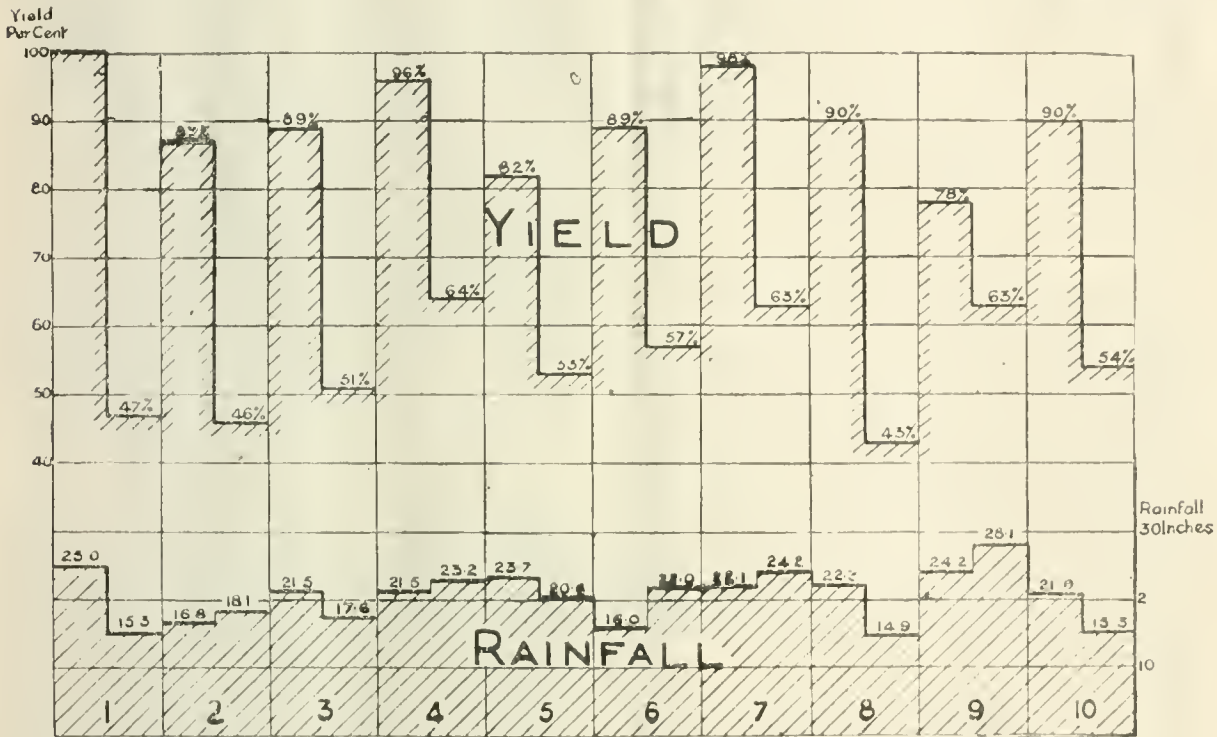


DIAGRAM SHOWING THE RELATION BETWEEN THE RAINFALL AND RUN-OFF IN THE MERSEY WATERSHED.

shed has been delivered to the consumer unfiltered. To-day, however, the consumer is not satisfied with unfiltered water, and many authorities have been compelled by force of public opinion, backed up by that of the analyst and of the medical profession, to undertake the filtration of their supplies. Indeed, I have little doubt that in the near future the whole of the water supplies drawn from this source will be filtered.

We, as water engineers, cannot but be grateful that the mechanical filter has made this possible, as the older method of sand filtration would not only have entailed very large capital expenditure, but it is doubtful whether the large area of land required could have been obtained; and, again, the result of sand filtration, although bacteriologically good, is not comparable either chemically or physically with that of mechanical filtration.

The results obtained by mechanical filtration with water considerably discoloured and carrying large quantities of suspended matter are such that it is well worth consideration whether the flood water which now has to be passed to waste, even in dry years, cannot be successfully treated and so rendered available for ordinary domestic use, and seeing that, where gravitation works have been designed to take only a portion of the flood water, the watersheds are not fully reservoired, I think it is worth while considering whether, with the aid of mechanical filtration, and assuming that satisfactory reservoir sites

There is already a plant in course of construction with units 9 ft. in diameter, and experience will show how far this can be extended on the present designs. The cleansing of the filtering material, and the period for which it has to be dormant after washing, are probably the two most important factors which will need consideration, but the reduction in the number of units will tend to both economy in construction and reduced expense in working.

In my opinion also mechanically filtered water would be further improved if, before being delivered to the consumer, it were passed into a service reservoir to allow a secondary deposition of matter in suspension, which no ordinary laboratory analysis shows, but which I think is undoubtedly present. The addition of the aluminiferous and lime to the raw water, the chemical action thereby involved, and the bacteriological and chemical changes produced by filtration, all take place so rapidly that I venture to suggest that the time allowed is insufficient for the completion of the various processes.

The analyses I have tabulated in my description of the Stockport works were obtained from samples of the water taken immediately it left the filters, yet deposition took place in the service reservoir into which the water flows, taking the form of a film on the bottom and on the lower portion of the walls. This reservoir had been in use eighteen months, and during that time 400 million gallons had been delivered through 6 miles of cast-iron pipes from the

filters, and the water had stood, on an average, twenty-four hours in the reservoir.

I regard the action as in some respects analogous to the deposition which takes place after softening and filtering, an action which carbonating has frequently been introduced to counteract. An alternative cause of the deposit may be the action of the treated water on the cast-iron pipes, which in some districts has had the effect of loosening the corrosion and causing serious disturbance of the water as delivered to the consumer for varying periods after the installation of mechanical filters. I am pleased to say that Prof. Delépine, of the Public Health Laboratory, Manchester, has undertaken to give us the results of his research in this connection.

The cost of mechanical filtration varies with the quality of the water, which determines the quantity of chemicals needed. In the case of the Kinder water, the cost during the last twelve months has averaged one-tenth of a penny per 1,000 gallons, including wages of attendants and cost of chemicals. The amount of water used in washing the filter works out at 1 per cent, but I consider that a certain proportion of this may be set off against that which would otherwise have been used to cleanse the mains.

It will also be interesting to observe the effect of mechanical filtration of water on the community at large. We all remember the controversy which at one time prevailed between advocates of hard and soft matter, and we also know the detrimental effects which the medical profession attribute to the lack of mineral matter in moorland waters, to the action of such water on lead, and to the discoloration due to peat, all of which disadvantages are removed by this process. It must therefore be shown, particularly in districts formerly supplied with unfiltered water, to what extent mechanical filtration, with its chemical treatment, acts as a physiological or pathological factor in the health of the community.

REINFORCED CONCRETE.

The use of reinforced concrete in the construction of covered reservoirs is an advantage, especially in regard to cost of construction. Although I have found that the cost of the concrete with reinforcement, when laid, is approximately the same as that of the bulk-concrete, brickwork or other similar material which would have been necessary, a great saving is effected in the reduced amount of excavation relative to a given capacity of the reservoir. Thus, in a reservoir 20 ft. deep, to hold 4,000,000 gallons, which I have constructed, the cubical contents of the structure, including water space, when reinforced concrete is used, is 28,000 cub. yds., as compared with 35,000 cub. yds. if constructed of brickwork or bulk-concrete, while the area covered by the reinforced concrete reservoir is from 15 to 20 per cent less than that covered by reservoirs of bulk concrete or other material.

The extra cost of reinforced work per cubic yard is not only due to the steel reinforcement, but to the extra care which has to be exercised in the selection of the material to be used and the placing of it in position, as watertightness depends not on several feet thickness, but on inches only. The aggregate must be of exceptional quality and of carefully selected size and shape (it must not be of larger size than $\frac{3}{4}$ in., and as near cubical as possible), the cement should not be less than one-seventh of the whole in bulk (not weight), and the timbering must be carried out by skilled carpenters, the ordinary timberman not being sufficiently trained. No doubt, in course of time, as the use of the material increases, the timberman will become educated to the work, and highly skilled carpenters will not be required. It is also to be anticipated that, as the reliability of reinforced concrete is proved by repeated examples, the period allowed by the Local Government Board for the repayment of loans will be extended. As so much depends on the quality of the work, I consider it advisable that it should be carried out by administration.

DISTRIBUTION.

The difficulties connected with the distribution of water are well illustrated in the Stockport area, where the levels vary from 120 ordnance datum to 600 ordnance datum, and the water has to be passed through the low-lying districts to the higher parts. A high and low level distribution would, therefore, be most complicated and costly. The service reservoirs from which the supplies are given are situated at 770 ordnance datum, 580 ordnance datum, 450 ordnance datum and 475 ordnance datum respectively. That at 475 ordnance datum belongs to the Manchester Corpora-

tion, and it is possible to confine it to the supply of one district; but the remaining four-fifths of the supply has to be, to some extent, interchangeable as regards its area of distribution. The trunk main between the two higher reservoirs is therefore charged with water at a pressure which would be excessive in the districts supplied by the lower reservoirs, but to enable the supply from the higher reservoirs to be utilised as required in the lower districts, the junctions of the two systems of mains are fitted with reducing valves, so that the pressure in the lower areas is maintained equal to the static head of the lower reservoir, and the losses by friction are thus counteracted.

In some high districts, on the low pressure supply, special provision for fire extinguishing is made by means of underground tanks. These are watertight brick structures placed under the footways in the proximity of large "risks" fed by direct connections with the water mains, particular care being taken that the mains used are low pressure, and therefore not connected with sprinkler installations.

The cost of distribution is constantly increasing, due, in a large measure, to improvements of road surfaces, such materials as tarred macadam, rock asphalt, granite setts grouted with cement, concrete beds, and even reinforced-concrete beds, involving excessive cost in opening and making good. In some cases I have found that the reinstatement of the road surfaces has cost as much as, and even more than, the providing and laying of the main. Another difficulty is the ever-increasing number of conduits in addition to water pipes—such as gas, electric light and power, telephones, telegraphs and hydraulic power and the fixing of standards for electric lighting and traction. The footways are thus becoming so crowded that when the road surface is of such a nature as to be practically inaccessible for laying pipes, &c., special provision will have to be made in future town planning schemes for much wider footways to accommodate the various pipes, cables, &c. At the same time the authorities, having power to lay such conduits, will have to agree upon some definite system for adjusting their positions relative to each other. This has already been done in the borough of Stockport as regards municipal supplies of water, gas and electricity, each being laid at certain fixed distances from the building line.

CHARGES FOR WATER SUPPLY.

Water is the cheapest commodity with which the public is provided. In the case of cottage property the amount paid is, approximately, only $\frac{3}{4}$ d. per inhabitant per week. In the case of a house rented at, say, £30 per annum, fitted with bath and water-closet, with the usual average of five inmates, the maximum amount paid per inhabitant is between 2d. and 3d. per week. In a house rented at £50, between 3d. and 4d. per week, and even in the highest-rented houses of, say, £200, only 6d. per week. Not only is the amount of water consumed per head increasing every year, but by the wider meaning given by the Courts of Law to the term "domestic supply," the income of the water authorities throughout the country is being gradually but materially reduced. The difficulty arises chiefly from the fact that the Acts of Parliament under which we work do not define what a "domestic supply" is, but almost invariably what it is not, so that any new demand which arises cannot, from force of circumstances, be in the exception, and is therefore liable to be ruled a "domestic supply." In regard to some recent decisions I cannot refrain from remarking that, when a consumer uses a "domestic supply" for the purposes of a profitable trade, he should surely be liable for something over and above the normal charge for a domestic supply.

It must not be forgotten that both municipal and company undertakings must charge sufficient for the water supplied to meet the actual cost of providing, purifying and distributing it. Therefore, any serious reduction in the income from one class of consumers (as, for example, the trade consumer) must be met by increased charges on the other class of consumers (in this case, the domestic consumer), and therefore adjustment of the charges should be based upon some equitable principle, and not be subject to the various decisions obtained in the Courts of Law.

CONSUMPTION OF WATER AND PREVENTION OF WASTE.

Experience in this district shows that the domestic consumption of water is between 20 and 21 gallons per head, and, as the whole of the district is sewered on the water-carriage system, this may be considered satisfactory.

Actual measurement shows that, in cottage property fitted with water closets, the consumption is from 8 to 9 gallons per head per day, and, with baths in addition, 13 to 14 gallons; in the highest-class property, where water is used for garden, horses and carriages, or motor cars and such-like purposes, 40 gallons per head is consumed, and in large institutions, such as industrial schools, the consumption is 30 gallons per head per day.

With the increasing cost of new works, owing to the gradual exhaustion of what may be termed local watersheds, the increasing cost of distribution and the gradual elimination of special charges, it becomes more necessary, year by year, to use constant vigilance in the matter of waste, and British engineers may well congratulate themselves that from 30 to 40 gallons per head per day is sufficient for all needs as compared with the quantities our *confrères* on the Continent and in America have to provide—viz., from 100 to 150 gallons per head per day. In this connection Stockport may claim some credit for having introduced the first device for tapping water mains without first emptying them of water, a device now in very general use.

The new Model Code of By-laws recently issued by the Local Government Board, in the framing of which your council (acting both in conjunction with the Joint Committee on Water Regulations and independently) took a prominent part, has improved our position in the restrictions which we can justifiably impose on the consumer in regard to waste and misuse of water, and I have hopes that, in the future, further headway may be made in this direction. Our members figure so largely on the Joint Committee on Water Regulations that I can confidently ask you to support the work of this organisation to the utmost.

WATER DIVINING.

The water engineer has always had a deep distrust of those who claim to accomplish by intuition that which he can only do with some degree of certainty after years of study and experience, and I think that the results of the experiments which took place in April of last year under the supervision of a scientific committee (which included two of our members) is worth recording. The committee say "that whatever sensitiveness to underground water may exist in certain persons, of which some evidence has been given, it is not sufficiently definite and trustworthy to be of much practical value."

This is a result which will surprise none of us, and should be convincing evidence that the engineer is the only one to be trusted in locating and securing a public water supply.

There are matters of extreme importance which I have refrained from referring to, such as the codification of existing Acts of Parliament, and the necessity for new legislation relating to water supplies; the appointment of a central authority to deal with the allocation and protection of sources of supply; the investigation of available sources of both upland and underground water, and many others; but they have already been ably put before you by my predecessors, and I have therefore advisedly restricted my remarks to my personal experience and opinions in the hope that they may be of some value.

In conclusion I trust that during my year of office the institution will continue to progress in the good work which it is undoubtedly carrying on, not only for our own benefit, but for that of the authorities we serve.

WATER ENGINEER'S NEW PRESIDENT.

Mr. Thomas Molyneux, ASSOC. M. INST. C. E., the author of the foregoing address, was from 1881 to 1893 an assistant in the waterworks engineer's office of the Manchester Corporation, under the late Mr. Jas. C. Eastham. In 1893 he was appointed assistant water engineer to the Stockport District Waterworks Company, and later engineer. In 1899 he was actively engaged in the sale of the undertaking to the Stockport Corporation, and on the completion of the purchase his services were engaged by the Stockport Corporation as engineer. The works Mr. Molyneux has carried out include the sinking of boreholes to provide a supply of 1,000,000 gallons of water per day, and the installation of a softening plant to deal with this water. In 1901 he took part in the promotion of the Act of Parliament by which Stockport was empowered to take water from the river Kinder, and has since carried out the works in connection with the distribution of the water provided by this scheme, which includes the construction of two reinforced reservoirs. A portrait of Mr. Molyneux accompanies this issue in the form of an inset.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act ii., 2.

THE MUNICIPAL AND COUNTY ENGINEERS' MEETINGS.

To the Editor of THE SURVEYOR.

SIR,—The "Municipal and Counties" seems to be quite rejuvenated, and perhaps it was never before doing such useful work as it is at present. The membership is, I understand, going up in leaps and bounds. Not the least incentive to membership is, no doubt, the opportunity afforded of increasing one's knowledge by the visits. These visits, like many sermons, have three points—the printed description of the engineer-in-charge, the inspection of the works, and, lastly, and most particularly, the discussion, which includes requests for elucidation of difficulties.

The printed description by the engineer-in-charge is generally above reproach, and often is far more useful than a text-book. The inspection of the works is generally excellently well done, and at the same time gives the opportunity of some hurried further explanation on the various sites. Would it not, however, be wise to cut out some of the unproductive sight-seeing which strikes one as being more for the purpose of showing what a nice town so-and-so is than for engineering help?

The discussion, indeed, has room for much improvement. There is never a dearth of speakers; often half those present would like to make a few comments and ask a few questions, but the whole thing is generally much rushed. There is no doubt that for real usefulness a lot of short speeches is productive of far more good than a few long-drawn-out speeches. Unfortunately, however, added to the briefness of the time allowed for discussion is the drawback of lengthy speech making. It is more than useful to hear the terse opinions of some engineers who put their knowledge freely at the disposal of the members present. The time has, however, come undoubtedly for a limit to be put on all speeches at these meetings, and this might with advantage be fixed at five minutes. If this were done there would be an opportunity of hearing twenty-four members in a couple of hours. It being understood that oratory was not desired, encouragement would be given to many members who, although of a retiring disposition, have interesting things to say, to get up and say a few straight words without feeling that they ought to be silent because they were either unknown men or lacked the gift of words. Perhaps my remarks may receive consideration by those having the welfare of the institution at heart. In conclusion I should like to say that, having a fairly good carrying voice, and a certain amount of decision, I can generally manage to find a way of saying what I want to at a meeting, so my suggestion is not a case of two for myself and one for someone else.—Yours, &c.,

DETritus.

June 8, 1914.

ROAD TARS.

To the Editor of THE SURVEYOR.

SIR,—Be assured that those readers of your journal who are engaged in highway engineering, as well as the manufacturers of road material, recognise the assistance you have given them by publishing such selected papers as have reference to the art of the road maker. Many students of this great subject, with a keen desire for information, have not the opportunity to seek out for themselves the invaluable information which you from time to time place at their disposal.

Especially will those concerned with the preparation of tar for roads appreciate your aid in having given them in the current issue of *THE SURVEYOR* Mr. Sharple's fine paper on "The Relation between the Melting-point and the Viscosity of Refined Tars." The author's visit to England when he came to Europe to attend the Road Congress at Paris left pleasant memories with those who had the pleasure of meeting him, and it is needless to say that anything from his pen on the subject of which he is such a master will be highly valued.

Your views, as expressed in the editorial notice of Mr. Sharple's paper of the important property of viscosity in tar cannot be too widely known. In his presidential address to the Southern District Association of Gas Engineers and Managers in March last, Mr. Glover remarked on the necessity for a

"standard of viscosity and adhering to that standard." The Road Board, in the new edition of "General Directions and Specifications," recognise the importance of viscosity, and explain in a concise and simple form the conditions under which a service test for that property should be made.

The efficiency of road tars depends upon the amount of binding power present in that degree which is requisite for the particular nature of the work in hand; to this broad statement I would add the words which come at the end of your editorial notice—"assuming that the material is stable under traffic and weather conditions."

In the "Market Report of Gas Products," *Journal of Gas Lighting, &c.*, June 2, 1914, appears the following, dated London, May 30th: "The supply of tar and pitch for road purposes continues to absorb the attention of manufacturers."

Those few words are full of meaning to those who remember the time when tar distillers and gas engineers were not disposed to regard the preparation of road tars as a prominent factor in their sales products.—Yours, &c.,

JOHN HUTCHINSON.

11 Tothill-street,
Westminster.
June 9, 1914.

ROAD TERMINOLOGY.

To the Editor of THE SURVEYOR.

Sir,—Please let me use your columns again to point out to "Engineer" that, as he has carefully avoided answering any of my questions contained in my letter of the 29th ult., I take it that they are unanswerable.

He repeats, but in no way substantiates, his remark that coal-tar products destroy the good properties of natural bitumen. He surely knows that thousands of tons of natural bitumen are used annually in conjunction with tar products for road making and maintenance!

I refuse to answer him when he asks if I have recommended or do recommend it—"Half a loaf is better than no bread."

He says he has "thirty years' personal experience in refining bitumen for road paving." I challenge him to prove it. I further challenge him to prove that he or any of his "authorities" have anything else but a very limited knowledge of the manipulation of natural bitumen for road work outside the laboratory. . . .

The fact that "Engineer" considers my questions "not in the best of taste" will explain fully the reason why he omits answering them. I think he has shown bad taste also by continually attacking the Standardisation Committee and members of the Road Board, who might find less difficulty in justifying their *bona fides* than would "Engineer."

When "Engineer" gives you the same right, you have my permission to publish my full name, address and credentials.—Yours, &c.,

NOT SO DUSTY.

June 9, 1914.

Town Planning in Salford.—Salford Corporation decided on Wednesday to make application to the Local Government Board for authority to prepare a town planning scheme over an area of about 2,000 acres, principally in the north and west of the borough.

The Cheapest Gas.—The Widnes Corporation Gas-works produce what is claimed to be the cheapest gas in the world, and at a meeting of the town council on Tuesday further reductions in price were announced. The rate for motive power is now as low as 8d. per 1,000.

Surveyors' Institution.—The president (Mr. Howard Chatfield Clarke) and the council of the Surveyors' Institution will hold a reception, by arrangement with the council of the Zoological Society, in the Gardens of the Society, on Friday, June 26, from 4 p.m. to 7 p.m.

Sewer Cleansing.—Brighouse Corporation Highways Committee have decided to purchase, after a very successful trial, a sewer plough and cleanser at a cost of £12 12s. The inventor, Mr. Jas. Caine, sewers inspector to the Eccles Corporation, recently sold the first pair to his corporation after a successful demonstration on a congested pipe main under the tramway track.

SOME RECENT PUBLICATIONS.*

TECHNICAL MECHANICS. By Edward R. Mamer. Price 10s. 6d. nett. London: Chapman & Hall, Limited.

The author of this work is Professor of Mechanics in the University of Wisconsin, and this the third edition embodies many changes made in the light of ten years' use of the book as a text in the author's classes. The scope of the work is rather unusual, being neither the ordinary theoretical mechanics on the one hand nor, on the other hand, covering the same ground as a text-book on applied mechanics. It is really a work on theoretical mechanics specially adapted to meet the requirements of students of engineering. For example, the first chapters on forces are followed by a chapter in which the principles enunciated are applied to simple structures and their graphical analysis. Subsequent chapters are devoted to a consideration of the laws of friction, centre of gravity, suspended cables, motion and work. Many solved numerical examples have been included to elucidate principles—a feature which will doubtless be appreciated by the student. There is also a good collection of problems to be solved by the reader.

THE DOCK AND HARBOUR ENGINEER'S REFERENCE BOOK. By Brysson Cunningham, B.E. Price 7s. 6d. nett. London: Charles Griffin & Co., Limited.

In this handbook the author has endeavoured to compile and arrange, in a convenient manner, notes primarily made for his own use, which will, however, be found of general utility. A useful feature of the volume is that sources are indicated whence fuller information on any given subject may be derived if the reader so desires. The scope of the work may best be indicated by the following list of sections into which it is divided: (i.) General administrative, nautical and physical data; (ii.) cost of dock and harbour systems; (iii.) harbour construction; (iv.) dock construction; (v.) quay and dock walls and wharves, and their equipment; (vi.) locks, graving docks and floating docks, and their equipment; (vii.) dredging and subaqueous rock removal; (viii.) maritime canals, channel rectification, channel demarcation, and coast defence. Each section is written in a practical way, and the many illustrations render the text very clear. A copious index facilitates reference.

STEAM TURBINES. By J. A. Moyer. Second Edition. Price 15s. nett. London: Chapman & Hall, Limited.

This book is intended as a manual of the theory and practice of the design, operation and manufacture of steam turbines, the author's object being to give within the compass of a single volume of reasonable size all the information which the student or practical engineer is likely to require. Starting with the elementary theory of heat, the author next deals with the more simple problems of nozzle design, steam turbine types, and blade design. Several commercial types are considered, and among the later chapters are those which deal with tests of turbines, steam turbine economics, gas turbines, and electric generators for turbines. Most of the additions in this new edition are concerned with new applications of existing commercial types. New chapters on bleeder or extraction turbines and mixed pressure turbines are included. Much of the other matter has been rewritten, and many new examples have been added, so as to render the book more serviceable than before as a text-book for students of the subject and practitioners.

PRACTICAL ILLUMINATION. By Justus Eck, M.A., M.I.E.E. Price 1s. nett. London: S. Rentell & Co., Limited.

The object of the author of this pocket-book, intended for engineers, contractors, and all interested in efficient illumination by electricity, has been to encourage the reader to study the subject more extensively by placing the elements of the matter before him in a simple and practical way. In addition to sections dealing with direct incandescent and arc lighting and indirect lighting, the work contains much other information regarding the installation and maintenance of lighting systems and many kindred matters. The book should prove useful both to the consumer and installer of electric light, particularly by helping them to solve the problems which confront them on a scientific basis.

*Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Why is it that the Leicester County Council decline to tar-paint the surface of their roads? Is it because the hunting interest is so strong, and there is a fear that this treatment of the road surfaces will cause them to be unduly slippery, or is it on account of the expense? Can nothing be done to these roads to keep down the dust which at the present season is excessive, and makes these roads almost impassable? What do the pedestrians say to it, and is not this excessive dust a menace to health?

Why cannot the Metropolitan omnibus companies manage their traffic a little better in the interests of the travelling public? Why should one often have to wait five or six minutes for an omnibus and then a whole flock of them arrive together? Why should they then appear to be in such a desperate hurry all to start together that they can hardly wait for their passengers to mount the vehicle? Would it not be much better in the interests of all concerned if they could be somewhat divided out into units?

What has become of the Barford and Perkins' three-axle road roller which was exhibited at the Exhibition last year in connection with the Third International Road Congress? Was it not claimed for this roller that it would diminish "the harmonic recurring waves or depressions" in the surface of a roadway treated by this roller? Has this roller, or one of similar type, been used anywhere, and, if so, with what results?

Is it a fact, as stated in the columns of THE SURVEYOR a short time ago by a correspondent, that street repairs in the larger provincial towns are better and more expeditiously effected than in the "Mighty Metropolis"? And if this is not a fact, why is it that no one has yet taken up the cudgels on behalf of the Metropolis to controvert this statement?

What has been the experience of concrete road beds, or strength crusts, reinforced with steel wire netting? Has sufficient time elapsed to state definitely whether the steel will rust and perish in such an exposed position, and what has been the experience with regard to cutting trenches in a roadway constructed in this manner? Subject to the replies to these questions proving satisfactory, must it not appear that this form of construction is on right scientific lines, and should meet some of the difficulties now encountered with road foundations?

Has not the time arrived for the serious consideration of the desirability of the formation of a Highway Engineers' Association, or some society of a similar nature, by which questions of road construction and maintenance only could be discussed? Or is it felt that there are already too many professional associations or institutions existing at the present time?

Is it a fact that the Permanent Committee of the International Road Congresses has recently passed a resolution to the effect that the papers submitted to the forthcoming congress at Munich must not be printed in any newspaper until a period of at least three months has elapsed after the congress? Will not this resolution stultify the object of these International Congresses—viz., the desire to give publicity to road questions—and prevent all newspapers reporting their proceedings? Is it too late to take steps to prevent this resolution being carried into effect? And what about the copyright laws of different nations?

Why is it that the Local Government Board allow the expenses of surveyors or members of councils attending, as delegates, the town planning conferences or meetings as a proper charge on the rates, whereas they refuse to allow such expenses for surveyors or delegates attending equally, if not more, useful conferences? Is it because the Local Government Board are anxious to boom the Town Planning Act more than any other sanitary Acts?

Why are there read at the Institution of Civil Engineers so few papers of interest to the municipal engineer, seeing that so large a number of members

of that institution are engineers or surveyors to local authorities?

When is the surface of a carriageway worn out, or at what stage of the wear is it necessary completely to repair or renew the surface? Who is the judge of this necessity? Is it the surveyor, his council, or the user of the road? Is not this question very largely one of opinion and description and amount of traffic? Is it not difficult, nay, almost impossible, to say at what exact date the road needs repairs?

Is it a fact, as is sometimes stated, that the dust from a road with an impervious surface is more detrimental to health than one that is of the ordinary water-bound construction? If this is so, does it arise from the fact that the organic moisture cannot be absorbed, or is it due to the "acid" dust which may generate on a road surface treated with some bituminous compound?

Can it not now be assumed that most of the objections to the monthly "Journal" of the Institution of Municipal and County Engineers have died down, and that the objectors, like the proverbial eels, have got used to it?

Has not sufficient time now elapsed since the introduction of the motor bus on our streets to be able to tell with some exactitude how far the indictment against this description of traffic is justified, and what is the exact measure of extra wear on the roads which has been caused in the Metropolis since this form of traffic was introduced? For instance, can it be shown that the wood pavements have been worn out much quicker since their use by motor buses, and, if so, what is the exact measure of wear?

How does the question of "security of tenure" now stand with regard to the municipal surveyor? Is it not possible that the present President of the Local Government Board may be more in sympathy with this movement than his predecessor in office? And could there not be some further efforts in this direction made by the Institution of Municipal and County Engineers?

When will the palatial new offices of the London County Council be finished? At the present rate of progression it looks as if these buildings will be ready for occupation by the grandchildren of the present members of the council, and then only if there are not too many strikes in the meantime.

What is the reason that, although in the United States of America they have a profound technical and theoretical knowledge of road construction and maintenance, we hear so many complaints of bad roads and streets in some of their larger centres? Is it because, as we sometimes hear, a considerable amount of the money voted for roads and streets is often diverted from its legitimate channels?

Is not the programme of the annual meeting of the Institution of Municipal and County Engineers at Cheltenham of a rather "severe" character? Are there not too many papers to be read and discussed, and too few excursions? How does the programme compare with former meetings of this institution at which some excellent and instructive excursions were arranged and carried out?

How long will it take the Massachusetts Highway Commission to convert their 7,200 miles of "dirt" roads into macadam roads, and how long did it take them to "treat with bitumen" the 1,200 miles of road surfaces out of the 20,000 miles which exist in the State? Is it surprising to hear that these "dirt" roads "are broken up by the frost for a few weeks in the Spring as they have not adequate foundations"? And what about the repair and maintenance of the remaining 12,800 miles of road? May we not consider ourselves fortunate that we have no county surveyors who have to grapple with such a problem, and that we have no "dirt" roads in this country?

May it not be taken as rather a "sign of the times" that the name of the candidate selected for the proposed appointment of engineering assistant to the county surveyor of Essex is to be submitted to the Road Board for their approval? Does not this rather point to the possibility of "State control" over our roads in the near future?

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

398. Road Construction.—Should the stones in a macadam road be all of one gauge, or are varying sizes preferable? Give reasons. (Junior.)

399. Fireproof Construction.—What fireproof preparations can be used for protecting timber, and what independent coverings may be applied for the same purpose? (S.A., 1905.)

402. Column Design.—A hollow cast-iron column is 9 in. in external diameter, its length is 12 ft., and its two ends are firmly built in. The compressive load it supports is 60 tons. What thickness must the metal be in order to have a factor of safety of 10? (T. R.)

403. Rain Gauge.—Describe, with sketches, a reliable form of rain gauge.

404. Collapsing Strength of Pipes.—What is the collapsing pressure in lbs. per square inch of a 3-in. cast-iron pipe, 12 ft. long, and of 1/4-in. thickness? Pressure on outside of pipe only. (H. V. A.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

400. Structures.—What is meant by a redundant member in a truss, and why are such members introduced? Sketch two simple trusses, each having at least one redundant member. (I.C.E.)

A frame, or truss, may, for the purposes of statics, be either incomplete, complete, or redundant. In the first case the truss is not properly formed into triangles, as in an ordinary queen-post truss, which, except for the rigidity of the joints at the ends of the queen-post, would obviously fail

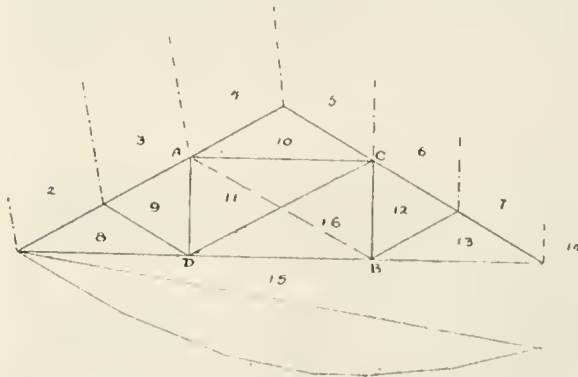


FIG. 1.

under an oblique thrust. A redundant frame, on the other hand, is one in which there are too many triangles, the truss being completely triangulated apart from the redundant members. Fig. 1 shows a cross-braced queen-post truss, the braces being of round iron, and therefore capable of supporting tensile stresses only. It will be found on drawing the stress diagram that it is impossible to take into account both the stresses AB and CD. If either is omitted the diagram works out quite naturally. It is obvious that if AB is in tension, CD is in compression, and vice versa, and the member in compression is the redundant one. It will be seen on referring to the stress diagram that under the thrusts shown AB is the redundant

member; but it is also clear that when the wind pressure is acting on the other slope of the roof.

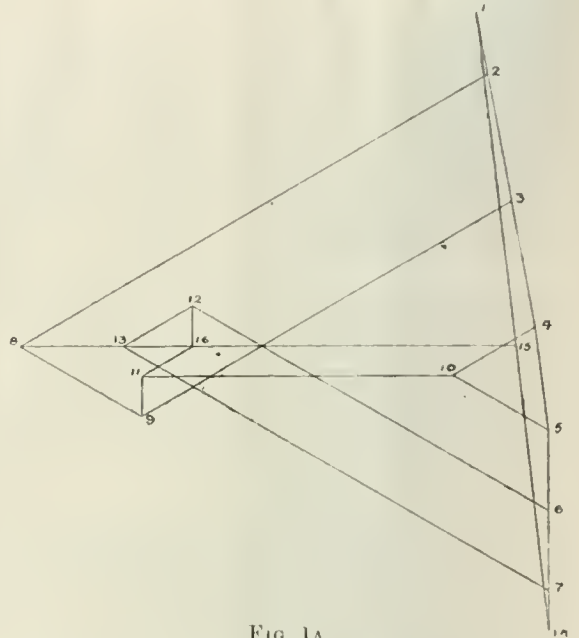
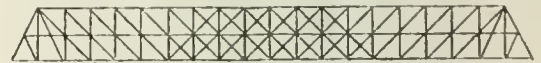


FIG. 1A.

the stresses in AB and CD are reversed, and CD becomes the superfluous member. It is this re-



Cincinnati Southern Railway Bridge
Central Span (510')

FIG. 2.

versal of the stresses due to the moving load that has to be provided against by introducing cross-

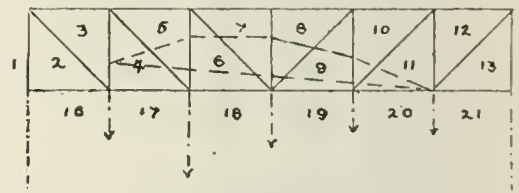


FIG. 3.

bracing; thus the central portions of the Cincinnati Southern Railway Bridge over the Ohio, for in-

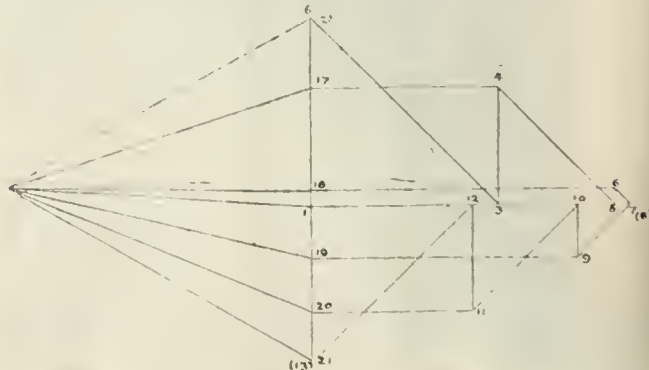


FIG. 3A.

stance, are cross-braced; while the ends of the spans are constructed as Whipple-Murphy girders

(Fig. 2). The trains in passing over the bridge cause a reversal of the stresses in the members near the centre of the span. Fig. 3 shows a girder supporting both a distributed and a concentrated load on the bottom flange. On referring to the stress diagram it is seen that the members 2-16, 7-8, and 13-21 are not stressed at all, as is obvious also from first principles, for three forces acting at a point cannot be in equilibrium if two of them are in a straight line. (F. W. P.)

401. Specific Gravity.—A bullet of lead, whose specific gravity is 11.4, weighs 1.09 oz. in air and 1 oz. in olive oil. Find the specific gravity of the olive oil.

Since the weight of bullet in air is 1.09 ozs.
and specific gravity of lead is... 11.4

∴ the weight of an equal volume of water is $\frac{1.09}{11.4} = .0956$ ozs.

Again the weight of bullet in air is 1.09 ozs.
and the weight of bullet in olive oil is 1.00 "
then the weight of an equal volume of olive oil is .09 "

∴ the specific gravity of the sample of olive oil is $\frac{.09}{.0956} = .941$

(H. G. L.)

The specific gravity of a substance is a number merely, being the ratio

$$\frac{\text{Mass of a given volume of the substance.}}{\text{Mass of an equal volume of water.}}$$

In the case of the olive oil, call this ratio S.

Weight of bullet in air is 1.09 oz., and its specific gravity referred to water is 11.4.

Hence weight of an equal volume of water is $\frac{1.09}{11.4}$ oz., and weight of an equal volume of oil is $\frac{1.09 \times S}{11.4}$ oz.

When the bullet is lowered into the oil (Fig. 1), the forces acting on the bullet are:—

- (1) Its weight acting downwards (W).
- (2) The tension in the string from the balance

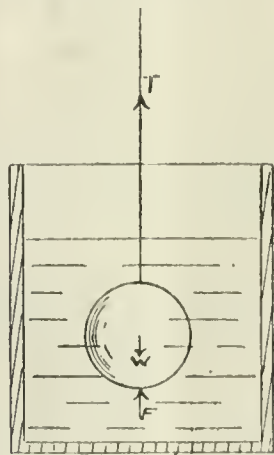


FIG. 1.

(T) acting upwards and measuring the apparent weight—1 oz.

(3) The buoyancy (F) acting upwards, being equal to the weight of oil displaced.

(4) The thrusts of the liquid on the surface of the bullet, these thrusts counteract one another, their algebraic sum being zero.

Equating the first three forces we have—

$$T + F = W$$

$$\text{i.e., } 1 + \frac{1.09 \times S}{11.4} = 1.09$$

$$\frac{S}{11.4} = \frac{1.09 - 1}{1.09} = .941$$

If the oil had been quite pure, and the observations more exact, our answer would have been about .915. There are two or three corrections to apply to the result on account of the buoyancy of the air, &c., but these would only affect the third decimal place, and that very slightly. (F. W. P.)

CONCRETE INSTITUTE.

ANNUAL MEETING AND DINNER.

The fifth annual general meeting of the Concrete Institute was held on Thursday, May 28th, when Prof. Henry Adams, M.INST.C.E., M.I.MECH.E., F.S.I., F.R.SAN.I., was installed as president for the ensuing two years of office.

The fourth annual dinner of the institute was held in the Crown Room, Connaught Rooms, in the evening, the president occupying the chair, among others present being Mr Horace L. P. Boot, M.I.MECH.E., M.I.E.E., president of the Institution of Municipal Engineers; Mr. C. McArthur Butler, F.C.I.S., secretary of the Society of Architects; Mr. Thomas J. Carless, M.C.I., president of the Quantity Surveyors' Association; the Hon. Sir John Cockburn, K.C.M.G., M.D., late Premier of South Australia; Mr. H. Kempton Dyson, secretary of the Concrete Institute; Mr. J. Ernest Franck, A.R.I.B.A., M.C.I., member of council and hon. secretary of the Parliamentary Standing Committee of the Concrete Institute, Mr. W. Curtis Green, F.R.I.B.A., president of the Architectural Association; Mr. George Hubbard, F.S.A., vice-president of the Royal Institute of British Architects; Mr. Ellis Marsland, M.S.A., district surveyor for Camberwell, president of the District Surveyors' Association; Mr. John Murray, F.R.I.B.A., Crown surveyor; Mr. F. W. Rice, president of the Institute of Builders; Mr. Leslie S. Robertson, M.INST.C.E., secretary of the Engineering Standards Committee; Mr Alexander Ross, past-vice-president of the Concrete Institute, vice-president of the Institution of Civil Engineers; Mr. H. D. Searles-Wood, F.R.I.B.A., vice-president of the Concrete Institute; Sir Henry Tanner, C.B., I.S.O., F.R.I.B.A., F.S.I., past-president of the Concrete Institute.

Mr. ELLIS MARSLAND, M.S.A., district surveyor for Camberwell, president of the District Surveyors' Association, in proposing the toast of "The Concrete Institute," offered his congratulations on the fact that the institute had, in the short space of six years, attained a membership exceeding 1,000. The institute had evolved order out of chaos, had standardised and regulated the whole system of concrete construction, so as to make it practical and workable.

The PRESIDENT, in replying, said the Concrete Institute had come in on a flood tide, and its immediate success was almost phenomenal. The meetings were crowded, and the copies of the papers were eagerly sought after; then, unfortunately, there was an ebb—the attendance fell off because it was found that in concrete alone there was not sufficient scope. The council, in considering the matter, came to the conclusion that some development was wanted, and he thought they wisely decided to admit papers on structural steelwork where no concrete was employed, or only employed in a secondary manner. The result was that the interest in the meetings was revived, and the attendance went up again with a bound. The council then fully considered the whole position, and came to the conclusion that some amplification of the title was desirable, and added a sub-title—"An Institute for Structural Engineers, Architects, &c." Structural engineering was the one term that best expressed the variety of work of which the institute took cognisance. But that did not mean structural steelwork alone; it included all kinds of buildings, and all materials where stability was the chief aim. It excluded architecture, town planning, railway and tramway work, sewerage work, waterworks, and mechanical engineering of all kinds. For some time past the council had been preparing a scheme of examinations. The intention was that the graduates and associate-members should be able to obtain certificates testifying to their knowledge of the various branches that came under the domain of the structural engineer and architect. At present the examination would be entirely voluntary; but there was no doubt that the time might come when the question of making them compulsory would be considered. The policy of holding examinations had been questioned in some quarters, but an examination certificate was the best form of testimonial, and with so large a proportion of young men among their members the opportunity of obtaining a certificate should be of great assistance.

Mr. H. D. SEARLES-WOOD, F.R.I.B.A., proposed the toast of "The Visitors," and Sir JOHN COCKBURN responded.

Mr. E. FINDER ETHELLES, F.PHYS.SOC., A.M.I.MECH.E., HON. A.R.I.B.A., M.C.I., proposed the health of the chairman, the PRESIDENT briefly responding.

Royal Institute of British Architects.—Mr. Ernest Newton, A.R.A., has been elected president of this body.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

EXTRAORDINARY TRAFFIC.—In *Worsborough Urban District Council v. Barnsley British Co-operative Society, Limited* (Court of Appeal, May 20th and 21st) the society appealed from the decision of Mr. Justice Rowlatt. For some time prior to the year 1904 the society had sent out to their various branches in the neighbourhood of Barnsley traction engines laden with goods along a main road which was suitable to bear such traffic. In that year, however, tramways were laid down in the main road, and the society then began to use a country lane, the only alternative route available. The council having remonstrated with them for so doing, they returned to the main road, and continued to use it till 1909. In that year the main road was paved with granite, which, as the society alleged, rendered it dangerous for their purposes. They accordingly from that time used the lane, which, being unsuitable for traction traffic, was thereby damaged. On behalf of the society it was contended that, in deciding whether there had been extraordinary traffic, it was material to consider (a) the motive of the persons conducting the traffic, (b) whether there is or is not an alternative route, (c) whether a road previously used has been rendered impossible to use by the action of the highway authority. Mr. Justice Rowlatt, however, held that these considerations were not material, but that the Court had simply to look at the phenomena as they occurred on the road in question, to see the nature of the road, and to decide whether the traffic was extraordinary; and he gave judgment in favour of the council. The Court of Appeal affirmed this decision. The Lord Chief Justice, without deciding whether the fact that a road is not adapted to particular traffic is conclusive that the traffic is extraordinary, held that the traffic was extraordinary, and that the road in question was not adapted to the traffic. Lord Justice Phillimore held that traffic remained extraordinary until the road was made fit to bear it. Mr. Justice Lush held that, the alleged fact that the society had been forced off the main road was immaterial, the question being whether the traffic in fact was extraordinary. The appeal was accordingly dismissed.

PRIVATE STREET WORKS: CHARGE ON PREMISES.—An important point as to the statutory charge upon premises for expenses of private street works was decided in *Croydon Rural District Council v. Betts* (Chancery Division, Mr. Justice Warrington, March 18th). The defendant was the owner of several houses and plots of building land abutting on two roads within the Croydon Rural District which had been made up by the council under sec. 150 of the Public Health Act, 1875. The expenses were apportioned in the usual way, and demand was made for payment. Default having been made in payment, the council applied to the Court for a declaration that under sec. 257 of the Act they were entitled to a general charge upon all the defendant's properties in both roads for the aggregate amount of the expenses apportioned in respect thereof. On behalf of the defendant, it was contended that the council were entitled only to a separate charge on each individual house or plot separately in respect of the sum apportioned thereon. Mr. Justice Warrington accepted this view. He said that the charge given by sec. 257 was a charge, not on the interest of the owner, but on the property itself. Hence it was only rational to hold that the Legislature intended that there should be a separate charge in respect of each separate plot; otherwise the charge could not be worked. It would be extremely unfair to the mortgagee of a small piece of land to have his security charged with a large sum in respect of other property of the mortgager. Sec. 257 confirmed that view. The charge was to be a charge on the premises in respect of which the expenses were incurred. The provisions for apportioning the expenses showed that the Legislature regarded the premises in respect of which the expenses were incurred as separate premises, and treated the expenses incurred as incurred in respect of these separate

premises. Hence the expenses were to be apportioned in respect of each separate piece of land fronting on the road, and the charge should be in respect of each separate piece of land.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as *noms de plume*. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

HIGHWAY: BOUNDARY.—"Boundary" writes: Kindly advise me on the following points: (1) Is the centre of the growth of a hedge adjoining a highway the limit to which an owner may build a wall, always providing the public have an uninterrupted right over the whole of the road up to the toe of the bank? (2) or can the owner build a wall out to the toe of the bank? My council have had no difficulty in enforcing the former; now an owner claims a right to erect a wall 2 ft. or 3 ft. outside the growth of the hedge.

"The presumption of law where a highway is separated from adjoining land by a bank is that the whole of the bank is upon the adjoining land, and that the highway extends only to the foot of the bank" (Copnall's "Law Relating to Highways," 2nd edition, page 52). No authority is cited for this statement, however, and it appears to be intended to refer only to cases in which the bank is the only boundary, and therefore not to apply to the present case, where there is a hedge on the top of the bank. The ordinary presumption of law is that where there is a highway between fences the highway extends up to the fences on both sides. But this presumption may be rebutted by the nature of the ground or other circumstances (Pratt and Mackenzie's "Law of Highways," 15th edition, page 41). Assuming that there is nothing to rebut the presumption in the present case, the highway would, in my opinion, extend to the centre of the hedge, and the landowner could not build beyond that point.

SUBSCRIPTIONS TO INSTITUTION.—"F. H." writes: What is the position of a member of an institution who has discontinued paying his subscriptions for several years, during which period he has attended no meetings or otherwise acted as a member, being under the impression that his membership lapsed at the expiration of the year for which he last paid a subscription? Is he legally liable to pay subsequent subscriptions?

With respect to institutions to which the Literary and Scientific Institutions Act, 1854, applies, sec. 25 of that Act provides that any member who is in arrear with his subscriptions according to the rules of the institution may be sued. The Act applies to every institution "for the time being established for the promotion of science, literature, or the fine arts, for adult instruction, the diffusion of useful knowledge, the foundation or maintenance of libraries or reading-rooms for general use among the members or open to the public, or public museums and galleries of paintings and other works of art, collections of natural history, mechanical and philosophical inventions, instruments, or designs." By sec. 24, the governing body of such an institution is empowered to make by-laws. These by-laws usually contain provisions as to (*inter alia*) the method of election of members, the amount of the annual subscription, the notice to be given by members wishing to resign, the expulsion of members, &c. In my opinion, a member of such an institution who has not given the prescribed notice of resignation continues liable to pay his annual subscriptions until he gives such notice or is expelled. In some institutions every candidate for election has to sign a written agreement to be bound by the by-laws, but I think such an agreement would be implied even if not put into writing. The position is for all practical purposes the same with respect to institutions which are not within the Act, the rules of the institution representing the terms of the contract entered into between the members.

BUILDING BY-LAWS: EXEMPTION.—"J. D. K." writes: Any building in His Majesty's possession, or employed or intended to be employed for His Majesty's use or service, is exempt from the operation of by-laws relating to new buildings. Our by-laws require a duplicate system of drainage for buildings, one set of drains for sewage only, and one for surface water only, to be provided. Seeing that our town sewers were designed on the separate system, taking advantage of the exemption would place us in an awkward position. Is not the Crown impliedly bound by the by-laws?

It is a general rule that the Crown is not bound by an Act of Parliament except so far as the Crown is mentioned

The Surveyor

And Municipal and County Engineer.

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therein (Glen's "Law of Public Health," 13th edition, page 943). The by-laws being made in exercise of powers conferred by sec. 157 of the Public Health Act, 1875, which does not mention the Crown, they would not, in my opinion, bind the Crown. And even if they did, the exemption clause would prevent them from being applicable to buildings in possession of his Majesty or employed for his use or service.

CROSSING OVER FOOTWAY IN NEW STREET.—"C. G. L." writes: Will you be good enough to state whether sec. 18 of the Public Health Acts Amendment Act, 1907, applies to any person laying out a new street involving passage for building and other materials across a kerbed footway?

As pointed out in "Lumley's Public Health Acts" (7th edition), page 1175, the meaning of this section is not clear. The owner of premises abutting on a highway has a common law right of access to that highway, and apparently, if he owns half the width of the roadway he can open a cartway across the footpath, so long as there is no unreasonable interference with the public rights. Whatever may be the effect of the section, however, it only applies to a street which has become repairable by the inhabitants at large, and which has a kerbed or paved footway. It would not apply to a new street until that street became repairable by the inhabitants at large.

Business Announcement.—Mr. W. E. Horsman, 127 Pendle-road, Streatham, London, S.W., informs us that, after having been for over thirty years with Messrs. George Waller & Son, he has now commenced business on his own account, and will in future trade under the style of W. E. Horsman & Son.

Housing at Warrington.—It has been decided by the Warrington Town Council to send a deputation to London to consult the Local Government Board on the Housing and Town Planning Act. It has also been decided to give notice that persons erecting houses in excess of twenty to the acre, pending the adoption of a scheme, would do so at their own risk.

A Chair of Town Planning.—The Senate of London University are instituting a part-time Chair of Town Planning, tenable at University College, at a salary of £400 a year. The professor will act in co-operation with the Professor of Architecture and the Chadwick Professor of Municipal Engineering, who deals with the engineering aspects of town planning.

Manchester and Electricity Production.—The Manchester City Corporation on Wednesday agreed to a recommendation of the Electricity Committee that its chairman, deputy chairman, and engineer should be authorised to visit Paris, Berlin, New York, Schenectady, Philadelphia, Pittsburg, Chicago, and Montreal, to inquire into (a) the most modern practice in regard to the design and equipment of large generating stations for economical production, and (b) the lay-out of modern extra high-voltage transmission systems.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Birkenhead T.C. (June 3rd. Mr. M. K. North).—£1,350 for the widening of Borough-road.—It is proposed to increase the width of the road at the part dealt with in the application from 18 ft. to 60 ft., and for this purpose it is necessary to purchase a strip of land. The proposed loan would cover the cost of the land and the necessary works.

Brackley T.C. (May 22nd. Mr. H. S. Stewart).—£2,200 for a scheme under Part III. of the Working Classes Act, 1890, for the provision of twelve houses.—The borough surveyor, Mr. A. A. Green, stated that there were no cases of overcrowding at present, but there were ten or twelve houses that should be closed. It was proposed to let the cottages at 4s. 8d. per week.

Evesham T.C. (June 9th. Mr. H. S. Bidwell).—£1,800 for the purchase of land as a site for working-class dwellings to be erected under Part III. of the Housing of the Working Classes Act, 1890.—The surveyor and sanitary inspector, Mr. H. S. Harvey, stated that there was considerable overcrowding in eighty-four dwellings. No dwellings under £13 per annum rent had been erected during the past five years. People were living under conditions detrimental to health and morals, and nothing could be done, for if they were turned out there was no place for them to go to. There was overcrowding all over the borough. The site, when fully developed, would accommodate 150 cottages.

Norwich T.C. (June 3rd. Mr. A. G. Drury).—£12,800 for the extension of the municipal offices on the site of the old fish market.—A statement in support of the scheme was made by the town clerk, Mr. A. H. Miller, and the city engineer, Mr. A. E. Collins, submitted the plans and explained them in detail. It was not disputed by the opposition that the existing municipal buildings were inadequate.

Penrith U.D.C. (June 4th. Mr. R. H. Bicknell).—£7,000 for gasworks improvements and extensions.—Part of the scheme is for the installation of mechanical stokers, which it was claimed would increase the make of gas by 500 ft. per ton of coal, and save £400 a year in labour.

Ramsbottom U.D.C. (June 2nd. Mr. R. H. Bicknell).—£1,450 for the widening and improvement of Bolton-street.—It was stated that the widening of the road would mean the removing of a bend, and would facilitate and protect the traffic along the road.

Hastings T.C. (June 9th. Mr. P. M. Crosthwaite).—£362 for the enlargement of a public convenience at White Rock; £3,755 for works of sea defence; and £640 for works of sewerage in Silverhall Park.—The town clerk stated that the corporation were constructing a sea wall at a point eastward of the town. The work had already been commenced, because during the gales in March last a large hole was made in the present wall by the waves. They had received many complaints from residents in the vicinity regarding the flooding of their premises, and the corporation were constructing a new wall in such a manner as would permit of the minimum of sea to wash over in the future. In addition to the new wall a great improvement would be effected to the roadway, which was probably narrower there than at any other portion of the parade. There would be a widening of nearly 12 ft., and general approval had been expressed in regard to the scheme. Statements were also made with respect to the other proposed works.

Salford T.C. (June 10th. Mr. T. C. Ekin).—£13,500 for the purpose of the electricity undertaking, and £70,000 for the gas undertaking.—The deputy town clerk, Mr. S. Carnt, stated, with respect to the first application, that it became necessary owing to an agreement arrived at between the Salford Corporation and the Manchester Ship Canal Company, by which the corporation agreed to supply electrical energy for the No. 9 Dock, which was within the borough's area of supply. In regard to the second application, Mr. Carnt stated that £7,100 was required for the erection of boundary walls in connection with the Liverpool-street gasworks. The board had previously sanctioned the expenditure of £2,000 for this purpose, and the corporation now asked for

that sanction to be cancelled, as since it was applied for they had bought additional land and would require a larger sum. For general prospective requirements the board had given their sanction to borrow £27,000, so that their application now was virtually only for £43,000. Of this it was intended that £42,000 should be spent in gas cookers, for which there was a large demand in the borough at present, meters, and the laying and maintenance of mains.

Southgate U.D.C. (May 26th. Mr. F. H. Tulloch).—£1,150 for the provision of an open space. The surveyor, Mr. C. G. Lawson, informed the inspector that the land to be acquired was about 2½ acres in extent.

Winchcombe R.D.C. (June 9th. Mr. H. S. Bidwell).—£1,150 for a housing scheme for the village of Alderton. It was explained that the council proposed to build six cottages and to purchase an acre of land for £100. It was intended to charge a maximum rent of 4s. a week, and if possible the rent would be less.

Yarmouth T.C. (June 2nd. Mr. A. G. Drury).—£1,300 for the construction of quay heading in the river Bure for the protection of the North River-road. The borough surveyor, Mr. J. W. Cockrill, said the work was necessary to keep in place and maintain the road. By the proposed work the road would be increased in width slightly. He believed Jarrah was the best wood to use, and well worth the extra cost. He had used Jarrah for river works about eighteen years, and there were no signs of decay.

APPLICATIONS FOR LOANS.

Arundel T.C.—£2,200 for the erection of ten five-roomed cottages, including street works and fencing.

Barnet U.D.C.—£8,000 for a housing scheme.

Carlisle R.D.C.—£60,000 for a water supply scheme.

Chester T.C.—£2,910 for street widening.

Chester-le-Street U.D.C.—£2,600 for the purchase of land for housing purposes.

Chesterton R.D.C.—£650 for the erection of four cottages.

Chorley T.C.—£3,963 for street improvement.

Cleckheaton U.D.C.—£1,700 for the purposes of the destructor.

Darlington T.C.—£41,000 for sewage disposal works and sewerage.

Dewsbury T.C.—£400 for road widening.

Docking R.D.C.—£1,000 for the erection of workmen's dwellings.

East Dereham U.D.C.—£312 for works of water supply.

Epsom R.D.C.—£850 for street works.

Hereford T.C.—£530 for an increased water supply at the electricity works.

Newcastle-upon-Tyne T.C.—£2,075 for work at the Ouseburn culvert.

Seaford U.D.C.—£1,000 for the purchase of land for a pleasure ground.

Sevenoaks R.D.C.—£2,000 for workmen's cottages.

Staines R.D.C.—£29,046 for a sewage disposal scheme.

Stroud U.D.C.—£1,650 for stables and the extension of the baths.

Swindon T.C.—£7,075 for school buildings, and £7,000 for electricity plant.

Tralee U.D.C.—£8,185 for the erection of thirty-nine cottages.

Wallasey T.C.—£11,912 for a housing scheme.

Walton-upon-Thames U.D.C.—£1,450 for the purchase of land for a recreation ground.

Westhamnett R.D.C.—£12,500 for a sewerage scheme for Selsey.

Wigan T.C.—£6,000 for new gas mains and services.

Worcester T.C.—£5,250 to cover expenditure during the next three years on electricity mains and transformers.

Yarmouth T.C.—£11,550 for a school at Newtown.

LOANS SANCTIONED.

Bath T.C.—£600 for an improvement scheme.

Bridlington T.C.—£1,300 for a widening scheme.

Camborne U.D.C.—£25,000 for a sewerage scheme.

Darwen T.C.—£5,000 for the installation of the water-carriage system.

Hove T.C.—£10,000 for the widening and improvement of Hove-street, repayable as follows: £6,120

repayable in sixty years; £3,022 repayable in twenty years; £858 repayable in thirty years.

Linthwaite U.D.C.—£1,200 for streets and sewers.

Merton and Morden U.D.C.—£3,130 for a recreation ground.

Norton U.D.C.—£119 for the Leavening water supply works.

Rathdrum U.D.C.—£2,700 for the housing scheme.

Sefton R.D.C.—£2,200 for sewage disposal and sewerage.

Shoreham U.D.C.—£200 for the extension of the town hall.

Walton-upon-Thames U.D.C.—£1,600 for sewer extension.

FORTHCOMING INQUIRIES.

	JUNE.	£
15. Hendon. For street improvement (Mr. F. H. Tulloch)		5,234
15. Luton. For the extension of the refuse destructor (Mr. R. H. Bicknell) ...		4,500
15.— Paddington. For the erection of baths and washhouses (Mr. A. G. Drury) ...		48,069
16.— Berkhampstead. For works of sewage disposal (Mr. A. G. Drury) ...		3,000
16.— Gateshead. For the provision of a refuse staith (Mr. A. W. Brightmore) ...		23,000
16.— Honley. For the purposes of municipal offices and bridge widening (Major J. Stewart)		3,300
16.— Valley. For a housing scheme (Mr. Edward Leonard)		236
16.— Warwick. For the purpose of municipal offices (Mr. R. H. Bicknell)		—
17.— Carshalton. For the purposes of a park and public conveniences (Mr. R. H. Bicknell)		1,100
17.— Gwyrfa. For a housing scheme (Mr. Edward Leonard)		6,760
17.— Manchester. For the purposes of a tramway shelter and conveniences (Major J. Stewart)		—
17.— Stanley. For works of sewerage (Mr. R. G. Hetherington)		14,000
17.— Worcester. For sewage works extension (Mr. T. C. Ekin)		650
18.— Blackpool. For private street improvement (Major J. Stewart)		6,846
18.— Bradford. For the purposes of a recreation ground, library, and cottage baths (Mr. W. O. E. Meade-King)		7,395
18.— Kiveton Park. For works of sewage disposal (Mr. R. G. Hetherington) ...		4,300
18.— Walsall. For the electricity undertaking (Mr. T. C. Ekin)		74,850
19.— Buxton. For street improvement (Mr. W. O. E. Meade-King)		1,750
19.— Doncaster. For works of sewage disposal (Mr. R. G. Hetherington) ...		4,000
23. Epsom. For works of water supply (Mr. A. G. Drury)		12,260

TOWN PLANNING.

30.—**Southend.** (Mr. George L. Pepler)

An Important Canadian Contract.—The authorities of the city of Toronto have accepted the joint tender of the John verMehr Engineering Company, Limited, as engineers, and Wm. Cowlin & Son (Canada), Limited, as contractors, for the new mechanical filtration plant at Toronto Island. The Ransome-verMehr Machinery Company, Limited, London, is the head office of the John verMehr Engineering Company, Limited, Toronto, and Wm. Cowlin & Son (Canada), Limited, is a branch office of Wm. Cowlin & Son, of Bristol. The work to be done, in addition to the pressure filtration plant (embodying Ransome continuous filters), includes the erection of filter-house building, pumping station building, suction well building, chemical storage and mixing house, coal storage building, wash-water tank, chimney and wharf. It is believed to be the largest single order ever placed for an installation of this description, the filters themselves being required to treat 60,000,000 imperial gallons of water per day of twenty-four hours, the total contract price being, approximately, £220,000.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Middlesex £58,000, Somerset; housing and town planning—Finchley £93,443; roads and materials—Limerick £34,251, Wanstead £50,000; sewerage and sewage disposal—Fleet £36,400, Larne £12,750, Westhampnett £12,500; water, gas and electricity—Carlisle £60,000. Particulars of other projected works will be found in our "Local Government Board Inquiries" pages.

ADMINISTRATION.

Chichester T.C.—Acting upon a report by the Highways Committee, it has been decided to separate the offices of surveyor and inspector of nuisances, that Mr. E. J. Lobley continue to be paid £250 a year for acting as surveyor alone, that Mr. Nash be appointed inspector of nuisances (to include the work of housing inspector) for one year, and so on, to devote the whole of his time to the work, and be paid a salary of £130 per annum, and that the surveyor's temporary assistant be dispensed with.

BUILDINGS.

Bideford R.D.C.—For the erection of ten workmen's cottages, a series of tenders amounting to a total of £2,025 have been accepted.

Brixham U.D.C.—The surveyor, Mr. J. Silley, has been instructed to prepare alternative plans and estimates for the erection of a pavilion or shelter on Furzeham recreation ground.

Burnham (Somerset) U.D.C.—It has been agreed to fit up part of the old fire station as a mortuary.

Middlesex C.C.—It has been decided to erect at Eastwood, in compliance with the provisions of the National Insurance Act, a sanatorium at a cost of £58,000, to accommodate 280 consumptive patients.

Somerset C.C.—The Local Government Board have intimated their approval of the council's scheme for a county sanatorium upon a site at King's Castle, near Wells.

Southmolton R.D.C.—Plans of a proposed new bridge at Drayford have been passed by the council, and forwarded to the county council, the latter authority having sanctioned a contribution of £1,000 towards the cost of the structure.

Uckfield U.D.C.—The Sanitary Committee have been authorised to obtain the necessary particulars as to the cost of a proposed municipal slaughterhouse.

Wallasey T.C.—The council on Tuesday accepted the contracts of Messrs. Hughes & Stirling, Liverpool, at £11,437 for the new electricity buildings; of Messrs. Ferranti, Limited, London, at £1,304, for the transformers; and of M. Louis Prat, London, at £1,084, for three steel chimneys.

Whitby U.D.C.—Plans are being invited for a shelter at the Spa, at a cost not exceeding £1,000.

HOUSING AND TOWN PLANNING.

Alnwick U.D.C.—The surveyor, Mr. Geoffrey Wilson, has received instructions to prepare plans for cottages with two bedrooms in No. 2 area.

Arundel T.C.—The tender of Mr. Sydney Payne, of Southwick, at £1,914, has been accepted for the erection of ten five-roomed cottages. The Works Committee, in submitting the recommendation, stated that they would much have preferred to have six-roomed cottages, but they were unable to decide upon that owing to the high price of building materials.

Aylsham R.D.C.—It has been decided to build six workmen's cottages.

Bridgnorth T.C.—The council on Tuesday decided to submit to the Local Government Board for their approval plans prepared by the borough surveyor, Mr. E. Trevor, for dwellings on two sites provisionally selected. The approximate estimate for the erection of the dwellings, in pairs, on the Bacon's Croft site in Mill-street was £203 each, and on the Cliff-road site, in four, £185 each. These amounts did not include cost of site, roads, fences, nor extension of gas, water and sewage mains. Having regard to the total

cost it was further estimated that on a rental of 3s. 6d. a week, free of rates, there would be an annual loss of over £2 each. If let at 4s. a week, the tenant also paying poor-rate and water-rate, there would be a loss of about 9s., or at 4s. 6d. a week, in addition to poor-rate and water-rate, a profit of about 15s. each per annum.

Docking R.D.C.—A scheme has been adopted for the erection of six cottages at Brancaster, at a cost of £150 each.

Feckenham R.D.C.—A draft scheme for the erection of ten workmen's dwellings at Astwood Bank has been submitted to the Local Government Board. The items include the purchase of 1 acre of land, £242; estimated cost of building, £1,575; sewerage and water supply, £50; fencing, £25; architect fees and legal expenses, £45; a total of £1,937. Based on a calculation that the houses were let at 4s. a week, the tenants paying rates, a surplus of £4 a year would be realised by the council. Including rent and rates the cost to the tenants would be from 5s. 6d. to 5s. 9d. a week.

Finchley U.D.C.—A scheme for the erection of 300 houses at an estimated cost of £93,443 has been approved generally by the Local Government Board.

Guildford T.C. A proposal to accept a tender for the erection of twenty cottages in Old Farm-road has been referred back to the Housing Committee in consequence of the receipt of a letter from the tenderer stating that a clerical error had been made in filling up the form of tender. A councillor stated that the lowest tender was £1,000 more than the tenders accepted in 1912 for building a similar number of cottages.

Nottingham T.C.—The council on Monday approved the Housing Committee's proposal for laying out an unhealthy area under the Nottingham (Carter-gate and Mauvers-street) Improvement Scheme, 1912.

PARKS AND OPEN SPACES.

Briton Ferry U.D.C. A bowling green is to be constructed at an estimated cost of £150.

Dundee T.C.—The Town Planning Committee recommend the corporation to purchase the freehold of 25 acres round the Law at a cost of £1,700, for the purpose ultimately of a park.

Exmouth U.D.C.—Land is to be purchased at a cost of £1,050 for the purpose of public tennis courts.

Swanage U.D.C.—It has been decided to apply to the Local Government Board for powers to borrow £7,500 with a view to purchasing the recreation ground near the sea-front, which is at present held on lease. The owner has met the council in the most favourable manner with regard to the purchase, and the council have unanimously accorded him a vote of thanks for his public-spirited action.

REFUSE COLLECTION AND DISPOSAL.

Dromore U.D.C.—Being pressed by the Local Government Board, the council have resolved to give consideration to the system of refuse removal. At present there is no systematic collection of rubbish, and a serious nuisance is threatened from accumulations.

Portadown U.D.C.—Consequent upon a report by a special committee, the council have agreed to adopt a scheme of domestic scavenging by their own workmen, and to make a charge upon the occupiers for the removal of refuse.

ROADS AND MATERIALS.

Axminster R.D.C. The surveyor, Mr. G. A. Millard, at the recent council meeting, stated that during the last month he had kept a very accurate record of the time he had spent in the office and the time he had spent out, and he found that altogether he spent ninety-one hours at the office. That, he thought, represented about ten days, and in addition to that he had six days in the month on which he paid wages, and two days to prepare for the annual meeting. That was eighteen days, and left him working six days to do the work of the council. Mr. J. Richards proposed that a clerk be appointed. Mr. Bates seconded, and stated that, from the facts the

surveyor had told them, they must come to the conclusion that something must be done. Six days on the road was not sufficient for an expenditure of £6,000. The proposition was agreed to.

Blaenavon U.D.C.—The question of refuse disposal is to be considered at a special meeting of the council. The surveyor, Mr. E. W. Edwards, stated that the present cost is about £617 per annum, equivalent to a rate of 5½d. in the £. He estimates the cost of a refuse destructor, including purchase of land, at £2,750, equivalent to a rate of 7½d. in the £.

Gamberwell B.C.—A section of Rye-lane from Hanover-street to Hanover-park is being laid with lithofalt by the Limmer Asphalt Paving Company, Limited.

Chingford U.D.C.—The council have accepted an offer by the Road Board of a loan of £600 for the improvement of Hall-lane.

Durham T.C.—The city surveyor, Mr. J. T. Pegge, has received instructions to carry out tar-grouting in North-road, at a cost of about £700.

Edinburgh T.C.—The Streets Committee recommend that the roads to be traversed by the corporation motor buses should be tar-sprayed.

Elgin C.C.—A letter has been received from the Road Board stating that the board would be prepared to give grants in connection with the proposed improvements on the Palmercross and Pittendreich road, and the Dulnain Bridge and Grantown road. The estimated cost of the work was £2,934, and the board had proposed to give a grant of £2,299, and £700 on loan, free of interest. The County Road Board have agreed to accept the offer for the Palmercross and Pittendreich road, and to ask for a five-sixth grant for the other road, which was stated to be essentially a motor road.

Farnham U.D.C.—The surveyor, Mr. R. W. Cass, has received instructions to prepare a scheme for the widening of part of Longdown-road, an intimation having been received that the council would probably obtain substantial contributions towards the cost from the county council and the Road Board.

Fermanagh C.C.—The Road Board have offered a grant of any amount up to £2,500, in addition to past grants, for work that may be executed up to the end of 1915, with the proviso that the district councils should provide £1 for £1. The grants are to be spent on strengthening the surfaces of roads and improving bad corners.

Hampstead B.C.—The council having agreed to undertake the necessary paving, an intimation has been received from the London County Council that it is their intention to proceed with the acquisition of the property required for the widening of High-road, near Messina-avenue.

Hove T.C.—The Works Committee recommend that the tender of Messrs. J. Parsons & Sons, 176 Church-road, Hove, at £295, for carrying out the proposed new street works in Ferndale-road be accepted. The committee also recommend the acceptance of the tender of the Improved Wood Pavement Company, Limited, 46 Queen Victoria-street, London, at £941, for providing and laying wood paving and taking up and relaying existing wood paving adjoining Palmeira Lawn.

Hursley R.D.C.—An application has been made to the Road Board for a grant to improve the road between Highbridge and Allbrook, and the Winchester and Eastleigh councils are to be asked to join in an application to the county council to take the road over as a main road.

Limerick T.C.—The Improvement Committee recommend the council to adopt an extensive paving scheme, estimated to cost £34,251.

Morayshire C.C.—The Laurencekirk District Committee have in contemplation an extensive scheme of road improvement. Recently the chief engineer of the Road Board (Mr. H. P. Maybury) visited the district and inspected the roads, and the committee met and considered a scheme. Among other things the scheme provides for the development of the Knock Hill quarry, and for the purchase of quarrying plant costing about £800.

Nottingham T.C.—The council on Monday approved a scheme for widening Hkoston-road by the purchase of the necessary land.

Rotherham T.C.—The Road Board have sanctioned a grant of £1,000 towards the cost of the improvement of College-square.

Surbiton U.D.C.—On Monday the council agreed to certain replies—prepared by the clerk, Mr. F. W. Wood, and the surveyor, Mr. H. T. Mather—to questions put by the Local Government Board as to arterial roads in Greater London. The following query and reply are given as being of general interest: Have you any opinion to offer as to the width of roads for various purposes and requirements—*i.e.*, as to whether roads of short length for estate or domestic purposes should be narrower, and main traffic routes wider than are required by the by-laws in force in your district?—Answer: Certainly main traffic routes should be wider than the width prescribed for roads by the local by-laws (36 ft.). The carriageways should not be less than 40 ft., and if likely to be used by tramways should be at least 50 ft. On the other hand, roads which are of short length and which are likely to be used by domestic traffic only might be narrower than 36 ft., and a by-law to this effect is now under the consideration of the council. For general estate or domestic purposes, as long as the distance between fronts of buildings is under control, it is only necessary to have the road wide enough for the particular class of traffic it is likely to serve. This depends on length, character of property and any other considerations.

Walton-upon-Thames U.D.C.—The council have decided to proceed with the scheme of the surveyor, Mr. R. Wilds, for the widening of Esher-road.—It has been agreed to make up Crutchfield-lane for a distance of 249 yds., at an estimated cost of £592.

Wanstead U.D.C.—The surveyor, Mr. C. H. Bressey, reports that the Road Board have agreed to finance a scheme of wood paving for practically all the main roads, and other works, at an estimated cost of £50,000. The work will extend over three years.

Warrington T.C.—The council have accepted a tender by the Limmer Asphalt Paving Company, Limited, for laying lithofalt blocks over 1,000 yds. of roads.

Westmorland C.C.—The Road Board, it was announced at the council meeting last week, had voted a further grant of £1,361 towards road improvements which were being made. At the present time, the chairman of the Main Roads Committee stated, they received 32 per cent of the whole money spent on the roads of the county, but he hoped the committee who had the thing to settle in the future would see that it would be unfair only to allow relief on that basis, as the roads cost 8s. 4d. per head to keep in order, whereas those in Lancashire cost only 4s. 6d. per head. Lancashire expected to get 4d. in the £ relief from the rates, whereas in Westmorland no further benefit was expected.

Whitley and Monkseaton U.D.C.—The new lower promenade and public shelter constructed by the council out of revenue were formally opened on Saturday. In the course of the proceedings appreciative reference was made to the interest taken in the scheme by the surveyor, Mr. A. J. Rousell.

SEWERAGE AND SEWAGE DISPOSAL.

Cuckfield R.D.C.—A report by Messrs. Strachan & Weekes on a drainage scheme for Handcross has been referred to the parish councils concerned.

Fleet (Hants) U.D.C.—At the last meeting of the council the clerk reported that the Local Government Board had approved, without requiring any modification, the scheme of sewerage and sewage disposal for the drainage of Fleet, prepared by the council's consulting engineer, Mr. T. J. Moss-Flower, Westminster and Bristol, and had sanctioned the borrowing of the amount required to carry out the work—*viz.*, £36,400. Instructions were given to the solicitor to complete the purchase of the land for the air-compressing station, and to complete the lease in connection with the land required for the sewage disposal works. Tenders for cast-iron pipes were received, and referred to the engineer for report. The scheme involves some 16 miles of gravitating sewers. The sewage will concentrate at several points, from which it will be ejected to the sewage disposal works, which are a long way from the residential part of the town. The ejectors will be worked by means of compressed air from a central air-compressing station. The sewage disposal plant consists of screening chambers, balancing, detritus, sedimentation, upward-flow, storm and dosing tanks, primary and secondary percolating filters, humus channels, works for the disposal of the sludge, and for dealing with storm-water and other incidental works. Tenders are to be at once invited for the work.

Larne U.D.C.—A scheme of sewerage, which it was stated had occupied the attention of the council for thirteen or fourteen years, was finally adopted last week, when the council instructed Mr. G. M. Taylor to prepare the necessary plans, specification and estimates for the sea outfall, storage tank, and gravitation sewer to Lahorna Hotel, the whole of the sewers shown in his original report, and the pumping station, at an estimated cost of £12,750.

Newcastle (Ireland) U.D.C.—A contract has been sealed for the work in connection with a scheme of sewerage.

Peterborough R.D.C.—The surveyor, Mr. G. A. Penwill, has received instructions to carry out the Eye drainage scheme by direct labour.

Westhampnett R.D.C.—The council have adopted a sewerage scheme for Selsey prepared by Mr. Howard Humphreys, which is estimated to cost £12,500. Mr. Humphreys reports that float tests showed quite clearly that a reasonably satisfactory point of outfall could be obtained in Bracklesham Bay if the sewage was discharged upon the falling tide, and providing the sewage was partially treated prior to discharge. It was to be regretted that no satisfactory point of discharge for crude sewage could be found either to the east or west of Selsey; the currents were so peculiar, however, that, unless the council were prepared to incur a very heavy expense for a long outfall sewer, it would be needful partially to treat the sewage before discharging the same into the bay. It was scarcely needful, perhaps, to state that Selsey was a most difficult place to drain economically. Roughly speaking, there was a square mile of land to be dealt with, and very little fall in any direction; to make matters worse there was subsoil water a few feet below the surface, together with a large amount of running sand. Unless the scheme was to cost an enormous amount, it was evident that the sewers must be kept at as shallow a depth as possible; at the best the work would be difficult. Moreover the population was very scattered. After much consideration, it seems that the best course to pursue would be to gravitate the greater part of the sewage to tanks, and to raise the sewage of the lower areas by means of automatic air lifts discharging into the gravitation sewers. It was clear that no purely gravitation scheme was possible, even if they could safely discharge crude sewage at the Bill, for they could not get self-cleansing gradients for the pipes and the average depth of the sewers would be at least 12 ft. Air lifts could be placed anywhere they were required, and so, when the eastern side of Selsey developed fully, all that would be needful would be the provision of one extra lift near the Beach station.

Wolstanton U.D.C.—The tender of Mr. S. Heath, at £980, has been accepted for the construction of the new sewage outfall works at Apedale-road.

WATER, GAS, AND ELECTRICITY.

Carlisle R.D.C.—A scheme for the supply of water to the whole of the council's area, at an estimated cost of £60,000, was adopted on Monday last. The source of supply is Roughton Gill mine on Coldbeck Fells.

Derby T.C.—The council are recommended by the Highways Committee to provide an installation of 500 patent automatic gas controllers and pilots, at a cost of £653.

Loughborough R.D.C.—The question of the Hathern water supply has been referred to a special committee of the council, with the clerk, medical officer, and engineer, Mr. F. W. Hodson.

Loughborough T.C.—The profit earned by the gas undertaking last year was £7,884.

Nottingham T.C.—The council on Monday adopted an instruction to the Lighting Committee to confer with the electrical engineer, with a view of arranging for experiments to be carried out in certain streets by suspending metal filament electric lamps from cables or attached to the tramway standards.

Southampton T.C.—The waterworks engineer has submitted a report stating, with respect to the Otterbourne water supply, that the chalk had been reached at a depth of 14 ft. from the surface in the trial shaft at the southern boundary of the land recently purchased, and there was no doubt that the proposed scheme to connect adits in that land with the present adits, although at a lower level, was perfectly feasible, and he was strongly of opinion that a permanent shaft should be sunk and adits driven so as to increase

the supply without delay. The council have decided to refer this report to Mr. Rolfe, engineer, and Mr. W. Whitaker, previous to asking for a loan of £5,000 for the proposed works.

Swansea T.C.—Twenty-two new fire hydrants are to be purchased, at an estimated cost of £162.

Tendring R.D.C.—The council have instructed Messrs. Taylor & Wallin, of Newcastle-on-Tyne and London, to prepare a scheme for and report upon the water supply of the parish of Great Bentley, Essex.

Tetbury U.D.C.—A water supply scheme estimated to cost £3,255 has been submitted to the Local Government Board.

Truro T.C.—An amended scheme for electric lighting has been adopted, the cost being estimated at £9,700.

MISCELLANEOUS.

Brighton T.C.—The tramway undertaking last year earned a nett profit of £842.

Hull T.C.—The tender of the Brush Electrical Engineering Company (Limited) has been accepted for twenty tramway car bodies at £181 each; the tender of the M. and G. Trunk and Engineering Company (Limited) for twenty trucks at £49 17s. 6d. each; and the tender of Siemens Brothers' Dynamo Works (Limited) for twenty pairs of motors for ordinary series parallel at £181 per pair, and twenty pairs of controllers of their latest pattern at £3 per pair.

Plymouth T.C.—The nett profit of the tramway undertaking last year was £4,037.

Winchester T.C.—It has been agreed to purchase a motor fire engine, at an estimated cost of £1,000.

Wolverhampton T.C.—The nett profit of the tramway undertaking last year was £5,553, equal to a rate of 3½d. in the £.

York T.C.—The Tramways Committee's report for the year ended March 31st, which marks the completion of four years since the tramways were taken over by the corporation, shows that the receipts yielded a nett surplus, after interest, sinking fund, and all charges have been met, of £2,523.

FOR OTHER ADVERTISEMENTS

See End of Paper.

GOOLE URBAN DISTRICT COUNCIL.
APPOINTMENT OF TOWN SURVEYOR.

The above Council invite applications for the above appointment.

The salary will be £200 per annum, payable monthly, and the person appointed will be required to reside in the Urban District and devote his whole time to the duties of his office.

He must have a thorough knowledge of the Construction and Maintenance of Roads, and be capable of preparing Plans and Estimates for new works.

Applications, on pre-scribed Forms to be obtained on receipt of stamped addressed envelope, stating age, qualifications and experience, together with copies of three recent testimonials, to be sent to the under-mentioned not later than Saturday, 27th June, 1914, endorsed "Town Surveyor."

Canvassing, directly or indirectly, will be a disqualification.

(By order)

ROBERT TYSON,

Clerk to the Council.

Council Offices,

Goole.

(1,697)

ESSEX COUNTY COUNCIL.

CLERK OF WORKS

Wanted, at once, a Clerk of the Works for six months, competent to supervise the Construction of a Ferro-concrete Bridge (Hennebique System) at Ongar, Essex.

Only applications from those having previous experience in Ferro-concrete will be considered.

Salary £3 3s. per week.

Applications, with two recent testimonials (copies only), to be sent not later than 17th June, 1914.

PERCY J. SHELDON, M.INST.C.E.

County Surveyor.

County Surveyor's Offices,

Chelmsford.

June 11, 1914

(1,700)

ASSISTANT desires appointment in Surveyor's Office. Good experience in building, surveying, levelling, and road making. Good draughtsman. Moderate salary.—Box 1,432, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.
(1,695)

ASSISTANT desires appointment in Surveyor's Office. Expert shorthand-typist; experience in surveying and levelling; good mathematician. Five years' experience Road and Sewer Contractor's Office. Moderate salary.—Box 1,433, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.
(1,699)

WHITSTABLE URBAN DISTRICT COUNCIL.

SEWERAGE AND SEWAGE DISPOSAL WORKS.

CONTRACT No. 2.

SLUDGE PUMP AND OIL ENGINE.

The above Council are prepared to receive Tenders from competent persons for the supply and erection upon the Council's Sewage Disposal Works at Swalecliffe of a Sludge Pump to deliver 4,000 gallons of sewage sludge per hour, and an oil engine to drive the same, together with accessories.

Full particulars of the proposed plant, together with Specifications and Forms of Tender, may be obtained on application to Messrs. Strachan & Weekes, Civil Engineers, 9 Victoria-street, Westminster, on and after Monday, June 15, 1914, on payment of a deposit of One Guinea by cheque, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Tender for Sludge Pump," are to be delivered at my office at Whitstable at or before 12 noon on Monday, June 29, 1914.

The lowest or any Tender will not necessarily be accepted.

(By order)

J. F. WHICHCORD,

(1,696)

Clerk.

TUNBRIDGE RURAL DISTRICT COUNCIL.

RURAL HOUSING.

TO BUILDERS AND CONTRACTORS.

The above Council invite Tenders for the erection of 25 Pairs Cottages in connection with above scheme, in various parts of their district as follows:—

A.—Brenchley (Petteridge site)	...	3	pairs.
B.—" (Pixot Hill site)	...	2	"
C.—Paddock Wood (Warrington site)	...	3	"
D.—" (Catts Place site)	...	2	"
E.—Hadlow	...	5	"
F.—Hildenborough	...	2	"
G.—Horsmonden	...	4	"
H.—Pembury	...	4	"

Plans and Specification and Form of Contract may be inspected at the office of the Surveyor, Mr. Frank Harris, the Broadway, Southborough, Tunbridge Wells, between the hours of 9.30 a.m. and 5 p.m., Saturdays excepted, until the time appointed for the delivery of the Tenders.

Any person desiring to tender and to receive a copy of the Bills of Quantities must send in his name and address, accompanied by a deposit of £2 2s., so as to reach the undersigned not later than the 22nd June. The deposit will be returned provided the tenderer shall have sent in and not withdrawn a *bonâ-fide* Tender.

Copies of the Bills of Quantities will be posted to applicants on or about the 25th June. Tenders, on forms which will be supplied with the Bill of Quantities, must be enclosed in a sealed envelope endorsed "Tender for Rural Housing," and sent or delivered to the undersigned not later than 10 a.m. on Tuesday, the 7th day of July, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

NEVILLE R. STONE,

Clerk to the Council.

23 Church-road,
Tunbridge Wells.
June, 1914.

(1,698)

PERSONAL.

Mr. J. W. Cockrill, borough surveyor of Yarmouth, has been supplied by his council with a Belsize motor car.

Mr. P. A. Benn, deputy borough surveyor of Loughborough, has been appointed city surveyor of Lichfield, at a salary of £200 a year.

Mr. W. Smith Wilson, of Kenilworth, and Mr. L. Walker, of Cudworth, have been appointed junior assistants to the borough surveyor of Chesterfield.

Mr. A. S. Butterworth, city engineer of Port Elizabeth, will, it is reported, pay a business-cum-pleasure visit to England about the end of the year.

Mr. Austin H. Elliott, ASSOC.M.INST.C.E., P.A.S.T.I., who was chief assistant to Mr. J. R. Elliott (Messrs. Elliott & Brown), civil engineer, Nottingham, assistant in the borough surveyor and water engineer's office, Lancaster, and eleven years engineering assistant to the city engineer, Nottingham, has been appointed engineer and surveyor to the Carlton Urban District Council, Notts, and commences his new duties on July 1st.

Mr. William Lewis Harpur, county road surveyor for Breconshire, son of Mr. William Harpur, city engineer of Cardiff, was married on Monday at the parish church of Llangorse (Breconshire) to Miss Mabel Powell, second daughter of Alderman David Powell, J.P., and Mrs. Powell, Caedryssu, Brecon. Afterwards a reception was held at Lake House, Llangorse, and subsequently Mr. and Mrs. Harpur left for Aberystwyth.

Major Henry Macaulay, who for thirty years was borough surveyor of Kingston (Surrey), and for another five years consulting surveyor to the corporation, celebrated his eighty-fourth birthday last week. He is in excellent health, and recently was present, as a member of the National Reserve, at the inspection by Lord Roberts. He is at present preparing plans for the extension of the Victoria Hospital, of which he is the honorary architect.

Mr. T. Waddingham, surveyor to the Hebden Bridge Urban District Council, who, as announced last week, has retired with the object of commencing business at Grimsby on his own account, is the subject of a highly appreciative article in the *Hebden Bridge Times*, the writer of which says: "Many important and permanent improvements have been made during his surveyorship, and considerable economies effected by his enterprise, backed up by a progressive council. Inquiring for details of these, we find an extensive list which makes interesting reading, and which will be informative to the Hebden Bridge ratepayer in showing how his interests are being served by the council and its officials."

Mr. D. M. Jenkins, ASSOC.M.INST.C.E., borough engineer of Neath, was the chief figure of an interesting function recently, when his past and present engineering pupils gave expression to their appreciation of their former chief by presenting him and Mrs. Jenkins on the occasion of their silver wedding, with a silver tea set and tray. The front of the tray was engraved with the initials "D. M. & S. A. J., 1889-1914," and the back bore the following inscription: "Presented to D. M. Jenkins, Esq., ASSOC.M.INST.C.E., and Mrs. Jenkins, on the occasion of their silver wedding, by his past and present engineering pupils, as a slight token of their appreciation and best wishes." The following are the names of Mr. Jenkins' past and present pupils who took part in the presentation: Messrs. T. Thomas, chief engineering assistant, Hull; A. H. Quick, London County Council engineer's department; E. C. Pole, deputy county surveyor, Glamorgan; D. Edwards, borough surveyor, Taunton; W. L. Jenkins, county surveyor, West Suffolk; R. Dudley, 80 North-gate, Regent's Park (late city engineer, Lucknow); D. P. Howells, town engineer, Benoni, Transvaal; F. G. Price, Great Western Railway engineer's department, Paddington; D. S. Thomas, Neath; N. H. Moore, Great Western Railway divisional engineer's office, Neath; F. Hatcher, assistant borough surveyor, Neath; F. C. Payne, Neath; N. J. Sair, surveyor's department, ironworks, Ebbw Vale; and Messrs. E. Rees, G. C. Jones, N. Kimble and A. G. Evans, of the borough engineer's office, Neath. The committee having charge of the matter were Messrs. Thomas, Pole, Dudley, Hatcher and Edwards, the last-named acting as hon. secretary.

The Advantages of Steam Tractor Haulage Over Team Labour for Road Material.*

By W. L. GIBSON, County Road Surveyor, Western District, Perthshire County Council.

No small debt is due to the efforts of the makers of road plant in having contributed to the great advance made in modern times in the methods of road making and maintenance, and not least in the manufacture and transportation of all kinds of material necessary for road work. The ratepayers, no less than road surveyors, owe them a debt for carrying out the great work at the minimum of cost.

Within the last thirty years the methods of road construction and maintenance have been revolutionised. For generations, we may say, no advance was made on the methods taught by the Romans. Insufficient attention was paid to the importance of good roads, and up to a generation ago the work was carried out by rule-of-thumb methods by the local blacksmith, who supplied the plant, consisting chiefly of tools, and the farmer and the local carting contractor who did the haulage.

Under this primitive system of haulage most of the material had to be distributed into depots along the roadside, entailing extra expenditure in relifting while road surfacing, and often there was difficulty in securing the necessary amount of team labour when required in isolated districts. But now road making has been elevated from the position of mere empiric practice to the dignity of a science. The local blacksmith, the farmer, and the local carting contractor are being replaced by engineering experts who undertake the supply of all kinds of plant necessary for the most improved methods of road making and maintenance and haulage of material.

In no department is the advance more notable than in the substitution of mechanically propelled vehicles for team labour. It is the purpose of this paper which I have the honour of submitting to you to consider some of the advantages possessed by tractor haulage as compared with team labour, and my observations may be useful to road engineers and surveyors who contemplate the adoption of the more modern method. I may be permitted to speak with some authority on the subject, as I understand I was the first county road surveyor in Scotland to adopt tractor haulage, and having now had ten years' experience of this method of transportation I am in a position to submit to you some observations on the subject, accompanied by detailed statements of actual cost and comparative analyses of tractor haulage as compared with team labour.

It has been said that, to put it succinctly, "the bigger the load the cheaper the cost per ton-mile." If this be true, haulage by heavy traction engines is still the

CHEAPEST KNOWN METHOD OF ROAD TRANSPORT.

so far as cost per ton-mile is concerned. Nevertheless, road surveyors must consider the question of damage to road by such haulage, and it is therefore necessary for them to keep the axle weights within reasonable limits. If heavy plant is used surveyors must make and maintain their roads to meet this class of traffic, which means that a large initial expenditure as well as a large annual cost would be required to meet the expense of road maintenance for their own traffic. If, on the other hand, light tractor haulage be employed there is a marked saving in the wear and tear to the road surface as contrasted with the heavier plant. We must, therefore, qualify our axiom that "the bigger the load the cheaper the cost per ton-mile" by this rider, "The heavier the axle weight the greater the damage to roads," with its corollary of increased cost for maintenance.

To secure at one and the same time cheapness of transport and minimum damage to roads must be the aim and ideal of the skilful road engineer, and it is my opinion that the two aims are irreconcilable so long as heavy traction haulage is employed. On other grounds the use of heavy traction haulage is to be deprecated.

The question of easy working—*i.e.*, turning and shunting on narrow roads, and in quarries and loading banks of railway sidings—is an important

consideration, for it must be remembered that in haulage of road material the primary object is to ply between the quarry or the railway siding and the scene of steam road rolling operations without the intervention of roadside storing depots, and the inevitable and unnecessary cost of depositing and relifting the material.

Let us consider briefly team labour as regards cheapness of transport and

DAMAGE TO ROADS.

As far as the first is concerned, team labour cannot compete with tractor haulage. But the difference in wear and tear between light tractor haulage and team labour is a more problematical question, though my own experience goes to confirm me in the view that in some cases if not in most there is a difference here also in favour of the former. Indeed, I would go further and affirm that in some cases where the effect of the use of team labour was to cut through the surface and cause deep ruts, the substitution of tractors resulted merely in a depression, which was more easily remedied by making up with metal, and that continued use of the tractor and wagon over the metal in the course of haulage actually producing a much stronger road than before. It is naturally to the advantage of the carting contractor, when hauling under contract, to load to the full, but the greater the profit the greater the damage to the road. I am thus led to conclude that here again, though of course in a much less degree, the two aims of the road surveyor cannot be fully secured by the employment of team labour.

In considering as to the adoption of mechanical haulage for West Perthshire, I recognised that many of my roads were lightly constructed and narrow, and the quarries restricted in area and not easy of access. I considered that to adopt heavy traction engines would be almost impracticable for the work contemplated. Under the heavy motor-car regulations the use of self-contained vehicles such as steam and petrol wagons is permitted; but from the author's point of view they have the disadvantage of the great axle weight on the hind wheels, which are as a rule, in the case of the steam wagon, only about 3 ft. 6 in. diameter by 10 in. wide, carrying a legal weight—often, unfortunately, exceeded—of 8 tons.

This is quite an extravagant load for an ordinary country road. An illustration of the damage by vehicles of this class is the great difficulty my friends in Renfrewshire and Ayrshire have in maintaining the main Glasgow and Kilmarnock road. This type of vehicle has also another disadvantage to road authorities, in that the whole plant must remain idle while being loaded, whereas the tractor, using two tipping wagons, can be hauling the one while the other is loading. The output of this plant, therefore, is greater than that of a steam or petrol wagon, and the produce of the breaker, or tar-macadam mixer, or material from the railway siding, is delivered on the road in a more regular manner. While the higher speed—legal maximum of 12 miles per hour—of motor wagons on rubber tyres may be considered an advantage for this type, in the present state of development of mechanical haulage it appears to me that the cost of rubber tyres alone, which could be calculated at not less than 2d. per vehicle mile, and the cost of petrol where motor engines are used, make it impossible for this type to be compared with tractor haulage for the conveyance of road material irrespective of the disadvantages already mentioned of the self-contained unit.

Notwithstanding rubber tyres, the axle weight of this self-contained vehicle has proved to be very damaging to road surfaces where regular services of motor buses, heavy vans and charrs-à-banc are in operation. It must, of course, be understood that where the roads are strong and smooth, and where facilities are provided for quick and cheap loading, the use of the fast-running motor wagon—either steam or petrol—may be seriously considered; but the author has yet to learn of instances in any way similar to his own work where this type of vehicle has been used at a cost which can be compared with his own experience.

* Paper read at meeting of the Institution of Municipal and County Engineers held at Dunfermline, on Friday and Saturday last.

The following points may be suggested for the consideration of road engineers and surveyors who may be contemplating the adoption of mechanical haulage:

- (1) Strength of Roads. Whether capable of carrying the maximum axle weight of the type of vehicle it is proposed to use.
- (2) Quantity of Material to be Transported.—If the

still so cheap that purchase of plant may not at present be justified.

(4) Whether the work of the district suits the use of convertible tractor and roller. (The author finds the convertible tractor the most useful plant he has.)

(5) Whether the engine can be utilised for driving small stonebreaker for tar-macadam mixer, supplying

STATEMENT No. 1.
DETAILED STATEMENT OF WORKING EXPENSES OF TRACTOR "PIONEER"—3 TONS—FOR YEAR ENDING 15TH MAY, 1913; ALSO COMPARATIVE STATEMENT OF COST OF TEAM LABOUR.

Steam Tractor Haulage.							Team Labour.	
Quarries, stations and depots.	Average distance material was hauled. Miles.	No. of days hauling.	Total distance travelled per-day. Miles.	Quantity of metal hauled. Tons.	Rate in pence.	Amount.	Carting rate.	Amount.
Leny Quarry	3½	13	21	289	9	£ s. d. 10 16 9	s. d. 3 1	£ s. d. 44 11 1
Barbush " " " "	2	73	18	1,647	9	61 15 3	1 9	144 2 3
King's Park Quarry " " " "	3½	14	28	300	9½	11 17 6	3 1	46 5 0
Dunblane Station " " " "	1	12	12	450	5½	10 6 3	0 8	15 0 0
Bridge of Allan " " " "	1	8	18	192	8½	6 16 0	1 0	9 12 0
Blackford " " " "	3	1	24	16	12½	9 17 0	2 8	2 2 8
Callander " " " "	3	6	10½	202	6	5 1 0	0 8	6 14 8
Port of Menteith " " " "	3	10	24	170	12	8 10 0	2 8	22 13 4
Gartmore " " " "	2	62	20	1,491	8	49 14 0	1 9	130 9 3
Roadside Depots " " " "	3½	40	28	600	13½	33 15 0		
Washing out boiler, cleaning and repairing engine and wagons, 66 days at 4s. 8d.						15 8 0	40 days 5 horses and carts at 45s. per day ..	90 0 0
Filling metal into wagons at rate of 7s. 4d. per day						87 12 8	Filling metal into carts at road side depots for road rolling operations—5,357 at 6½d. per ton	145 1 8
Total						£302 9 5	Total ...	£656 11 11

ANALYSIS:—

No. of days hauling	239
Material hauled	5,357 tons
" " per day	22½
Total distance travelled in 239 days	4,873 miles
Average " " per day	20½
*Average cost per day	£1 5s. 7½d.
" " per ton per mile	5.9d.
Fuel consumed per day	3 cwt8.

* This includes filling wagons, time of driver washing out boiler, cleaning, and repairs, with depreciation, etc., estimated at the rate of 22 per cent.

ABSTRACT:—

Cost of carting by team labour	£ s. d. 656 11 11	In percentages. 100
" " steam tractor haulage	302 9 5	46
Total saving†	£354 2 6	54

† In addition, the tractor (after 8½ years' work) was sold for £150.

STATEMENT No. 2.
ABSTRACT STATEMENT OF WORKINGS OF NO. 1 TRACTOR "PIONEER"—3 TONS—FOR 8½ YEARS ENDING 15TH MAY, 1914.

	Hauling Road Material.				Miscellaneous Works.			Average quantity hauled per day including road material and miscellaneous works. Tons.	Total distance travelled during year. Miles.	Average distance travelled per day. Miles.	Fuel consumed per day. Cwts.	Weather conditions.
	No. of days at work hauling road material.	Quantity of road material hauled during year. Tons.	Average cost per day.	Average cost per ton mile in pence.	No. of days at work.	Quantity hauled during year. Tons.	Cost per day.					
Half-year ending May 15, 1905	79	1,424	24 6	5.75	—	—	18.02	1,659	21.00	1½	Fair	
Year " " 1906	244	5,506	20 2	3.60	44	12 3½	22.56	5,940	20.62	1½	Good	
" " 1907	180	4,287	21 8	3.99	21	11 6½	26.72	5,386	26.79	1½	Excellent	
" " 1908	202	4,404	23 2	5.14	31	28.0	14 11½	5,713	24.51	1½	Fair	
" " 1909	226	3,955	23 6	7.27	7	112	16 2½	17.45	3,794	16.28	2½	Very wet
" " 1910	197	3,849	29 0	7.00	13	148	14 0	19.03	3,659	17.42	2	Fair
" " 1911	244	4,516	22 1	6.87	—	—	19.29	6,208	26.78	2½	Good	
" " 1912	217	6,780	24 3	4.36	—	—	31.24	5,098	23.49	3	Excellent	
" " 1913	239	5,357	25 2	5.86	—	—	22.41	4,873	20.38	3½	Very wet	

ANALYSIS:—

No. of days at work in 8½ years	1,944
Quantity of material hauled in 8½ years	11,254 tons
Average quantity hauled per day	21.91 tons
Total distance travelled in 8½ years	42,390 miles
Average distance travelled per day	23.20 miles
*Average cost per day—hauling road material	29s. 8½d.
" " " " miscellaneous haulage	14s. 4½d.
Average cost per ton per mile, including filling into wagons, etc.	5.52d.
Average quantity of fuel consumed per day	2 cwt, 1 qr.
Average saving over team labour	44.92 p. cent

* Depreciation and tear and wear including at the rate of 15 per cent for first 7½ years, and 22 per cent for last year.

SUMMARY:—

Estimated saving in favour of steam tractor haulage	£ s. d. 2,355 9 5½
Deduct initial cost of tractor and wagons	517 10 1
	1,837 19 1½
Add produce of sale of old plant	150 0 0
Total estimated saving	£1,987 19 1½

COMPARATIVE STATEMENT OF COST BETWEEN STEAM TRACTOR HAULAGE AND TEAM LABOUR FOR 8½ YEARS.

Year.	Estimated cost of team labour.	Actual cost of steam tractor haulage.	Estimated saving in cost in favour of steam tractor haulage.
Half-year ending 1905	£ s. d. 101 18 3	£ s. d. 65 6 4	£ s. d. 36 11 11
Year " " 1906	542 19 7	201 19 11	340 19 8
" " 1907	514 19 11	217 14 1½	297 5 9½
" " 1908	564 3 6	257 19 0½	306 4 5½
" " 1909	513 16 3	271 8 5	242 7 10
" " 1910	418 6 10	226 18 5	191 8 5
" " 1911	511 18 9	259 10 4	252 8 5
" " 1912	598 6 6	264 6 0½	334 0 5½
" " 1913	656 11 11	302 9 5	354 2 6
Totals ...	£4,423 1 6	£2,067 12 1½	£2,355 9 5½

tonnage is small, or the distances unduly short, hire may be cheaper than purchase.

(3) Present Cost of Transport.—There are still some districts where I understand the prices of cartage are

steam for rock drilling, pumping water out of quarries, removing accumulations of road scrapings, hauling tar-sprayers and boilers, or any of the many operations for which a surveyor requires power of any kind.

The author wishes it to be understood, lest he should be taken to task by motor haulage experts in general, that he fully realises that other kinds of traffic may be better undertaken by other types of vehicles than that which he advocates for the haulage of road material.

use less than one year, and little or no expense for repairs has yet been necessary.

Statements Nos. 1 and 3 are given as examples of one year's work, and the method of keeping the cost. Statements Nos. 2 and 4 show abstracts and analyses

STATEMENT NO. 3.

DETAILED STATEMENT OF WORKING EXPENSES OF TRACTOR "ROB ROY"—5 TONS—CONVERTIBLE TO ROLLER—7 TONS—FOR YEAR ENDING 15TH MAY, 1914; ALSO COMPARATIVE STATEMENT OF COST OF TEAM LABOUR.

Quarries, stations and depots.	Steam Tractor Haulage.						Team Labour.			
	Average distance material was hauled. Miles.	No. of days hauling.	Total distance travelled per day. Miles.	Quantity of metal hauled. Tons.	Rate in pence.	Amount.	Carting rate.	Amount.		
Garrick Quarry ...	1½	30	15	673	8½	£ 23 4 9	1s. 2d.	£ 39 8 8	241 19 6	
Barbush " ...	1½	17	15	450	7	13 2 6	1s. 2d.	26 5 0		
Leny " ...	4	25	24	615	8½	21 15 7½	3s. 6d.	107 12 6	54 8 0	
Ardehullarie Quarry	3	29	32	515	10½	22 10 7½	2s. 8d.	68 13 4		
Dunblane station ...	1½	10	18	278	6½	7 16 4½	1s. 2d.	16 4 4	55 2 0	
Greenloaning " ...	2	10	24	284	6½	7 13 10	1s. 9d.	24 17 0		
Bridge of Allan " ...	3	5	24	100	9½	3 17 1	2s. 8d.	13 6 8	85 10 7	
Roadside depots ...	3½	13	21	240	10	10 0 0				
Filling into wagons, allow at rate of 7s. 4d. per day ...						52 1 4	13 days, 6 carts and horses at 54s. per day ...			35 2 0
Washing out and cleaning and repairing engine and wagons— Time of driver, 30 days 4s. 8d. ...						7 0 0	Add filling and carting metal from roadside depots to rolling operations, 3.15s tons at 6½d.			
Total ...						£ 169 2 1½	Total			£ 417 0 1

ANALYSIS:—

No. of days hauling ... 142
 Quantity of material hauled ... 3,158 tons
 Average quantity hauled per day ... 22.23 "
 " distance travelled per day ... 21.95 miles
 Total distance travelled in 142 days ... 3,118 miles
 Average cost per day, including filling into wagons and time of driver, washing out boiler, cleaning and repairing ... £1 3s. 9½d.
 (Depreciation and tear and wear included at the rate of 15%.)
 Average cost per ton mile ... 5.14d.
 Fuel consumed per day ... 3 cwt.

ABSTRACT:—

Cost of carting by old contract system ... 417 0 1 ... 100%
 " Motor Haulage ... 169 2 1½ ... 40%
 Total saving ... £ 247 17 11½ ... 59%

NOTE.—This tractor, being convertible to a 7-ton road roller, was engaged at rolling operations for 111 days at an average cost of 18s. 4½d. per day.

STATEMENT NO. 4.

ABSTRACT STATEMENT OF WORKINGS OF NO. 2 TRACTOR "ROB ROY"—5 TONS—CONVERTIBLE TO ROLLER—7 TONS—FOR 6 YEARS ENDING 15TH MAY, 1914.

Year.	Hauling Road Material.				Engaged as Roller at Miscellaneous Works.			Average quantity hauled per day, including road material & Miscellaneous works. Tons.	Total distance travelled during year. Miles.	Average distance travelled per day. Miles.	Fuel consumed per day. Cwt.	Weather conditions
	No. of days at work hauling road material. Tons.	Quantity of road material hauled during year. Tons.	Average cost per day.	Cost per ton mile in pence.	No. of days at work.	Quantity hauled during year. Tons.	Cost per day.					
Year ending 1909 ...	151	3,739	£ 1 1 10½	6.90	Mis. wks. 12	240	15s. 6d.	25.00	3,098	19.00	1	Very wet
" 1910 ...	99	2,302	1 7 5½	4.14	Rolling 118	—	18s. 4d.	18.00	2,915	29.74	1	Fair
" 1911 ...	145	2,888	1 3 7	4.00	Rolling 116	—	18s. 9d.	19.91	3,899	26.88	3½	Good
" 1912 ...	103	3,318	1 6 11½	5.20	Rolling 146	—	18s. 4½d.	33.00	2,514	24.40	3½	Excellent
" 1913 ...	121	2,617	1 4 11½	4.58	Rolling 162	—	18s. 4½d.	21.62	2,682	22.16	3½	Very wet
" 1914 ...	142	3,158	1 3 9½	5.11	Rolling 141	—	18s. 4½d.	22.23	3,118	21.95	3	Excellent

NO. 2. TRACTOR "ROB ROY."—COMPARATIVE STATEMENT OF COST BETWEEN STEAM TRACTOR HAULAGE AND TEAM LABOUR FOR 6 YEARS.

ANALYSIS:—

No. of days at work hauling in 6 years ... 773 days
 " rolling in 6 years ... 683 "
 Quantity of material hauled in 6 years ... 18,262 tons
 Average quantity hauled per day ... 23.62 "
 Total distance travelled in 6 years ... 18,256 miles
 Average distance travelled per day ... 24.92 "
 Average cost per day hauling (depreciation and tear and wear included at the rate of 15%) ... £1 3s. 9½d.
 Average cost per day rolling ... 18s. 9d.
 " per ton per mile, including filling into wagons ... 4.84d.
 Average quantity of fuel consumed per day ... 3½ cwt.
 " saving over team labour ... 42.13%

Year.	Estimated cost of team labour.	Cost of steam tractor haulage.	Saving in favour of steam tractor haulage.
Year ending 1909 ...	£ 464 4 5	£ 176 5 11	£ 287 18 6
" 1910 ...	392 12 11	136 16 1	256 16 10
" 1911 ...	410 19 11	170 18 6	240 1 4
" 1912 ...	321 7 1	139 1 3½	182 5 9½
" 1913 ...	347 10 3½	140 11 10½	206 18 5
" 1914 ...	417 0 1	169 2 1½	247 17 11½
Totals ...	£ 2,263 14 8½	£ 932 15 9½	£ 1,330 18 10½

SUMMARY:—

Saving in favour of steam tractor haulage ... £ 1,330 18 10½
 Deduct initial cost of tractor wagons and rolling gear ... 750 7 6
 Add present value of tractor wagons and rolling gear ... 380 11 4½
 375 0 0
 Total estimated saving ... £ 935 11 4½

NOTE.—This engine has also been employed at rolling operations for 683 days during the past 6 years at an average cost of 18s. 5d. per day. The value of this work is not included in the estimated saving.

Details of the actual work and cost of operation of the two first tractor plants purchased by my council are annexed. The third engine replacing 3-ton tractor "Pioneer" sold last year, has been in

for the whole of the years during which the tractors have been at work.

A comparison between the costs of team labour and tractor haulage is shown in each statement.

Control of Ashpits, Ashbins, and House Refuse by By-Laws.

EFFECTS OF THE PUBLIC HEALTH ACT, 1875, AND THE PUBLIC HEALTH ACTS AMENDMENT ACT, 1890.

By R. H. QUINE, D.P.H. (VIC.).

(Conclusion.)

Respectable builders and contractors would prefer to instal the best form of sanitary appliance generally, but by the absence of any decent standard or rules set by the local authority they are compelled, in tendering for work, to compete with unscrupulous rivals, and to quote for and introduce cheap and flimsy rubbish, which turns out to be more costly in the long run. Where there is no standard low price becomes the sole and absolute master, and the most skilful "scamper" or producer of cheap or sweated goods gets by way of reward whatever business goes, but which, like the dodges of the adulterator, benefits no one but himself, only injuring the others. Those who refuse to make or sell rubbishy goods, and those who produce high-efficiency appliances, but at even slightly higher initial cost, are squeezed out. On the other hand, where there is a decent standard with a high minimum level of conditions, it benefits all and is equal for all, injuring none. It encourages the invention of still higher standards. Moreover, to insist on decent minimum conditions is the very reason for the existence of local authorities.

It is thus seen that the sanitary department, working with no doubt the best intention, has not realised its high duty of guiding the council in making preventive by-laws, and has failed seriously in this particular direction.

In all this the cleansing department has taken a very subsidiary place, and has merely contented itself with emptying whatever receptacles it found. Although one of the greatest spending departments of corporate work, it was not in the past considered necessary to put it under the control of men with scientific education. An intelligent and forceful foreman, and protégés (more or less able-bodied) of the local councillors were formerly considered good enough for the work. The result has been that the cleansing department has contributed little or nothing to the settlement of this question. Not one such department in 100 can even now furnish statistics as to the relative speed, labour, and cost of working, and the quantity or quality, or weight of refuse, produced by the various receptacles placed in various positions for dealing with house refuse which they handle. When ideas are present, they mostly run to the vague belief that one uniform size and shape of receptacle for all situations is the thing to be desired and enforced: round pegs to fit square, triangular, and all sorts and sizes of holes. In some misguided places they even go so far as to make these appliances, and not only compete against dealers, but try to exclude all improvement in methods and appliances.

This important problem is not to be solved by any one bin, but by right conditions for all bins. Cleansing departments, as a rule, are not sufficiently educated in sanitary law or the principles of sanitation or engineering to act as leaders of reform in this subject, which is much more difficult and complicated than might be supposed from its apparent simplicity.

Let us now glance at the reasons for this great absence of standards and divergence of practice in local authorities. We will find that it is largely due to perverted reading and misunderstanding of the Public Health Acts Amendment Act, 1890. This Act was almost revolutionary in the matter of house refuse. Its intention was to bring the older houses, the occupiers of houses, and the newer form of receptacles all under control.

The quite obvious intention of sec. 11 of the 1890 Act was to provide that all those various small unauthorised new receptacles which were of different construction from the old ashpits, kept in a different way, worked in a different way, and liable to infinitely greater possibilities of misuse and abuse, and which were beginning to replace the old ashpits, should be brought under control to prevent nuisance and danger, and to facilitate collection. The simplest way to do this seemed to be to enact that they should all be deemed to be ashpits, and therefore subject to the law

of ashpits. This they are, in fact, at the present time. Every ashbin, bucket, tub, box—whether soap box or kipper box or cardboard—is now, in the eyes of the law, an ashpit if used for house refuse, and is liable to the law of ashpits and to control by by-laws. This law of 1890 has not in any way shifted from the local authority the burden of providing, in accordance with the 1875 Act, that ashpits (including the newer form) shall be properly constructed and properly kept, and that they be supplied if not present, and be repaired, mended or altered if not in accordance with the by-laws. What it has done is to order the local authorities to extend such control to these new appliances.

If any new kind of receptacle is provided, it shall be considered an ashpit and subject to the same conditions as any other form of ashpit, and shall be in accordance with the by-laws for the time being, and if the by-laws are not sufficient they shall be extended so that nothing shall be introduced without sanction and approval of the council.

The reason of the 1890 Act causing so much confusion and mischief lies in the fact that, instead of being read as meaning that every receptacle is now legally an ashpit and subject to ashpit law and control, it has been taken to mean that any of these receptacles can now be used instead of an ashpit, and that because they are not in the same form as the old ashpit, nor controlled by the same by-laws as to construction, they therefore are not subject to ashpit law and control, and because no by-laws worth speaking of have been made to control how they are to be constructed and kept, that they are free to be of any construction, kept in any place, and used anyhow. Sanitary departments are very seriously to blame for tolerating, if not actually encouraging, this loose and improper view, and for not laying down strict rules for governing these appliances. Failing the making of by-laws themselves, they ought to have furnished the surveyor's department with the conditions required by them, so that the surveyor might have attended to the matter. No false pride or petty dignity of office ought to be allowed to interfere with asking for or tendering advice in this matter; the law and the public interest demand it.

Recently some attempts have been made to frame more complete by-laws to govern how all forms of ashpit should be constructed and kept, and how nuisance from dust ashes and refuse should be prevented; also what duties should be imposed on the occupier. As a rule, however, by-laws referring to the new receptacles are of the most elemental description. In London, for instance, at the present day they take the form of "a metal receptacle with one handle or more, a cover, and under 2 cub. ft. capacity," conditions quite filled by an old saucepan, kettle, tin pail or milk can. There are no by-laws as to how all these receptacles should be constructed, kept or used; the result is the use of the flimsiest and cheapest ashbins that can be made, and filthy and untidy backyard conditions. Improved methods are impossible.

In South Wales and other places this neglect of the local authority to make by-laws as to the new form of ashpits, and the prevention of nuisances and danger is carried to the extreme limit. The ashpit disappears altogether, and neither the builder of the houses nor the owner provides any receptacles whatsoever—neither the old ashpit nor its newer equivalent. The 50s. on the ashpit and the few shillings on bin or tub are both saved, and go into the builder's pocket. The occupier may provide something if he thinks fit when he comes into the house, but the local authority, having ignored its duty as to by-laws, is powerless, so that when the occupier does provide anything it is far below the standard set by the 1875 Act. In the streets may be seen lard buckets, pails, soap boxes, kipper boxes, old tins, cardboard, and even paper, all uncovered and exposed to wind, weather, flies, and animals. This result in the open street is more than paralleled by extremely bad con-

ditions behind the houses, and often inside them. For want of safely covered and constructed receptacles, the local authority is compelled to collect daily, and this daily collection, involving the co-operation of thousands of more or less careless housewives, sometimes approaches the farcical in that it is a daily perambulation of the cart rather than an actual collection from every house. South Wales and London do not stand alone in this matter.

Elsewhere the newer ashpit in the form of ashbins and boxes is frequently found without cover, or uncovered. They are therefore exposed to flies, cats, and other animals, wind and weather. They may be exposed in the streets, locked up in back yards, hidden from inspection, and involving extra travelling time and labour in collection. They usually stand on the ground, and are responsible for the dirtiest corner of the yard, surrounded by spill and dirt, which cannot be swept up without moving the bin. They are exposed to the corrosive effect of rain-splash and capillary attraction of ground-wet. They may stand under a window or close to a door, in the lobby or kitchen, in cellar or pantry, under the stairs, or even in sleeping rooms. They have been used as baths and wash tubs, and cradles, and for carrying coal or manure through the house to gardens, and even for baking. The children play with them. All sorts of improper things have been put in and taken out of them, and what ought to have been put in them has often been thrown on the ground.

Some of these refuse receptacles can be emptied six or eight times as quickly as others, and with less than a quarter of the labour. Some last four or five times as long as others. Some have a short sanitary life and others a long one.

From the above it will be seen that the manner of keeping the newer form of ashpit is at least as important as the manner of construction, and that preventive by-laws regulating the keeping are as important as those regulating construction, and that nuisances from dust, ashes and refuse may very readily arise if the bin is not put and kept where it ought to be kept, with by-laws made to enforce its right use.

If all this disorder and waste exists, and is due to want of proper control by the local authority, how may such control be recovered and order restored? How is a town to secure the best conditions for every type of house and situation, the best varieties of receptacles for each situation to secure those conditions, and the best methods of working such receptacles?

The carrying out of the law as to ashpits and house refuse in order to meet portable ashpit conditions involves the preparation by the council of a new kind of regulation in by-law form; new in kind because the new receptacles are in construction, keeping and use, and in every other way entirely different from the old ashpits.

It is absolutely necessary to define the manner in which these new forms of ashpits (and, in fact, all forms) should be constructed, how and where they should be kept, how not kept, how used and not used, and what conditions should be made for the prevention of nuisance from dust, ashes and refuse, to secure clean and tidy premises so that the builder, the owner, and the occupier should each know how to act.

It is obvious that mere construction regulations in building by-laws can no longer be made to cover all this; something more is necessary. It becomes a question as to the desirability of the whole matter of house refuse treatment being dealt with in a special and separate set of by-laws made *ad hoc*. This would mean some one department alone taking up the work of preparing and enforcing them, as far as installation of the receptacles in all houses, both new and old.

For various reasons the surveyor's department seems to be the most suitable for the purpose. If the surveyor took up the duty, he should ask the health department to lay down the conditions it desired to be imposed on all receptacles, of whatever kind, to prevent danger to health, covering—

- (1) The nature of the material of construction.
- (2) The nature of the "proper covers," and if an attached and self-closing cover is desirable.
- (3) The size most desirable in view of the frequency of emptying.
- (4) The place and manner in which the receptacle should or should not be kept, so as to facilitate in-

spection and emptying, and prolong their sanitary life, and promote tidiness.

(5) To say what should or should not be put into them.

(6) What facilities for collection should be imposed.

(7) And what precautions the occupier should observe for preventing nuisance and danger to health.

The cleansing department ought to be asked to express an opinion as to the size preferred for easy and quick handling, and what facilities in certain classes of houses should be imposed, so as to ensure the quickest, cheapest, and easiest collection.

The surveyor's department having the lists of these conditions should add their own conditions as to construction, workmanship, strength, and as to being "as approved." They should then draw up the by-laws. The officials of this department should alone control the inspection and passing, if not the actual installation of all forms of receptacles, whether for new or old houses, and should see that the construction of all appliances, however varying in form, submitted to the council for sanction should fulfil the conditions laid down in the by-laws, and that all such appliances of approved construction, size, and form, of sound material and good workmanship, should be sanctioned for use in a formal and open manner, and samples kept in view. Thus inspectors might know what to pass and what not to pass, and builders, owners and contractors might know exactly what appliances were sanctioned, and thus be able to choose out of those sanctioned the most suitable for the kind of house or situation being dealt with.

It is only by control of the installation being thus orderly, and centering in one department, that the treatment of house refuse can be put on a satisfactory footing, and the local authority again perform its clearly defined and much neglected duty.

SUMMER SCHOOL OF TOWN PLANNING.

The first course of lectures in Town Planning to be given in the University of London will take place in August, when a summer school will be held from the 3rd to the 15th. The lectures will be given in the new School of Architecture at University College. This building is the largest and most complete of its kind in the United Kingdom, and it is intended to use some of the rooms at an early date for a Department of Town Planning.

A similar summer school has been held for the last two years at Hampstead Garden Suburb, and this year several demonstrations will be given at the suburb, where the large area of land being developed on town planning lines serves as an excellent ground for study.

Mr. Raymond Unwin, F.R.I.B.A., architect of the Hampstead Garden Suburb and special lecturer in town planning in the University of Birmingham, will lecture on the practice of town planning; Prof. Ad-head, of Liverpool University, the first professor of town planning in this country, and Mr. L. P. Abercrombie, lecturer in civic design at Liverpool University, will deal with the foreign and historical aspects of the subject. Mr. E. R. Abbott, who, as clerk to the Ruslip-Northwood District Council, has been in charge of the legal side of the town planning measure here, lectures on the Act and the legal problems connected with it. The engineering side is being taken by two lecturers, both of whom are in charge of town planning schemes. Mr. G. L. Pepler, F.S.I., and Mr. Chas. J. Jenkins, M.A.S.T.C.E., M.I.M.E.C.E. Dr. Brinckmann, professor at Karlsruhe, will outline the development of town planning in Germany, and it is hoped that Mr. John Nolan will be in England in time to lecture on town planning in America. A lecture by Mr. H. V. Lanchester, F.R.I.B.A., with the interesting title, "Tradition and Civic Development," is also announced.

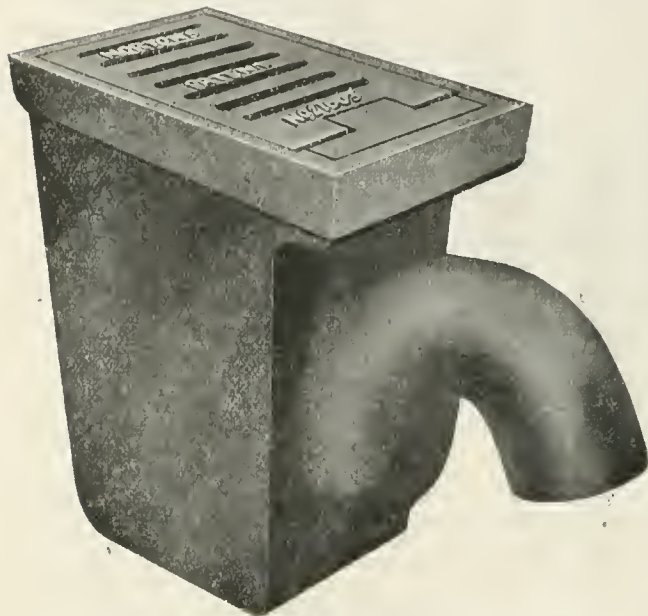
A programme of excursions and visits has been arranged to a number of centres of housing and town planning interest. On the first day of the session the president of the summer school, Mr. Herbert Samuel, President of the Local Government Board, will give an address at a reception of students to be held at University College.

The syllabus of the course can be had on application to Mr. J. S. Rathbone, joint hon. secretary, Fitzalan House, Finchley, N.

THE NORTON PATENT SURFACE BOX.

We illustrate herewith some examples of the various types of surface boxes made by the Norton Patent Surface Box Company, of 25 Bucklersbury, London, E.C.

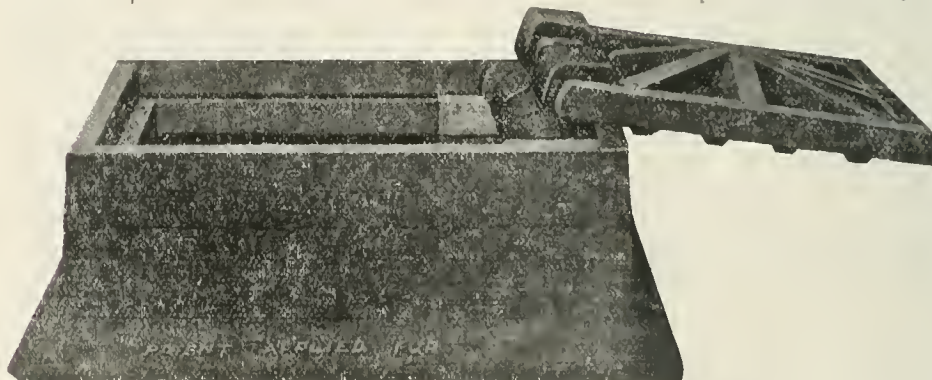
The special feature of these surface boxes is that their construction permits of broken, smooth, or dangerous covers being removed and new ones re-fixed in a few minutes without disturbance to the frame or roadway, or interference with traffic—an arrangement which, as engineers will be quick to



NORTON'S ROAD GULLEY, WITH DOUBLE-LINK COVER AND TRAP OUTLET.

realise, makes for very considerable savings in cost of repairs.

The boxes are arranged with a specially designed cover with a loose hinge fitted into recesses, in which are white metal blocks forming a non-corrodible bearing for the hinge, thus preventing rusting up. There are no bolts or nuts of any description, and the blocks are interchangeable—in fact, simplicity of construction is the keynote of the design throughout. The firm's recently designed covers for man-



HYDRANT OR VALVE CASE, WITH DOUBLE-LINK COVER.

holes, gullies, hydrants, meters, and so forth, while combining all the advantages of an interchangeable lid, are fitted with a double hinge which enables them, when open, to lie flat on the roadway; and it may also be pointed out that where traffic is extraordinarily heavy, steel or malleable iron covers can be fixed to the frames.

The company have already secured the patent rights in Great Britain, South Africa, Canada, New Zealand, and various foreign countries; but we understand that, so far as Great Britain is concerned, they are prepared to allow any manufacturing firm to make under their licence, in order that public authorities may place contracts in the hands of local firms. Already 5,000 of the firm's surface boxes are in use.

In reference to the enormous saving in cost by the use of the Norton patent surface boxes, it may be

mentioned that one water company in England spent, between 1902 and 1914, £8,470 for between 9-10,000 cases, a large proportion of this being made up in the cost of paving, labour, and removal of old cases. In the new system of Norton's patent the whole total cost during these twelve years to this particular water company would have been only £847, which is exactly 10 per cent of the money actually spent during the twelve years.

A "RING" IN ENGLISH WATER PIPES ?

WINCANTON RURAL COUNCIL AND A PROPOSED FRENCH SUPPLY.

With regard to the scheme for providing a water supply for Charlton Musgrove, for which work the tender of Messrs. Wright & Son, of Glastonbury, has been accepted, Mr. Phelps, of Shepton Mallet, the engineer engaged for the undertaking, attended the meeting recently of the Wincanton Rural District Council, and (the *Western Gazette* reports) made a statement to the effect that Messrs. Wright now found that the best terms they can get for the pipes—a 3-in. main—were from a firm in London for pipes made in France. The contractor had spoken to him (Mr. Phelps) asking if these French pipes could be used, and he had replied that if they came up to the specification, with the approval of the council, he would have no objection. Mr. Phelps added that these pipes were now being used very much in this country, which was probably due to the fact that a "ring" had been formed in England among English pipe makers as regards the price, with the result that French-made pipes were now coming into this country very freely.

In answer to Colonel Ridley, Mr. Phelps said that the fact remained that French firms could deliver these pipes in this country much cheaper than English makers.

Colonel Ridley remarked that he had never known anyone make a fortune either out of pipe making or brick making.

Mr. Osmond (representative of Charlton Musgrove) said it would be a pity to spoil the ship for a half-pennyworth of tar, and they wanted to have the best kind of pipes for the work.

Mr. Phelps pointed out that certain constituents in soils affected pipes, but if the French make were used he would take every precaution against that.

The chairman (Mr. W. E. Stacey) raised a point as to whether they would be doing justice to the other contractors who tendered for the work to have French pipes.

Mr. Scammell thought the council should not be prejudiced against the foreigner if the pipes were as good and cheaper than English made.

Mr. Phelps remarked that he would like to frustrate the object of the "ring" that had been formed, which brought a reply from Mr. Osmond that he hoped it would not be done at the expense of Charlton Musgrove.

Mr. Cornish: We should certainly support our own industries, but I must say I don't like this "ring."

Mr. Wright, the contractor, was also called into the meeting, and on the question of a reduction in the price of his tender in consequence of the price of pipes having since gone down, he was prepared to make a reduction of £67, and a further reduction now of £20. Asked as to the French pipes, he expressed the belief that they would last as long as English make, and said that he had already laid 20 miles of them.

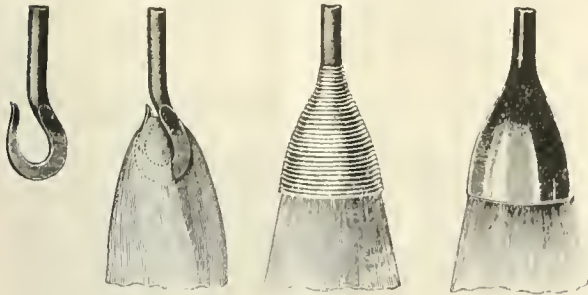
Mr. Phelps said it was right that the council should know that some of those pipes had been eaten through.

Mr. Wright remarked that it had been proved on analysis that it was nothing to do with the pipes. However, he was quite prepared to make the reduction he had mentioned, although he would be out of pocket if he could not use French pipes, which had been used for the Bridgewater gasworks.

After further discussion it was agreed that English-made pipes only should be used.

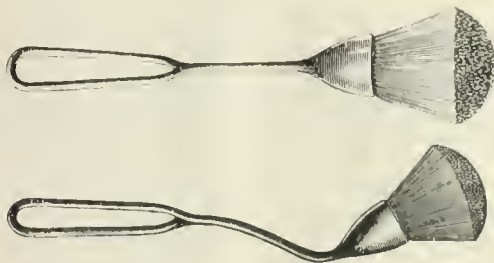
BRUSHES FOR ENGINEERING PURPOSES.

The saying that "new brooms sweep clean" is based on a knowledge of the fact that, for several reasons, the efficiency of a broom or brush rapidly becomes less when the instrument is in regular use. In engineering work—notably in the cleaning of engines and machinery and in road sweeping and



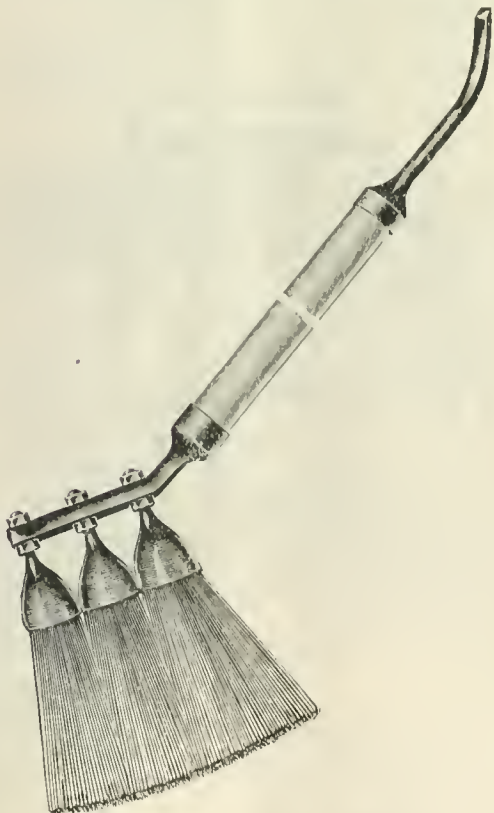
METHOD OF MANUFACTURING "FEARLESS" BRUSH.

tarring—it is especially desirable to be able to use brushes which will not leave some of their fibres behind them in the working parts of the engine or on the road, and when we reflect



ENGINE-CLEANING BRUSHES.

that the rate at which a brush can be used is in direct proportion to its efficiency, we must realise that any device or method of construction which prolongs the life of a brush reduces the cost of labour in the operations in which it is employed.



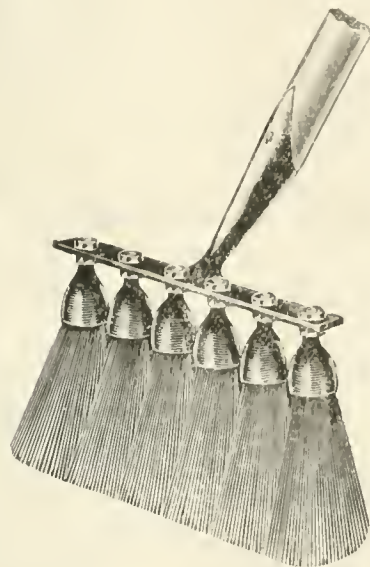
TRAMWAY OR RAILWAY POINT BRUSH AND SCRAPER.

One must not, however, overdo the expenditure on new brushes, and it is, therefore, of importance that the most lasting implements should be bought.

In this connection, attention may be directed to the

range of brushes made by the "Fearless" Brush Company, Limited, of No. 26 Hart-street, London, E.C., which are of considerable technical interest. These brushes are made without the use of any cementing material, and the fibres cannot, therefore, be loosened by solvent liquids or by variation in temperature. The fibres are held by a hook which is clamped, and this hook, with its loop of fibres, bristles or hairs, is then lapped with wire, and the wire soldered. Among the advantages of this method of construction that have attracted the attention of those who use brushes for engineering and other purposes, the following may be noticed: The brushes may be disinfected by immersion in a suitable liquid, and can even be boiled without loosening the fibres; they resist the effects of tar, oils, acids and other liquids; the fibres do not become detached, and get left behind in the valves or other working parts of machinery, and cannot be loosened by rough treatment.

From the point of view of the municipal engineer, all these considerations are important, and it may be further noted that the use of detachable knots is very convenient in the cases of road sweeping and



STIFF BASS BRUSH WITH INTERCHANGEABLE KNOTS.

tarring, and the cleaning out of tramway grooves and points. If the knots of which the brush is made up become worn they can be reversed or replaced with new ones. For road tarring, the advantage of being able to clean the brush by dipping it in a tar-solvent liquid is an important one, and for engine-cleaning work the resemblance which, in principle, the brush bears to a rag looped round a piece of wire is significant of its value for this purpose.

The "Fearless" Brush Company, Limited, have issued an illustrated catalogue showing many classes of brushes to which their patent principle is applied, and this should be in the hands of all municipal engineers and surveyors.

Burton Sewage Problem.—The Burton Corporation have a perplexing problem in hand in respect of the rising main of their sewage farm. At a special and private meeting of the town council it was decided to duplicate the main, at a cost of something like £30,000. Difficulty has been experienced for some time past, and only recently ½ mile of the rising main, between the pumping station and the sewage farm, was duplicated, at a cost of £4,000. Now it has been decided similarly to safeguard the remaining 4½ miles of main. This important step is believed to have been precipitated by a threatened action on the part of a neighbouring parish council, on the ground of alleged pollution of the Trent, and consequent annoyance to residents down the river, as the result of Burton sewage being turned into it. On one or two occasions last year the rising main burst, and sewage ran into the river. The sewage which has to be dealt with amounts to 40,000,000 gallons a week, and it is reported that something like four-fifths of this emanates from the breweries of the town. The decision to undertake the work, the *Birmingham Daily Mail* states, was arrived at unanimously, but it is believed one member was strongly of the opinion that the brewers should be asked to contribute more largely to the cost of disposal.

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A.,
Borough Surveyor, Great Yarmouth.

NORTH-WESTERN DISTRICT.

A meeting of the North-Western District is to be held at Lytham to-morrow (Saturday).

PROGRAMME.

11 a.m.—District executive meeting.

11.30 a.m.—District meeting.

Reception in the council chamber by the chairman of the council, Mr. Councillor J. Pearson, J.P.

District business.

Paper by Mr. Arthur J. Price, engineer and surveyor, on "The Municipal Works at Lytham," which will be taken as read.

Discussion.

1 p.m.—Lunch at Clifton Hotel.

2.15 p.m.—By the kindness of the Blackpool, St. Anne's, and Lytham Tramway Company, cars will be provided to enable the members to visit the West End outfall sewage works (in course of construction), the East End sewage and destructor works and slaughter-houses.

4.30 p.m.—Afternoon tea will be provided for the members at De Grey's Café.

ANNUAL GENERAL MEETING AND TOWN PLANNING, HOUSING AND ROAD CONFERENCES.

The forty-first annual general meeting of the institution will be held at the Town Hall, Cheltenham, on Wednesday, Thursday, Friday and Saturday, June 24th, 25th, 26th and 27th. Conferences will take place with delegates from the various corporations and local authorities of the United Kingdom and representatives of the different bodies interested in the subjects of town planning, housing and roads. An important exhibition of plans, maps and models of town planning and housing schemes has been arranged, and it is believed that the collection will be one of great educational and practical value. The exhibition will be open during the four days of the meeting. Ladies are invited to attend the meeting, visits and annual dinner, and the permission of the president may in their case be assumed, but due notice must be given on the reply form.

EASTERN DISTRICT.

An Eastern District meeting will be held at Bedford on June 20th, and one at Tilbury on July 25th.

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

EAST MIDLAND DISTRICT.

It is hoped that a District meeting will be held in South Leicestershire in the near future.

J. W. DUDLEY ROBINSON, B.SC.(LOND.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

NORTHERN DISTRICT.

Meetings will be held in Cumberland this month, at Alnwick on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

SOUTH-WESTERN DISTRICT.

A South-Western District meeting will be held at Tisbury, Wilts, to-morrow (Saturday).

PROGRAMME.

12.15 p.m.—Meet at the Victoria Hall. Short business meeting, at which will be presented a paper,

"Wiltshire Roads: Past and Present," by E. Plummer Davies, engineer and surveyor, Tisbury Rural District Council (member).

1.15 p.m.—Luncheon.

2.40 p.m.—Proceed by motor cars and motor buses to the waterworks at Lawn.

To Fonthill Arch (by Inigo Jones).

To eight new cottages on Fonthill Hill.

To Little Ridge. Inspect extensive additions to the residence of Mr. Hugh Morrison, J.P., county alderman.

To Old Tith Barn, Place Farm, Tisbury, one of the largest barns in England.

4.45 p.m.—Tea.

C. OWEN BAINES,

Hon. District Secretary

Paignton.

NORTH-WESTERN DISTRICT.

A meeting of this district, followed by a social evening, will be held at the Mitre Hotel, Manchester, on Friday, July 3rd. On the following day a visit will be paid to the waterworks of the corporation of Ashton-under-Lyne. Full programme will be issued later.

EASTERN AND NORTH-EASTERN DISTRICTS.

A visit will be paid by these districts of the institution, on Saturday, June 27th, to the quarries of the Enderby and Stoney Stanton Granite Company, Narborough.

PROGRAMME.

12.45 p.m.—Assemble at Leicester (Midland) Railway Station, and proceed by conveyances (kindly placed at our disposal) on a visit of inspection to the Enderby and Stoney Stanton Granite quarries. Arrangements will be made for blasting operations to be seen. Refreshments will be kindly provided by Mr. H. J. Grace, managing director of the company.

6.45 p.m.—Arrive back at Leicester Station.

Members of the Western District are specially invited.

Members are specially requested to note the following: August 15th and 16th, week-end visit to Hunstanton (ladies and friends especially invited), September 26th, Newmarket.

G. BELSON CHILVERS,

Hon. District Secretary.

Council Offices,
Oundle.

B. WYAND,

Secretary.

39 Victoria-street, S.W.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

ENGINEER AND SURVEYOR'S CLERK.—June 13th.—Corporation of Neath. 35s. per week.—The Engineer, Council Offices.

SURVEYOR'S CLERK.—June 13th.—Axminster Rural District Council. £52 to £65, according to ability.—Mr. Geo. A. Millard, district surveyor.

JUNIOR ASSISTANT.—June 13th.—Batley Town Council. £2 per week.—Mr. J. H. Craik, town clerk.

SURVEYOR AND WATERWORKS ENGINEER.—June 15th.—Hebden Bridge Urban District Council. £130 per annum.—Mr. Sam Ogden, clerk.

COUNTY SURVEYOR'S ASSISTANT.—June 15th.—West Suffolk County Council. £130—£150 per annum.—Mr. W. Lionel Jenkins, county surveyor, Shire Hall, Bury St. Edmunds.

INSPECTOR OF NUISANCES.—June 15th.—Basford Rural District Council. £120—£130 per annum.—Mr. H. Stone, clerk.

SURVEYOR AND INSPECTOR.—June 15th.—Stratton and Bude Urban District Council. £150—£165 per annum.—Mr. G. H. Gurney, clerk, Council Offices, Bude, North Cornwall.

WATER SURVEYOR.—June 16th.—Deal Urban District Council. £130 per annum.—Mr. Alfred C. Brown, town clerk.

CLERK OF WORKS.—June 16th.—Kirkby Moor-side Rural District Council.—Mr. R. Jennings, clerk.

JUNIOR ENGINEERING ASSISTANT.—June 17th.—Corporation of Coventry. £80 per annum.—Mr. J. E. Swindlehurst, city engineer and surveyor.

COUNTY SANITARY INSPECTORS.—June 20th.—Lancashire County Council. £200, with £25 for expenses and railway fares.—County Medical Officer of Health, County Offices, Preston.

STREETS FOREMAN.—June 20th.—Corporation of Tiverton. £100 per annum.—Mr. J. Siddalls, borough surveyor, Town Hall.

CLERK OF WORKS.—June 20th.—Northamptonshire County Council, Standing Joint Committee.—Mr. C. S. Morris, county surveyor, County Hall, Northampton.

SURVEYOR'S CLERK.—June 22nd.—Denton Urban District Council. 30s. per week.—Mr. W. Richards, clerk, Town Hall, Denton, near Manchester.

TEMPORARY ASSISTANT.—June 25th.—Corporation of South Shields. £3 10s. per week.—Mr. Leslie Roseveare, borough engineer.

CITY SURVEYOR.—August 4th.—Municipal Council of Sydney, New South Wales. £1,000—£1,300 per annum.—Mr. Thomas H. Nesbitt, town clerk, Town Hall, Sydney.

ASSISTANT ENGINEER.—Public Works Department of the Gold Coast Government. £300—£350.—Crown Agents for the Colonies, Whitehall-gardens, S.W.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

MIDDLETON.—July 16th.—Designs for a town hall, the cost of which must not exceed £18,000. Premiums £100, £50, and £25.—Town Clerk.

REIGATE. July 25th. Designs for a police and fire station, for the Corporation of Reigate. Premiums 40, 20, and 10 guineas.—Mr. A. Smith, town clerk.

LONDON.—September 7th.—Designs for elementary schools, for the London County Council.—Education Officer, Education Offices, Victoria-embankment, W.C.

BELPER.—Designs and estimates for the erection of a bridge over the River Derwent, for the Belper Rural District Council.—Mr. Robert C. Cordon, surveyor, Duffield, near Derby.

CHESTER.—Designs for working-class dwellings, for the Corporation of Chester. Premiums, £50, £25, and £10. Mr. Patrick Abercrombie, M.A., Liverpool University School of Civic Design, has been appointed assessor.—Mr. J. H. Dickson, town clerk.

GATESHEAD.—Designs for a school to accommodate 700 scholars, for the Education Committee.—Education Offices, Gateshead.

LIVERPOOL.—Designs for laying out a public park and recreation ground, for the Corporation of Liverpool. Premiums 100, 50, and 25 guineas.—Mr. E. R. Pickmere, town clerk.

WHITBY.—For the improvement of the theatre and grounds, for the Whitby Urban District Council.—Mr. T. K. Scott, surveyor.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

DEVON.—June 15th.—For the construction of a bridge over the river Yarty, for the county council.—Mr. W. P. Robinson, county surveyor, 22 Queen-street, Exeter.

GLAMORGAN.—June 15th.—For the executions of various works at schools, for the county council.—Mr. T. M. Franklin, clerk, County Hall, Cardiff.

DUBLIN.—June 15th.—For the erection of a recreation room at the tuberculosis hospital, for the corporation.—City Architect.

PENRITH.—June 15th.—For supplying and laying 1,000 yds. of 3-in. cast-iron piping, with valves and hydrants, for the rural district council.—Mr. Joseph Graham, engineer, 28 Castle-street, Carlisle.

WEST RIDING.—June 15th.—For the erection of constables' houses, for the county council.—The Architect, County Hall, Wakefield.

STAFFORD.—June 16th.—For building two reinforced concrete bridges and retaining walls, and the construction of a new roadway, for the rural district council.—Mr. Frank Idiens, surveyor, Crabberystreet, Stafford.

UTTOXETER.—June 16th.—For the building of two reinforced concrete bridges, for the rural district council.—Mr. F. Idiens, surveyor, Crabberystreet, Stafford.

MONMOUTH.—June 16th.—For extensions to a school, for the Education Committee.—Mr. J. Bam, architect, County Offices, Newport.

SOUTHEND.—June 16th.—For the erection of public conveniences, for the corporation.—Mr. E. J. Elford, borough surveyor.

DURHAM.—June 16th.—For the erection of a school, for the county council.—Mr. W. Rushworth, Shire Hall, Durham.

DENBIGH.—June 17th—July 17th.—For the erection of a town hall and market buildings in reinforced concrete, for the corporation.—Messrs. J. Brooke & Elcock, architects, 18 Exchange-street, Manchester.

DURSLEY.—June 17th.—For the erection of eight dwellings, for the rural district council.—Mr. V. A. Lawson, architect.

GLAMORGAN.—June 17th.—For repairs and alterations to house and buildings, for the county council.—Mr. T. M. Franklin, clerk, County Hall, Cardiff.

FELTWELL.—June 18th.—For the erection and maintenance of a pumping station, for the Commissioners of the Feltwell New Fen Drainage.—Mr. E. J. S'leock, engineer, Sanitary House, 33 Tothill-street, Westminster, and 10 Park-row, Leeds.

CLONES (Co. Monaghan).—June 18th.—For the erection of eighteen cottages, for the rural district council.—Mr. H. Maguire, clerk, Workhouse, Clones.

LAMBETH.—June 18th.—For the construction of a gallery and book shelves at public library, for the borough council.—Mr. B. Penny, town clerk.

EAST KILBRIDE.—June 18th.—For the erection of an open-air school, for the District Council.—Mr. W. E. Whyte, district clerk, Hamilton.

BARROW.—June 18th.—For proposed schools, for the corporation.—Borough Engineer and Surveyor.

CROYDON.—June 19th.—For sinking and boring a well, for the corporation.—Borough Engineer.

CHESTER.—June 20th.—For the erection of a tuberculosis ward at the isolation hospital, for the corporation.—City Surveyor.

ARUNDEL.—June 21st.—For the erection of ten cottages, for the corporation.—Mr. A. Holmes, town clerk.

BRIDGWATER.—June 22nd.—For laying 6,850 yds., or thereabouts, of cast-iron pipes, 3 in. diameter, and other works appertaining thereto, for the rural district council.—Mr. W. A. Collins, 56½ Eastover, Bridgwater.

CHELMSFORD.—June 22nd.—For the erection of an engine-house and cottage, for the corporation.—Borough Engineer.

EVESHAM.—June 22nd.—For the erection of twenty-four cottages, for the rural district council.—Mr. E. Holloway, surveyor.

ANDOVER.—June 22nd.—For repainting and repairing the municipal buildings, for the corporation.—The Borough Surveyor.

SOUTHAMPTON.—June 22nd.—For the erection of a refuse destructor, for the corporation.—Borough Engineer.

FINCHLEY.—June 22nd.—For the erection of 100 houses, for the urban district council.—Mr. C. J. Jenkin, engineer and surveyor, Church-end, Finchley.

GLASGOW.—June 22nd.—For the erection of a fire station, for the corporation.—Mr. J. Lindsay, town clerk.

BLAENAVON.—June 23rd.—For the erection of fifty houses, for the urban district council.—Mr. E. W. Edwards, surveyor.

PORTSMOUTH.—June 23rd.—For the erection of a school, for the Education Committee.—Mr. C. C. Vernon-Inkpen, architect, 40 Commercial-road, Portsmouth.

LONDON.—June 23rd.—For the construction of an embankment wall in the Thames in front of the new county hall, for the county council.—Chief Engineer, Spring-gardens, S.W.

WIGAN.—June 23rd.—For the erection of a school, for the Education Committee.—Messrs. W. A. Ralph & Son, architects, King-street.

GRANTHAM.—June 23rd.—For taking down and rebuilding the lining of the chimney at the refuse destructor, for the corporation.—Borough Surveyor.

MAIDSTONE.—June 23rd.—For the reconstruction on the Hennebique system of Bow bridge, Waterinbury, for the rural district council.—Mr. R. H. Halls, engineer, High-street, Lewes.

BRISTOL.—June 26th.—For the erection of a sanatorium, for the Health Committee.—Mr. L. McKenzie, city engineer and surveyor.

PEMBROKE.—June 27th.—For the erection of a new class-room, for the Education Committee.—Mr. K. McAlpin, architect, Pembroke Dock.

FINSBURY.—June 29th.—For structural alterations to the town hall, for the borough council.—Borough Surveyor.

HLNDLEY.—June 29th.—For the erection of a school, for the urban district council.—The Surveyor.

LONDON.—June 30th.—For the construction of two storage reservoirs in the Thames Valley, together with intake works on the banks of the Thames, and certain contingent works, for the Metropolitan Water Board.—Chief Engineer, Savoy-court, London, W.C.

ABERTILLERY.—July 1st.—For alterations and extensions of a school, for the urban district council.—Mr. W. H. Hiley, architect, Chapel-street, Abertillery.

WATFORD.—July 6th.—For the erection of a pumping station, including engine-house, basement, machine shop, boiler-house, filter-house, lime store, and softening tank, for the urban district council.—Mr. D. Waterhouse, engineer, Council Offices, High-street, Watford.

WINCANTON.—July 7th.—For the construction of a reservoir, for the rural district council.—Mr. E. A. Rankin, engineer, Bourton, Dorset.

Iron and Steel.

ARNOLD.—June 15th.—For the supply of wrought-iron unclimbable fencing, for the Burial Board.—Mr. A. J. Higginbottom, architect, Hallams-lane, Arnold.

MADRAS.—June 17th.—For the supply of cast-iron pipes, special castings, sluice valves and hydrants, for the corporation.—Mr. J. W. Madeley, special engineer, and Messrs. J. Mansergh & Sons, agents, 5 Victoria-street, Westminster, S.W.

MANCHESTER.—June 18th.—For the supply of cast-iron mains, for the Gas Committee.—Mr. F. A. Price, superintendent, Gas Department, Town Hall.

KEIGHLEY.—June 20th.—For the supply of rolled steel joists and other steelwork, for the corporation.—Mr. M. R. Barnett, engineer, Town Hall.

Roads.

RUNCORN.—June 15th.—For the supply of granite macadam, setts, kerbstones, and sanitary pipes, for the rural district council.—Mr. G. F. Ashton, clerk.

WANDSWORTH.—June 15th.—Tenders are invited for the purchase of the following disused rolling stock—viz.: Seven water vans, and two water carts.—Mr. P. Dodd, borough engineer, 215 Balham High-street, London, S.W.

ST. HELENS.—June 15th.—For making up certain streets and passages, for the corporation.—Mr. A. W. Bradley, borough engineer.

MERTHYR.—June 15th.—For the supply of road materials, for the corporation.—Borough Surveyor.

ESSEX.—June 15th.—For the execution of foundation works to certain roads, for the county council.—Mr. Percy J. Sheldon, county surveyor, Chelmsford.

WHITLEY AND MONKSEATON.—June 15th.—For street improvement works, for the urban district council.—Mr. A. J. Rousell, surveyor.

WESTHAMPTON.—June 15th.—For about 600 days' steam rolling, for the rural district council.—Mr. W. D. Rasell, clerk, 5 South-street, Chichester.

KING'S COUNTY. June 15th. For the supply of a steam roller and steam rolling plant, for the county council. Mr. Charles P. Kingst n, secretary, Court-house, Tullamore.

MURFIELD.—June 15th.—For making up a road, for the urban district council.—Mr. Edwin Gill, surveyor.

TIPTON.—June 15th.—For making up a street, for the urban district council.—Mr. W. H. Jukes, engineer and surveyor.

DEPTFORD.—June 16th. For work of making up and paving, for the borough council.—Borough Surveyor.

EPSOM.—June 16th.—For making up Leigh-road, School-road and Spencer-road, for the rural district council.—Mr. T. E. Ware, surveyor of highways, Waterloo-road, Epsom.

BELFAST.—June 16th.—For making up new streets, for the corporation.—City Surveyor.

STAMFORD.—June 17th.—For the supply of broken granite, for the corporation.—Mr. F. R. Ryman, borough surveyor and engineer.

WINSFORD.—June 17th.—For the supply of road materials, for the urban district council.—Mr. J. Wilkinson, surveyor.

STOCKPORT.—June 18th.—For making up certain streets, for the corporation.—Mr. J. Atkinson, borough surveyor.

LEWES.—June 19th.—For road rolling and the supply of 600 tons of 2-in. broken granite and 600 tons of broken surface-picked flints, for the corporation.—Borough Surveyor.

WHITWOOD.—June 20th.—For the supply of road materials, for the urban district council.—Mr. A. Hartley, surveyor.

BOOTLE.—June 23rd.—For the supply of granite paving materials, for the corporation.—Mr. B. J. Woffenden, borough engineer.

STRATFORD-UPON-AVON.—June 23rd.—For the supply of broken and unbroken macadam, for the corporation.—Mr. Roden Dixon, borough surveyor.

DUNMOW.—June 23rd.—For the supply of broken granite to be delivered during July and August, for the rural district council.—Mr. A. E. Floyd, clerk.

LONDON.—June 23rd.—For tar-paving works at schools, for the county council.—The Architect, 19 Charing Cross-road, W.C. (Room 74).

LEWISHAM.—June 23rd.—For making up a road, for the borough council.—The Borough Surveyor.

PONTEFRAC.—June 23rd.—For works of paving and lagging, for the corporation.—Mr. J. E. Pickard, borough engineer and surveyor.

ROMFORD.—June 23rd.—For fencing and road improvement, for the urban district council.—Mr. H. T. Ridge, surveyor.

LARNE.—June 25th.—For the construction of a new street, for the urban district council.—Mr. W. G. Younge, clerk.

EAST SUSSEX.—June 26th.—For the hiring of steam rollers and scarifiers, for the county council.—Mr. Fred. J. Wood, county surveyor, County Hall, Lewes.

SOUTHGATE.—June 27th.—For private street works, for the urban district council.—Mr. C. G. Lawson, surveyor.

BURNLEY.—June 29th.—For making up certain streets, for the rural district council.—Mr. H. Pritchard, surveyor.

SUNBURY.—July 6th.—For the supply of Guernsey granite, for the urban district council.—Mr. H. F. Coales, surveyor, Sunbury-on-Thames.

Sanitary.

WYCOMBE.—June 13th.—For the construction of sewage disposal and purification works at Princes Risborough, for the rural district council.—The Engineer.

HAYES.—June 13th.—For the construction of sewerage at Yeading, for the urban district council.—Mr. D. C. Fidler, engineer and surveyor.

HENDON.—June 15th.—For works of sewage disposal and sewerage, for the urban district council.—Mr. S. S. Grimley, Council Offices.

KENSINGTON.—June 15th.—For the construction of manholes and side entrances, with incidental works, for the borough council.—Borough Engineer.

CARLISLE.—June 15th.—For laying sewer pipes with manholes and flush tank, for the rural district council.—Mr. J. Graham, engineer, 28 Castle-street, Carlisle.

MANCHESTER.—June 15th.—For the construction of main drainage work No. II. (2), Gorton intercepting sewer, for the Rivers Committee.—City Surveyor.

BRIGHOUSE.—June 16th.—For sewage works extension, for the corporation.—Mr. S. S. Haywood, borough engineer.

LIVERPOOL.—June 16th.—For the construction of a main sewer, known as the northern outfall sewer, between Brasennose-road, Kirkdale, and the existing Walton outfall sewer, on the Walton Hall estate, for the Health Committee.—City Engineer.

BURY.—June 17th.—For the supply and erection of three revolving sprinklers at the sewage disposal works, for the corporation.—Mr. Joshua Bolton, sewage works manager, Corporation Offices.

NORTH DUBLIN.—June 17th.—For the construction of new sewers and water mains, for the rural district council.—Mr. P. H. McCarthy, 39 Westmoreland-street, Dublin.

BISHOP AUCKLAND.—June 17th.—For the erection of water closets, for the rural district council.—Mr. C. Heslop, surveyor.

CHEADLE.—June 18th.—For the removal of house refuse, for the rural district council.—Mr. F. S. Cox, clerk.

ELGIN.—June 20th.—For relaying a sewer, for the corporation.—Borough Surveyor.

MATLOCK.—June 22nd.—For the completion of the main sewerage, consisting of main outfall and subsidiary sewers of earthenware, steel and cast-iron pipes, with manholes, ventilation and flushing tanks, for the urban district council.—Messrs. J. Diggle & Son, engineers, 14 Victoria-street, Westminster, S.W.

BASFORD.—June 22nd.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. S. Maylan, engineer and surveyor.

ROWLEY REGIS.—June 22nd.—For the construction of a sewer, for the urban district council.—Mr. D. Wright, clerk, Council House, Old Hill.

FINCHLEY.—June 22nd.—For the construction of four clinker sewage filters at the sewage farm, for the urban district council.—Mr. C. J. Jenkin, engineer.

WESTBURY.—June 24th.—For the construction of stoneware pipe sewers, manholes, and flush chambers, for the urban district council.—Mr. W. H. Radford, engineer, Albion Chambers, Nottingham.

NEWPORT (Mon.).—June 29th.—For the construction of a stoneware pipe sewer, for the corporation.—Borough Engineer.

Stores.

ATHERTON.—June 17th.—For the supply of road materials, scavenging and machine brushes, iron castings, lime, gas meters, and cast-iron junctions, for the urban district council.—The Surveyor.

CROYDON.—June 19th.—For the supply of Portland cement, for the corporation.—Borough Engineer.

LEEDS.—June 22nd.—For the supply of articles, for the Gas Committee.—Mr. W. B. Leach, general manager, Gas Offices, Market Hall, Leeds.

Miscellaneous.

RICCALL.—June 18th.—For the erection of creosoted wood fencing and gates, for the rural district council.—Mr. A. Douglas, district surveyor, Barlby.

WALTHAMSTOW.—June 24th.—For the supply of four motor tractors and motor sweeper, for the urban district council.—Mr. E. Morley, surveyor.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance. ‡ Provisionally accepted.

BARNSELY.—For the erection of a sanatorium, for the corporation.—Mr. J. H. Taylor, borough surveyor, Barnsley: New Pavilion.—G. Haigh, Barnsley, £1,707. Alterations to Existing Buildings.—G. Haigh, Barnsley, £378.

BRENTWOOD.—For the construction of underground conveniences, for the urban district council. Mr. A. J. Meeson, surveyor:—

W. Lingwood, Romford	£548
F. W. Jarvis, Brentwood	355
W. & C. French, Buckhurst Hill	352
S. Cronin & Son, Brentwood*	323

DISLEY. For laying pipe sewer and constructing manholes, for the rural district council. Mr. C. S. Righton, surveyor:—

Gosling & Stafford, Stockport.	
J. R. Crisp, Stalybridge.	
J. Briscoe, Stockport.	
S. L. Williamson & Son, Derbyshire.	
D. Eadie & Co., Stockport	

DOVER. For the erection of twelve workmen's cottages, for the corporation. Mr. W. C. Hawke, borough engineer:—

C. Horton, Dover	£3,012
H. F. Caspall, Dover	2,793
W. H. Grigg, Dover	2,787
G. Lewis & Sons, Dover*	2,686

EPSOM. Accepted for the removal of house refuse, for the rural district council. Mr. F. A. Pratley, surveyor:—
J. Willis, Ashted, £170.

KIVETON PARK. For works of sewerage, for the rural district council. Mr. F. Hewitt, engineer and surveyor:—

SURFACE-WATER SEWERAGE, DINNINGTON.

H. & E. Andrews, Sheffield	£1,691
Edwards & Co., Doncaster	1,596
S. Porter & Son, Doncaster	1,532
J. E. Nadin, Sheffield	1,502

MAIN DRAINAGE EXTENSIONS, DINNINGTON.

S. Porter & Son, Doncaster	£318
J. W. Revill, Dinnington	310
J. E. Nadin, Sheffield	285
Edwards & Co., Doncaster	259
J. Turner, junr., Loughton	253
M. Whitehead, North Anston	237

LLANDAFF. For flagging footpaths, for the rural district council.—Mr. J. Holden, surveyor, Cardiff:—

C. Davies, Cardiff	£813
E. Rees, Whitchurch, Glam	799
J. Harry, Radyr, Glam	792

MARKET HARBOROUGH. For the erection of a brick and puddle gasholder tank, for the urban district council.—Mr. A. T. Harris, engineer:—

W. Muirhead & Co., London	£5,178
Taylor & Hales, London	4,633
A. Pacey & Sons, Leytonstone	3,890
H. Ashley, Mansfield	3,569
A. & S. Hyslop, Manchester	3,379
T. Vale & Sons, Limited, Stourport, Worcs	3,231
T. Hickman & Sons, Market Harborough	3,189
G. Bell & Sons, Limited, London	3,090
Southern & Co., Leicester	1,926
A. E. Palmer, Glenfield	1,025
Johnson & Langley, Leicester	1,022
J. J. Shardlow, Leicester	2,989
G. Henson & Sons, Wellingborough	2,851
G. Jarman & Sons, Market Harborough	2,850
Moss & Co., Limited, Loughborough	2,707

NEWCASTLE-UPON-TYNE. For the extension of the laundry and mortuary, for the Sanitary Committee. Mr. F. H. Holford, city and property surveyor:—

J. & W. Lowey, Newcastle-on-Tyne	£6,040
J. Jackson & Sons, Newcastle-on-Tyne	5,753
Middlemiss Brothers, Newcastle-on-Tyne	5,661
G. C. Carr, Newcastle-on-Tyne	5,648
Elliott Brothers, Newcastle-on-Tyne	5,500
G. Douglass, Newcastle-on-Tyne	5,448
J. Douglass, Newcastle-on-Tyne	5,308
Kirk & Brown, Newcastle-on-Tyne	5,299
J. L. Miller, North Shields	5,290
S. Miller, Newcastle-on-Tyne	5,235

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JUNE.

- 13.—Institution of Municipal and County Engineers: North-Western District Meeting at Lytham.
- 13.—Institution of Municipal Engineers: Western District Meeting at Tisbury. Mr. E. Plummer Davies on "Wiltshire Roads, Past and Present."
- 17.—Royal Institute of British Architects: Annual Dinner, Hotel Cecil.
- 20.—Institution of Municipal and County Engineers: Eastern District Meeting at Bedford.
- 24.—Institute of Sanitary Engineers: Visit to Linton sewage farm. Train from St. Pancras, 2.50 p.m.
- 24-27.—Institution of Municipal and County Engineers: Annual Meeting and Town Planning, Housing and Road Conference at Cheltenham.

JULY.

- 2.—Institution of Civil Engineers: Conversazione, 8.30-11.30 p.m.
- 3.—Institution of Municipal Engineers: North-Western District Meeting at Manchester
- 4-11.—Royal Sanitary Institute: Annual Congress and Exhibition at Blackpool.
- 6-10.—Institution of Mechanical Engineers: Summer Meeting in Paris
- 25.—Institution of Municipal and County Engineers: Eastern District Meeting at Tilbury.

SEPTEMBER.

- 19.—Institution of Municipal and County Engineers: Meeting at Cleethorpes.
- 26.—Institution of Municipal and County Engineers: Meeting at Scarborough.

TENDERS WANTED.

DUNMOW RURAL DISTRICT COUNCIL.

The above-named Council invite Tenders for the Supply of Broken Granite, to be delivered free during July and August, as under:—

- Thaxted Station—
356 tons 2-in. gauge,
200 tons 1½-in. gauge.
- Felstead Station—
110 tons 1½-in. gauge.
- Takeley Station—
90 tons 1½-in. gauge.

Tenders (on Forms to be obtained of me), with samples, should reach me not later than the 25th inst.

A. E. FLOYD,
Clerk.

Dunmow, Essex.
June 9, 1914. (1,694)

(Continued on p. xx.)

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

CLERK OF WORKS (experienced) for Water-works wanted by the Kirbymoorside Rural District Council. Apply, in candidate's handwriting, stating age, experience, references, and salary required, not later than noon, Tuesday, June 16th, to R. Jennings, Clerk Rural District Council, Kirbymoorside, Yorks. (1,684)

URBAN DISTRICT COUNCIL OF DENTON.

APPOINTMENT OF SURVEYOR'S CLERK.

The above Council invite applications for the position of Clerk in the Surveyor's Department.

The person to be appointed must have had experience in the keeping of time and wages books, stores accounts, day books, &c., and be an efficient shorthand typist.

Candidates with experience in the office of a Surveyor of a Local Authority preferred.

The salary will be 30s. per week.

Applications, in Candidate's own handwriting, stating age, qualifications and previous experience, accompanied by copies of not more than three recent testimonials, and endorsed "Surveyor's Clerk," to be sent in so as to be received by the undersigned not later than Monday, the 22nd day of June, 1914.

WM. RICHARDS,

Clerk to the Council.

Town Hall,
Denton,
Near Manchester.
May 30, 1914. (1,666)

BOROUGH OF TIVERTON.

Wanted, an experienced Man as Foreman in the Streets and Highways Department. Salary, £100 per year. Application, in own handwriting, giving full particulars of age, experience, &c., and with copies of three recent testimonials, and endorsed "Foreman," to be sent to the undersigned, from whom further particulars may be obtained, not later than Saturday, June 20th.

Canvassing will disqualify.

J. SIDDALLS,

Borough Surveyor.

Town Hall, Tiverton.
June 6, 1914. (1,683)

TAR MACADAM PAVING

Telephone: No. 232 North.

Telephone: No. 49 Matlock.

Telephone: No. 35 Walsall.

Josiah Smart & Son.

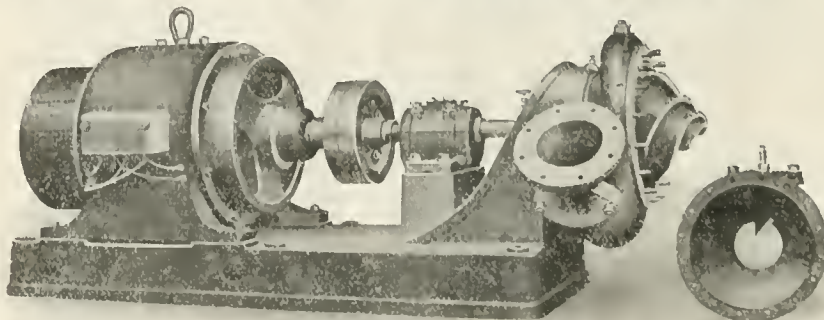
Offices:—

53 VICTORIA ST., WESTMINSTER, LONDON, S.W.

Quarries and Works:—

MATLOCK, WALSALL, and KETTERING.

STEREOPHAGUS PUMPS.



The most economical method for the automatic drainage of flat districts, basements, and isolated buildings, for the transport of sludge, and for all cases where liquids containing fibrous matter are to be dealt with.

Full particulars and estimates on application to—

THE STEREOPHAGUS PUMP
& ENGINEERING CO., LTD.,
39 Albany Buildings,
Victoria Street, S.W.

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

JUNE 19, 1914.

No. 1,170.

Minutes of Proceedings.

Salford Highways: Charges of Neglect.

Sweeping charges made by a Special Committee of the Salford Corporation with respect to the methods and policy of the Highways Committee of that corporation, to which publicity was given locally some time ago, naturally created a great deal of feeling in the town, but the wisdom of suspending judgment would appear to be justified by the report which the accused committee have prepared in their defence. It was in many respects a serious and in all respects a deplorable indictment that was levelled against the Highways Committee. They were charged with gross mismanagement of their trust, and it was alleged that, by reason of improper supervision, wages in Salford greatly exceeded the cost of materials, while a suggestion of suspicion, whether intentional or otherwise we need not stop to inquire, was raised by the statement that one firm year after year secured the order for stone setts and other material without due regard being paid to the prices quoted in other tenders. In the belief that the charges were of a nature to cause a loss of confidence in the Highways Committee, the Special Committee advised the town council not to pass the former committee's supplementary estimate for the sum over-expended until steps were taken to have the department efficiently managed, and as a result the Finance Committee withheld their sanction to the increase of the highway rate above the hitherto recognised rate of 6d. in the £, although it was admitted that this was insufficient for the due maintenance of the streets.

That such an unsatisfactory state of things as is here suggested should have been allowed to exist and to continue for a considerable period of time in such a town as Salford was, to say the least, surprising. Manifestly a responsibility rested upon the Highways Committee to meet the charges, or for ever hold their peace and hide their heads in ignominy as a body that had shamefully betrayed a public trust. The members accepted the challenge thrown out, and from a summary of their report which has been published we gather that they traverse and repudiate the report of the Special Committee in almost every particular. They state that the general complaints with regard to the working of the highway department appear to be based upon information with regard to one district only, though the methods pursued differed in many

respects. Reliable figures as to income and expenditure, they allege, had been ignored, and the committee proceed to point out that while in twenty years establishment charges have increased by 58 per cent, the works expenditure has only been advanced 5 per cent. Streets have been neglected, they maintain, owing to lack of funds, and this would appear to receive support from a comparison of the cost of upkeep in other cities, which is £283 per mile in Manchester, £368 in Sheffield, and £103 in Salford. It is denied that contracts were given year after year to the same firm regardless of circumstances, and it is explained that where the lowest tender was not accepted the material was considered to be of inferior quality. In other respects it is claimed that the committee's system was correct and proper, and as to the charge that the percentage of wages exceeded that of materials, it is alleged that the report of the Special Committee is misleading. Whether this defence will tend to exonerate the Highways Committee remains, of course, to be seen. From the statements made by the committee there appears to be no question that the borough surveyor and his staff have been for a long time seriously handicapped by the voting of sums inadequate for the proper execution of their various works. The Highways Committee have probably been lacking more in backbone than anything else, but in any case the publicity given to the subject will have served a useful purpose if it brings conviction home to the Salford Corporation that in the matter of street upkeep it is much better to face obvious facts than to seek to make a virtue of false prudence and futile economy.

* * *

The Physics and Dynamics of Road Traffic Problems.

In the first instalment of an article which appears in another part of this issue an engineer who writes under the pen name of "Contributor" discusses some of the elements of a very important subject—the effects of fast traffic upon roads. His points are made so clearly and his arguments are so definitely expressed that the reader cannot possibly be in any doubt as to the practical application of the reasoning to the immediately pressing problems of road and vehicle design. Whatever opinions may be held as to the principles and data upon which the reasoning in a scientific article is based, it will be admitted by all that the

most important desideratum is that the article shall be logical. Engineers can then express their opinions on it by direct references to the premises, and their acceptance or rejection of these will at once define their position in relation to the conclusions. In regard, for instance, to the relation between speed and dynamic effects, the writer of the article has correctly interpreted natural laws as regards the effects of braking a vehicle and the effects of the reaction between the vehicle and the road crust at bends and turnings. The dynamic effect is in those cases theoretically proportionate to the square of the speed. As regards thumping effects, however, the blows which the vehicle inflicts upon humps, for instance, the dynamic effect is directly proportionate to the speed—not the square of the speed. Again, as regards the relations between the nature of the tyres and the vehicle's repair bill, if we provisionally accept the estimate referred to in the article, it follows, logically, that a similar relation must obtain as regards thumping effects upon the road.

We do not, however, accept the whole of the conclusion come to in the article, because we know, both practically and by calculation, that the higher speeds result in relatively greater attrition effects, not only on account of what happens during acceleration and deceleration, but also because the power required to drive the vehicle is much greater than in simple proportion to the speed. There is also to be considered the fact that on many kinds of road crust the rubber tyre has a nearly constant tendency to loosen the surface when under the same conditions a steel or iron tyre has no such tendency; the zero line of the curves of comparison is not the same. As regards the comparison between "elastic" and "rigid" crusts, the writer of the article puts the matter in such a way that the practical application of his terms and of his arguments is perfectly clear. It is to be observed, however, that he uses the term "elastic" in a special sense—the property of being elastic through a relatively large contraction or expansion. The rigid road crust to which he refers is really elastic, particularly the telford type, but what "Contributor" wants to obtain is a material with a lower modulus of elasticity. He might, in fact, say that he wants a greater range of resiliency.

We have so often advocated increased thicknesses for road crusts that we feel bound to point out that greater thickness does not involve any sacrifice of elasticity. To suggest that it does implies a reliance upon the elasticity of the natural foundation—a very dangerous doctrine, unless, which seems quite needless, we were to make road crusts capable of standing really severe cross-breaking stresses. The foundation under a road is a continuous one, and by making thick crusts this natural foundation can be made to serve our purpose. Some degree of resiliency, that is a reasonably low modulus of elasticity, and a reasonably high actual elasticity are desirable in the whole of this crust. The top course may be made with materials having a lower modulus of elasticity, which, seemingly, is what "Contributor" desires. We believe, however, that a more important advantage of the carpeting system is that the materials of the carpet may be so chosen that plastic deformation may be followed by plastic restoration of form, and that the carpet may be readily replaced when it is worn without involving the expense of making up the strength crust. To understand what are the most satisfactory combinations or compromises as between elasticity, plasticity and rigidity is to be a master of the art of road-crust construction. We strongly commend "Contributor's" article to the notice of our readers, and shall be glad to give publicity to their views on the important

matters of principle and practice with which he deals.

* * *

A Local Government Board Report.

The Local Government Board have recently published Dr. Reginald Farrar's report to them on sanitary administration in the Wigton Rural, Wigton Urban, and Holme Cultram Urban Districts—a document which not only makes very interesting reading, but also demonstrates the value of that department of the board's activities which is concerned with the holding of inquiries similar to that undertaken by Dr. Farrar. The inquiry was held in consequence of certain information which had come to the knowledge of the board in 1912 to the effect that in the Wigton Urban District the housing conditions were bad, and that in the Wigton Rural and Holme Cultram Urban Districts the water supplies were deficient and the methods of excrement and refuse disposal unsatisfactory in certain villages. Dealing first with the Wigton Rural District, and especially with the water supply in that area, Dr. Farrar points out that for several years past the medical officer of health in his annual reports has drawn the attention of his council to the inadequacy and unsatisfactory character of the supplies of water in many parts of the district, particularly in its northern portion. In 1911, analyses of the water of 101 wells showed that no fewer than seventy-eight were polluted! In consequence of the continued representations of the medical officer of health, the district council ultimately directed their surveyor to prepare a scheme for a gravitation supply for those portions of the district which were in the greatest need. Having regard to the exceedingly unsatisfactory conditions, it comes as rather a shock to read that the scheme met with considerable opposition from the parish councils, chiefly, it would appear, on the ground of its cost. Dr. Farrar, in our view, sums up the position with extreme moderation when he says that, having regard to the urgent need of water in the area, an expenditure of the order indicated in the surveyor's estimates can hardly be called prohibitive or out of proportion to the benefit which the district is likely to receive.

We turn now to that part of the report which deals with housing conditions in the Wigton Urban District. The present position may be gauged from the following extract:—

The prevalence of casual labour and the deficiency of well-paid regular occupation for men have discouraged building, and fostered the demand for houses of low rental; the deplorable tendency to buy up old house property at low prices for speculative profit has created a vested interest in slums; while the inertia of the district council has perpetuated conditions which seem by no means creditable to that body. In few towns of England, within my experience, are the housing conditions so wretched as in the central parts of Wigton.

No wonder that Dr. Farrar deems it necessary to recommend that the district council should pay prompt attention to the unsatisfactory housing conditions that prevail in their district. In the Holme Cultram Urban District, too, the report recommends increased and systematic action under the Housing (Inspection of District) Regulations, in addition the provision of a system of public scavenging for Abbey Town and other matters. It is to be hoped that in each of these districts it will be recognised that it is unwise to restrict expenditure at the cost of efficiency when the interests of public health are at stake.

* * *

Mechanical Filters in America.

The mechanical filter is being used in America for the treatment of the very largest water supplies. At St. Louis a plant capable of treating 160,000,000 gallons a day is now in course of con-

struction, at Baltimore there is an installation with a capacity of 128,000,000 gallons a day, while by comparison a third installation at Trenton, New Jersey, which can deal with 30,000,000 gallons a day seems quite small. The adoption of mechanical filters on this large scale is entirely due to the good results produced at smaller installations. With the mechanical filter plus chemical treatment, it is felt that the purification of the water can be effected to any required degree, and, no matter how turbid or impure the raw water may be, the engineer and the chemist have means ever ready to hand to give the water the special treatment it may require. By a very simple provision of settling tanks and mixing channels, such preliminary treatment as may be required can be given, or if the water is sufficiently pure no chemicals need be used at all; and the American engineer appears to have grasped the important fact which we in England seem slow to understand, that as the raw water drawn from a river or storage reservoir varies in quality from time to time, so must its treatment vary. It is also notable that at all the new works we hear of provision being made for the application of a sterilising agent to the water whenever this may be required. Great care is given also to the way in which coagulant chemicals are added to the water. At St. Louis it is estimated that a saving of 30 per cent in the chemicals will be effected merely by allowing a long period for the softening action of the lime before sulphate of iron is added, thus avoiding the loss due to incomplete chemical reactions.

The completeness of detail is shown by the fact that even the wash water at Baltimore is clarified before it is discharged. The economy in power effected at Trenton by the use of a tank made like a gas holder for the storage of air and wash water is also noteworthy, an estimated saving of nine-tenths of the power required for the pumps and blower being effected by its means. Covered concrete tanks, 50 ft. by 28 ft., filled with a 30 in. depth of sand, resting on 12 in. of gravel, do not appear at first glance to differ greatly from ordinary slow sand filters as used at smaller works in this country. The real difference, however, lies in the facilities for regular and perfect mechanical cleaning, the working under a greater pressure with sand of finer grade, and the careful preliminary and after treatment of the water.

There can be no doubt that where such a system is applied the source from which the water is obtained becomes more a matter of quantity than of quality, for with the modern appliances and with our present knowledge we may treat the water so as to make it conform with the highest standard of purity. If the principle applied to these great American works were applied to small town or village installations in this country, there are few places which could not be supplied at comparatively small expense. The practice of always seeking a supply absolutely free from all possible contamination, even though this involves enormous expense, is unreasonable, and we adopt it in spite of the fact that the purest supply is always liable to accidental specific contamination of the worst kind.

Bituminous Road Carpets for a Surrey Urban District.

The example set by Mr. A. Dryland, M.I.N.S.T.C.E., county surveyor of Surrey, in adopting the carpeting principle for important main roads, has been followed by Mr. W. H. Grieves, engineer and surveyor to the urban district council of Sutton, in that county. Since the kind of bituminous carpet which Mr. Grieves proposes to use is similar to that adopted by Mr. Dryland, and since the way in which the carpet will be put down is also similar, we need not repeat here the observations which we made with reference to Mr. Dryland's scheme. The considerations which

have led up to the adoption of this method of reforming the road crusts of the Sutton Urban District are ably set forth in Mr. Grieves' very interesting report, the purport of which is given in our summary in another part of this issue.

This trial of a sand-bitumen carpet, with a small proportion of a stone filler, is bound to provide valuable data, and the cost per square yard is so low that even if the carpeting fails to last as long as is expected it may prove a useful and economical means of making up road crusts for heavy traffic. Mr. Grieves is alive to the importance of effecting the strengthening of the edges of the road crusts when they are provided with these bituminous carpets, and we venture to suggest to him that it will be worth while to adopt a more expensive and efficient method than that mentioned in his report, in view of the long life which is expected of the new carpeting and the relatively large number of chances of injury to the edges of the crusts before they are made up again. The most important element affecting the durability of a good tough road carpet, such as asphalt, is the behaviour of the strength crust as regards distortion, and the efficiency of the water-bound broken-stone crust as a strength crust supporting a waterproof carpet has yet to be determined practically under service conditions. The results of Mr. Grieves' practical trials of this method will be awaited with much interest.

As regards the durability of the carpet we may have to wait for some years for definite indications of its value, but in the meantime much may be learned as to its behaviour under wear, and the probable limits of its applicability to gradients. We wish Mr. Grieves every success in his new departure, and feel sure that his skill and energy will be directed to making the most economical use of the machinery and materials employed. Our own contribution to the subject is a definite recommendation that the desirability of bringing up the road crusts to ample thicknesses may be considered in a liberal spirit, since the cheapness of the carpet layer fully justifies a fairly large expenditure in this direction.

The Surrey County Council and their Surveyor.

The salary of 50 guineas per annum which is paid by the Road Board to the members of their Advisory Committee provided the Surrey County Council with a subject for a considerable discussion at their last meeting. Our readers will be aware that one of the members of the committee is Mr. A. Dryland, the county surveyor of Surrey, and the debate arose on the question of whether he, being a whole-time officer of the council, could with propriety be permitted to retain his salary from the Road Board, or whether he ought to pay the amount into the county fund. It must at once be said that the discussion proceeded entirely upon the question of principle involved, and that no disparaging word was said either as to Mr. Dryland's professional worth or as to his serving the Road Board, with the consent of the county council. On the contrary, many kindly references were made to the great services which he has rendered to the county since his appointment. In the result, the recommendation of the Highways Committee that he should be allowed to retain the amount, was referred back, with a broad hint that the time has come when his salary should be increased. Thus the principle will be maintained, and at the same time Mr. Dryland's many friends will see that he is not to be allowed to lose over the matter. It would be well if similar discussions in other councils were always conducted in the same spirit.

Fast Traffic, its Effect on Roads, and the Remedy.

By "CONTRIBUTOR."

Our roads now carry traffic differing widely from that of the past, not only in the total number of vehicles and in the great increase of axle weight of many of them, but chiefly in the great increase in average speed. The first two matters have been much discussed in your columns and elsewhere, but the effect of modern high speed has not been so much discussed, nor has it received the consideration which in the writer's opinion it deserves to receive, for it seems probable that the high and increasing speed at which motor traffic of all classes is now traversing our highways is likely to form the most difficult problem which the road engineer has to face.

We may assume that in the past, on most country roads, so large a proportion of the traffic was haulage of agricultural produce, and that passenger vehicles were then comparatively few in number, so that the average speed then approached very closely to the horses' walking pace. Therefore we may safely say that it is unlikely that it exceeded 5 miles per hour, whereas on a modern road, where the bulk of the traffic now consists of motor vehicles, heavy, medium, and light, and where the horse-drawn vehicle is comparatively infrequent, it is probable that the average speed of the vehicles will now be found to work out at over 16 miles per hour.

No one will question the well-known engineering formula—*i.e.*, that the dynamic effects of a moving body are proportionate to its mass, multiplied by its velocity squared—applies to vehicles moving on road surfaces, and if we apply this formula we shall see that for equal weights of vehicles the increase of speed from 5 to 16 miles an hour would increase the effect on the road as 1 is to 11, and this quite independent of increase of weight. Fortunately, even in the old days, it was observed that the vibration and hammering of vehicles moving at any pace higher than that of the walking pace of a horse must be cushioned by springs between the load and the road, and this cushioning action has been greatly increased by adding to the springs placed between the axles and the vehicles a highly effective cushion in the form of rubber tyres and pneumatic tyres interposed between the wheels themselves and the road surface. If it had not been for modern springing and the use of cushioning tyres, modern road traffic at modern speeds would have been impossible, if it were only on account of the immense damage to the road which would have followed on its adoption.

Modern motor traffic may be roughly divided into three classes. First there are the heavy vehicles which have axle weights often exceeding 8 tons, and which are generally provided with rigid steel wheels. The speed of these by law should not exceed 5 miles an hour, but in practice they usually attain an average of 7 miles. Then comes the medium motor-van traffic usually carried on wheels having solid rubber tyres. The average speed of these vans on country roads is apparently about 16 miles an hour. Then there is the light vehicle usually carried on pneumatic tyres, of which the speeds in many cases exceed 40 miles an hour, and of which a very conservative estimate of the average may be put at 20 miles.

If we assume that the statements made by the rubber tyre makers are approximately correct—that the cushioning action of the rubber saves the vehicle and thereby reduces the repair bill somewhat in the proportion of halving the cost when solid rubber is used in place of steel, or quartering the cost if pneumatic tyres are used, and that the damage done to road surfaces is mitigated in about the same proportions—we can readily calculate that a heavy steam lorry loaded up to 8 tons on the back axle, running at 12 miles an hour, damages the road as much as a 2-ton vehicle driven at nearly 50 miles an hour on pneumatic tyres, and that equal damaging effect is probably caused by medium 5-ton solid rubber-tyred tradesmen's vans running at about 20 miles an hour.

The damage which is done to road surfaces by traffic, and which is chiefly due to speed effects, is not confined to mere abrasion of the surface, but causes rapid formation of potholes, or cross corrugations, even when the road surfaces are surface tarred and the road material is excellent in quality.

As the undoubted convenience to the general public

of the motor omnibus depends largely on the speed at which passengers can be carried from point to point, and as this applies equally to the popularity and convenience of the modern motor delivery vans, it is extremely unlikely that any attempt will be made to reduce the speeds at present observed; in fact, it is much more probable that the future will see still greater speeds safely attained, and the writer has therefore thought the present moment fitting to discuss the views of the two schools of engineers and surveyors who are attempting to deal with the problem.

First, we must take what we may call the rigid school. This comprises all the men who, from the days of Telford, have thought that the stability and endurance of the road can be best effected by mass in the foundations, rigidity in the road crust itself, and in the wearing surface. On all sides we hear proposals to increase the thickness of the concrete supporting our wood pavements, of reverting to nicely squared and jointed granite-sett pavement for carriageways in our towns, and a similar extension of the use of rigid foundations, in the shape of concrete sub-crusts, for country roads. In America the roads themselves, even to the wearing surfaces, have been made with hydraulic concrete.

On the other hand, a school of engineers, of which the writer is one, are trying to impart some degree of elasticity to the road, and to endeavour to find out how such elasticity is to be obtained at reasonable cost, so as to supplement by elasticity or resiliency of the road the cushioning effect of the springs of the vehicles and of their rubber tyres. Writers in the daily Press, who have evidently never gone into cost questions, now talk glibly of the necessity for rubber roads, forgetting that, apart from high cost, the rolling resistance would be increased out of all proportion to the advantages gained.

Practical road surveyors have, from time to time, noted the very excellent results that have been obtained from modern elastic bituminous carpets, and are now extending the treatment to providing not only these elastic wearing surfaces, but elastic supporting crusts, and finally elastic foundations. If this school are right, here we have a field for inquiry and experiment of the highest importance, for, if their theories are carried to their logical conclusion, large sums of money which are now being spent, or proposed to be spent, on rigid foundations and rigid crusts are being wasted, and the effects of increased rigidity on both road and vehicle will be marked; the cost of upkeep of both will be increased, whereas enthusiasts on the side of elastic treatment see prospects of a reduction of wear and tear both of road and of vehicle; and last, but not least, a reduction of the vibration now communicated to the houses and properties of the frontagers to our public thoroughfares.

(To be continued.)

Tar-macadam Plant: Notice to Manufacturers.—The Somerset County Council contemplate purchasing a portable tar-macadam-making plant, and Mr. Edward Stead, the county surveyor, Wells, is desirous of obtaining various manufacturers' catalogues, &c.

Change of Address.—Messrs. A. & F. Manuelle, granite quarry owners and marble and stone merchants, advise us that they have removed to more convenient offices at Bishopsgate House, 80 Bishopsgate, E.C. Their telegraphic address will remain as at present—*viz.*, "Feldspar." London, but their telephone number will in future be London Wall, 8836 (two lines).

A New "Journal."—The Institution of Mechanical Engineers are the latest professional body to embark on the publication of a "Journal." The new production, a copy of the first issue of which reached us during the week, will be circulated to the members about eight times a year—namely, once a month during the period of session. So far as the present year is concerned it is intended that the "Journal" shall be supplementary to the "Proceedings" hitherto published, but subsequently it is proposed that it shall replace the latter. Advertisements, needless to say, do not find a place in its pages.

Institution of Water Engineers.

SUMMER GENERAL MEETING AT STOCKPORT.

The nineteenth summer general meeting of the Institution of Water Engineers was held on Thursday, Friday, and Saturday, June 11th, 12th, and 13th, at Stockport, Mr. Thomas Molyneux, ASSOC. M. INST. C. E., the corporation water engineer of that town, being, as we announced last week, formally installed as president in succession to Mr. C. Clemesha Smith, M. INST. C. E., water engineer to the Corporation of Wakefield. Those present were Messrs. A. Andrew (Oldham), H. J. Atkinson (Manchester), F. J. Bancroft (New Barnet), J. C. Barrowclough (Batley), J. F. Bedford (Colne), A. B. E. Blockburn (Sunderland), R. A. Blakeborough (Brighouse), C. Boldry (Chesterfield), H. Braddock (Stockport), F. H. Brunt (Rochdale), W. T. Burgess (London), R. Chamberlain (Buxton), C. H. Chapman (Salford), S. C. Chapman (Torquay), J. Chisholm (Airdrie), H. Cottam (Blackpool), G. Christie (Kilwinning), W. Clemence (Walton-on-Thames), J. H. Crowther (Wallasey), F. W. Davis (Nottingham), J. Dewhurst (Chefinsford), E. W. Dixon (Leeds), F. J. Dixon (Ashton-under-Lyne), G. T. Edwards (Leicester), J. Gray (Warrington), G. Greenslade (Southampton), P. Griffith (Westminster), R. J. Hartley (Halifax), H. C. Head (Winchester), H. Ashton Hill (Birmingham), F. W. Hodson (Loughborough), F. E. Howard (London), A. H. Jameson (London), A. J. Jenkins (Jersey), Dawson Kitchingman (Southampton), G. O. H. Klopp (London), J. Lackland (St. Helens), H. Lapworth (Westminster), J. Lees (Tonbridge), L. Holme Lewis (Manchester), F. W. Lillierap (Devonport), F. W. McCullough (Belfast), W. Matthews (Westminster), W. Millhouse (Scarborough), H. Molyneux (Westminster), T. Molyneux (Stockport), C. B. Newton (Hull), C. E. Newton (Manchester), H. Nicholson (Manchester), C. W. S. Oldham (Ipswich), W. Paterson (London), A. C. Potter (London), H. Preston (Grantham), C. H. Priestley (Cardiff), R. B. Rigby (Bury), H. Robinson (Consett), Edward Sandeman (Westminster), E. J. Silcock (Westminster), C. Clemesha Smith (Wakefield), J. H. W. Stocks (Manchester), E. Wainwright (Heaton Chapel), A. H. Walker (Loughborough), W. Watts (Wilmslow), W. Watts, junr. (Wilmslow), W. Whitaker (Croydon), J. W. Wilkinson (Manchester), F. L. Williams (London), O. Williams (Aberdare), G. Winter (Darlington), H. W. Woodall (Bournemouth) and R. H. Wyrill (Swansea), members; Councillor Atkey (Nottingham), G. F. Atkinson (Blackpool), Councillor H. Bell (Stockport), Councillor C. H. Bird, J.P. (Cardiff), Alderman E. Blackall (Devonport), H. G. Blakemore (London), F. P. Candy (London), Councillor J. Cartwright (Loughborough), Councillor J. Crocker (Torquay), M. Crossley (Halifax), Prof. S. Delépine (Manchester), J. Derbyshire (Manchester), A. E. Drown (Westminster), J. E. Edmondson (Manchester), Alderman J. Evans (Warrington), Alderman Greaves (Oldham), Councillor J. Gourley (Wallasey), J. E. Hardman (Manchester), Prof. G. Hickling (Manchester), Alderman A. Johnson (Stockport), J. Johnstone (Stockport), D. Kirk (Coatbridge), Councillor R. W. Oddy (Rochdale), Councillor Ogden (Bradford), C. W. Matthews (Manchester), Councillor T. W. Potts (Stockport) and C. W. Smith (Bury), visitors.

The proceedings opened in the Town Hall, Stockport, on Thursday morning, when the mayor, Councillor THOMAS WORTHINGTON POTTS, J.P., welcomed the institution to Stockport. He said he could assure them that Stockport was very pleased to think that the institution had selected that town for their annual meeting. In selecting such a busy manufacturing centre, it was evident that it had not been chosen because it was a health or pleasure resort. (Laughter.) It was far from that. Some 150 or 200 years ago, when the river Mersey was a beautiful and pellucid stream, Stockport might have been considered a pleasure resort, but those things had had to give way to the progress of manufacture, and to-day the town was a very busy industrial centre. Still, there were some things that Stockport might justly claim to be proud of. One, of course, was its magnificent town hall, and another, of which they might be even more proud, was their splendid waterworks undertaking at Kinder. The members would have an opportunity of visiting not only the Kinder undertaking but the Alderley reservoir and the pumping station at Wilmslow. They would be able to form their own opinion on those works, and he hoped they might be benefited

by what they would see. He could assure them that they in Stockport felt proud that the institution should have selected their water engineer as president for the ensuing year. They felt very proud that they had conferred such an honour upon Mr. Molyneux, thereby in some degree giving a little reflected glory to Stockport itself. In conclusion, he said he hoped the members would have a most enjoyable and successful gathering.

Mr. C. CLEMESHA SMITH, the retiring president, then took the chair, and in a short speech thanked the Mayor of Stockport for his welcome. The institution, he said, had for one of its main objects the widening of the experience and the increasing of the knowledge of its members with a view to making them more useful to the public whom they served. With that object they had endeavoured to create a common meeting ground, not only for engineers, but for scientists and others interested in water undertakings, and they would fail in that object if they were not assured of the sympathy and support of public authorities concerned. In the past they had had many evidences of that sympathy, and they had had renewed evidence that morning that the Corporation of Stockport was in entire sympathy with their aims and objects. They had to thank the mayor for his kind welcome, and the corporation for placing that magnificent town hall at their disposal for the meetings, and for giving them the opportunity of seeing their recently completed works at Kinder.

The mayor then left the meeting amid the applause of the members.

PRESENTATION OF PREMIUMS.

The SECRETARY having read the minutes of the last meeting, which were duly signed as correct,

The CHAIRMAN presented the following premiums awarded for papers read during the year 1913:—

(1) President's Premium, value £10, awarded to W. J. E. Binnie and Dr. Herbert Lapworth for their paper, entitled "Reservoir Storage in Relation to Stream Flow."

(2) Institution Premium, value £5, awarded to W. T. Burgess for his paper, entitled "The Solubility of Carbonate of Lime."

(3) Institution Premium, value £5, awarded to Alfred J. Jenkins for his paper, entitled "The Water Supply of Jersey."

(4) Institution Premium, value £5, awarded to R. Stevenson Henshaw for his paper, entitled "The Portland Urban District Council Waterworks."

NEW MEMBERS.

The SECRETARY announced the names of members elected by the council since the last general meeting as follows:—

As Members: Messrs. H. P. Hill, partner, Messrs. G. H. Hill & Sons, consulting water engineers, Manchester; S. B. Winsor, engineer to the Derwent Valley Water Board; E. C. Young, consulting water engineer, Tientsin, China; Henry C. Adams, partner, Messrs. Henry Adams & Sons, consulting water engineers, London, W.C.; A. W. E. Fawkes, city waterworks engineer, Calgary, Alberta, Canada; R. E. Tickell, consulting water engineer, London, W.

As Associate Members: Messrs. R. C. F. Busfield, resident engineer on waterworks extensions, Aberdeen; J. C. Cruickshank, assistant to consulting water engineers, Aberdeen; N. R. Kapur, assistant to corporation water engineer, Cardiff; S. Reason, assistant to water engineer, Antofagasta; T. H. Tyson, assistant to corporation water engineer, Halifax; G. F. Anderson, assistant to engineer of the Fylde Water Board; C. Hall, assistant to chief water engineer, F.C.A.B., Antofagasta, Chile; G. H. Ivory, resident engineer on waterworks for consulting engineer; J. H. Murphy, assistant to corporation waterworks engineer, Manchester; E. J. Wainwright, assistant to corporation water engineer, Stockport.

As Associate: Mr. G. Smith, engineer and surveyor to Eton Urban District Council.

For Transfer to Class of Members: Mr. T. Waddingham, recently water engineer, Hebden Bridge Urban District Council, now consulting engineer, Grimsby.

INSTALLATION OF PRESIDENT.

The CHAIRMAN, having offered a hearty welcome to the new members present, said his next duty was one

which gave him the greatest pleasure—it was that of introducing to them the president for the ensuing twelve months. This introduction was, he thought, quite unnecessary. Mr. Molyneux was known to them all; he had been a member of the institution for a long time. He was one of the original band who founded the institution, or, as it was then, the association, in the year 1897. Mr. Molyneux had been a member of the council for many years past, and by the regularity of his attendance, by his strong common sense, and by the fearlessness with which he had supported his opinion, once convinced that he was right, he had made a place for himself in the minds and hearts of his colleagues. He had no hesitation in saying that Mr. Molyneux would make an excellent president, and that his year of office would be one of pleasure to himself and of benefit to the institution, and that they would all mutually profit by his holding that office. He asked Mr. Molyneux to accept the document certifying the fact of his election as president, and he trusted that he would have good health for the coming year, and that he would live long to retain happy memories of his year of office. This year, though it would be heavy with responsibility, would have many pleasures, and the president would, he hoped and believed, look back upon his tenure of office with pleasurable feelings. He had very great pleasure in asking Mr. Molyneux to fill the chair for the ensuing year.

Mr. CLEMESHA SMITH then vacated the chair, which was taken by Mr. Molyneux amid applause.

The PRESIDENT said he was exceedingly delighted with the manner in which Mr. Clemesha Smith's words had been received. He was afraid they had had described to them a different man to what he was, but he would endeavour to live up to the standard that had been fixed for him. He could assure them that he would use his best endeavours to forward the interests of the institution, and that that should be his sole object in occupying the presidential chair.

THANKS TO RETIRING PRESIDENT.

Mr. Molyneux said his next duty was to ask their support to the following resolution: "That the best thanks of the members of the Institution of Water Engineers be given to Mr. Clemesha Smith on his relinquishing the position of president." Mr. Clemesha Smith was a gentleman whose urbanity had appealed to them all, and who had borne the office of president with dignity and honour. As a water engineer he had a record of which he might be proud, and which they could fully appreciate. He went to Wakefield in 1897, when there was a rate in aid of the waterworks undertaking of no less than 1s. 5d. in the £, and had to deal with a domestic consumption of 26 gallons per head. To-day he had succeeded in wiping out the rate, and reducing the consumption to 18 gallons per head. He had charge of the construction of the works he now looked after, and had dealt with a typical moorland water, so that Wakefield now had a water of excellent quality used economically, and without a burden on the rates. He took up the presidency of this institution last June, and had held the office with satisfaction to them all. He had presided over their meetings with courtesy and tact, and it had been a pleasure to sit with him. He submitted, therefore, to them that their heartiest thanks were due to him, and asked them to accord them by vote, trusting that, although retiring from the presidential chair, he would be long spared to give the institution his valuable services in other directions.

The resolution was carried by acclamation.

Mr. CLEMESHA SMITH said he had to thank them for the very hearty way in which they had received the words spoken by Mr. Molyneux in moving the vote of thanks for the services which he had been able to render during the past year. He feared that Mr. Molyneux had spoken of him in terms which were far too flattering, for the services which he had rendered had only been slight. At the outset he asked for the support not only of the council, but of the whole of the members of the institution, and any progress that may have been made was due entirely to the heartiness with which that support had been given him, and he thanked the council and the members of the institution for their attitude towards him during the past year. He would like to take that opportunity also of thanking their secretary, Mr. Griffith, for his share in the work of the institution. His work was far heavier than was apparent, and he performed it faithfully and zealously, and he had the true interests of the institution at heart. He thanked them for the vote which they had accorded him.

The PRESIDENT then delivered his address—fully reported in our last issue.

Mr. ASHTON HILL (Birmingham) in proposing a vote of thanks to the president, said he was sure they would all agree that Mr. Molyneux had given them a thoroughly useful and practical address, and one that would bear thinking over and reading at their leisure. They had been told that Mr. Molyneux had been a member of the institution from its commencement. He (Mr. Ashton Hill) had also been a member from the start, and he was sure they would agree with him when he said that it was clear Mr. Molyneux had served a very good apprenticeship, and that the experiences he had gained during all those years fully entitled him to the position he had now attained. He had known their president not only in connection with that institution, but he had come across him in other directions, and he had always regarded him as a very level-headed Lancashire man, and although they had not always seen eye to eye with one another, they had agreed to respect each others' opinions. All that Mr. Molyneux would require to make his year of office a success was the support of the members, and he (Mr. Ashton Hill) had no hesitation in assuring him that he would receive the undivided and earnest support of them all in the duties he had undertaken.

Mr. W. MATTHEWS (Westminster) seconded the resolution. He said he thought Mr. Molyneux was to be congratulated on the innovation he had made in his address by incorporating in it a *résumé* of the work that had been carried on by sectional committees of the council during the year. It was information that had hitherto not been brought before the members in general. The precedent set by Mr. Molyneux was a very good one, and would, he hoped, be followed by those who would succeed him in the presidential chair.

The resolution was carried with enthusiasm.

The PRESIDENT said he had to thank them for their kind vote of thanks. He must admit that as he was their nineteenth president it was somewhat difficult to write an address with anything new in it. He was afraid the twentieth president would find it even more difficult.

THE ANNUAL DINNER.

On Thursday, the 11th inst., the annual dinner was held at the Midland Hotel, Manchester. The president (Mr. T. Molyneux) was in the chair, and was supported by the Lord Mayor of Manchester (Alderman McCabe), the Mayor of Stockport (Councillor T. W. Potts), Aldermen A. Johnson and T. Allcock, Councillors Hy. Bell, D.L., C. Royce, J. Winter, A. Derwent, R. Foley, J. Burgon Padmore, the town clerk of Stockport (Mr. R. Hyde), the borough treasurer of Stockport (Mr. H. Grundy), Mr. C. Day, and Prof. Hickling, among others.

Following the usual loyal toasts,

Mr. F. W. McCULLOUGH proposed "The Mayor and Corporation of Stockport." The corporation, he said, possessed their own gas, electric lighting, tramways and water undertakings. They purchased the water undertaking in 1899 at a cost of three-quarters of a million. The new Kinder waterworks cost another three-quarters of a million. The difficulties they had in carrying through that scheme were almost insurmountable, and very great credit was due not only to the corporation, but to the members of the sub-committee of the Waterworks Committee.

The MAYOR OF STOCKPORT, in reply, dealt with the progress of municipal matters in Stockport and Manchester. One proposition which had been put forward, and which originated in Leeds, was that municipalities should be managed by a kind of general manager, who would be in the position of a sort of dictator, or like the mayor of a Continental town, who had things all in his own hands. He did not know what favour that proposition would meet with, but it was brought about by the great difficulties which confronted every municipal authority. Stockport had great difficulties to face, and one of them concerned the supply of water. When the water engineers came to see the Kinder works he thought they would agree that the corporation had overcome those difficulties in a most admirable manner.

Alderman E. JOHNSON, in giving the toast of "The Institution of Water Engineers," said it afforded him great pleasure to propose that toast, in the first place because they were holding their annual meeting in the ancient town of Stockport, and secondly because in their wisdom they had unanimously elected their water engineer, Mr. Molyneux, to the distinguished position of president of their institution for the ensuing year. He was sure that he could safely

predict that their new president would well and worthily fill the office to which they had elected him, and would hand the office down unsullied to his successor. Their institution was a most valuable one, for it was very essential that engineers who had to deal with all those grave and complex questions which surrounded the supply and distribution of water should meet together and associate with each other in an endeavour to arrive at a wise solution of the problems. In conclusion he expressed the sincere hope and belief that the institution would continue to grow in membership and strength because he was convinced of its usefulness not only to the water engineer, but to the community in general.

The PRESIDENT, in reply, said that those who were members of that institution were glad to hear that they were well thought of by those whom they served. The institution was a very progressive one. They had now a large membership—members belonging to it all over the world. They had members in Australia, India and America—in fact, there was hardly an English-speaking country in which they had not a representative. They had been in existence nineteen years, so that in a very short time they would be celebrating their twenty-first birthday, and he hoped they would then be able to do something which would bring the institution prominently before their fellow engineers.

Mr. C. CLEMESHA SMITH proposed "The Visitors."

The LORD MAYOR OF MANCHESTER, in responding to the toast, said that he was very pleased to be there because their president was a Manchester man, and received his early training in the town hall of that city.

Alderman CHARLES H. BIRD, J.P., and Councillor HENRY BELL, D.L. (Stockport), also responded.

(To be continued.)

THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

ANNUAL CONVENTION AT BIRMINGHAM.

This week the Incorporated Municipal Electrical Association are holding their annual convention at Birmingham; an attractive programme of papers, visits to works, receptions, and entertainments has been organised, and there is every reason to believe that the meeting will prove at least as successful as its many predecessors. The papers deal with the development of electricity supply, modern boiler-house plant, and the inexhaustible subject of tariffs.

A presidential address of exceptional interest was delivered on Tuesday by Mr. R. A. Chattock, the city electrical engineer, who deplored the fact that, owing to the rejection of the council's recommendations last year, the negotiations which were in progress with the British Electrical and Allied Manufacturers' Association for the adoption of a standard set of conditions of contract had fallen through. In the meantime, the Institution of Electrical Engineers has issued a set of model general conditions of contract, which, while not altogether acceptable to the Incorporated Municipal Electrical Association, has come into use, backed by the authority of the institution, and seems likely to hold the field. Referring to the Electric Lighting Bill which the association has promoted, Mr. Chattock stated that some members of the Electrical Contractors' Association were willing to accept it, but that the extreme opponents of municipal wiring had gained the day, and that the Bill would be opposed. The contractors, in his opinion, had nothing to fear from the municipal engineers, who only desired to ensure that good work should be done, especially in the case of the smaller installations, which were apt to fall into the hands of jerry wiremen. He thought that friendly agreement between the two associations ought not to be prevented by the idiosyncrasies of a few individuals on either side. In view of the recent dissolution of the Industrial Committee of the Institution of Electrical Engineers, Mr. Chattock suggested that a central body should be formed by all the associations connected with the electrical industry, to which should be referred all disputes arising between the component bodies, and which should afford influential support to political and industrial proposals for the benefit of the industry. Commenting on a recent speech of Mr. Newbigging, chief engineer to the gas department of the Corporation of Manchester, who advo-

ated the combined control of municipal gas and electricity supply undertakings, he declared that this would be fatal to progress, as competition was essential to the interests of the consumer; the gas supply authorities were feeling the competition of electricity because the price of the former had only been reduced (in Birmingham) 19.4 per cent in thirteen years, while the price of electricity had come down 73.6 per cent in the same period. Cheap power was a by-product of electricity supply, and the prices had not been unjustifiably cut down; in his opinion there was room for both commodities. Mr. Chattock strongly favoured the view that the supply of electricity should be centralised as far as possible, so that electrical energy could be obtained in every part of the country at bed-rock prices. He pointed out that cheap power was necessary to the commercial prosperity of the country, in view of the competition of foreign countries, which were already developing the policy of centralisation. It remains for Parliament to deal with the question of nationalisation of the supply industry, by forming a Government department, a public board of management like the Port of London Authority, or a private company under public control as to prices and dividends. They would have to give a supply at much lower prices than those which ruled at present, and there would be a deficit during the first few years, but this would be fully reimbursed when the undertaking matured. Small generating stations would be converted into sub-stations, but the engineers at present in charge of them need not fear the loss of their employment, for their aid was indispensable to success. The commercial side of electricity supply was dependent upon the technical side, and there must be an engineer at the head. To secure the full economy of overhead transmission, compulsory powers to obtain wayleaves were necessary. The supply of electricity to London, which was engaging the attention of the London County Council, would form part of the great national scheme. The leading municipalities, which had led the way in electricity supply, should meet and discuss proposals to be laid before Parliament. The results of such a policy would be general benefit to the community, abolition of the smoke nuisance and its attendant evils, conservation of our coal resources, and the maintenance of our commercial supremacy.

It will be seen that Mr. Chattock's views are in agreement with those propounded by Dr. Ferranti a few years ago, when he became president of the Institution of Electrical Engineers, and in his classical address foretold the time when electrical energy, generated and distributed under the most economical conditions, would be supplied everywhere at 3d. per unit. There is no doubt that public opinion is moving in the direction indicated by both these presidents, but material progress is painfully slow.

Coast Sand Dunes, Sand Spits and Sand Wastes.

By Gerald O. Case. 5s. nett. London: St. Bride's Press, 24 Bride-lane, E.C.—This work is a treatise on the advantages of the proper utilisation of inblown sand, so as to turn it into a protection against coast erosion, instead of being, as too often at present, an active agent in such erosion and in the laying waste of fertile land. The author draws many of his examples from Scotland. He points out the work that has been done on the Continent in turning sand wastes into pine forests. The book gives an able and systematic treatment of its subject.—*Scotsman*.

Road Grants.—In the House of Commons on Monday the Chancellor of the Exchequer was asked whether under the new financial proposals rural districts containing few or no first or second class roads would lose the amount they now received for the maintenance of the other roads in their area. Mr. Herbert Samuel, who replied, said that no Exchequer grants were payable at present to rural district councils in aid of the maintenance of roads. The Finance Bill did not affect the provisions of the Local Government Act, 1888, under which county councils might, if they thought fit, contribute towards the cost of the maintenance of any highway which was not a main road. Later, answering a question as to whether local municipal authorities would receive the grant in aid of the upkeep of main and second-class roads, as proposed in the Finance Bill, 1914, for roads passing through county boroughs, Mr. Samuel stated that councils of county boroughs would receive grants in aid of roads on a basis to be proposed by the Road Board.

Institution of Municipal and County Engineers.

NORTH-WESTERN DISTRICT MEETING AT LYTHAM.

A most successful meeting of the North-Western District of the Institution of Municipal and County Engineers took place on Saturday last at Lytham, the charming Lancashire coast resort some half-dozen miles distant from Blackpool. At the business meeting, which was presided over by Mr. John S. Brodie, the district chairman, a paper on the municipal works of the town was read by Mr. A. J. Price, the engineer and surveyor, and produced a good discussion, and in the afternoon visits were paid to the West End outfall sewage works which are in course of construction, the East End sewage and destructor works, and the slaughter-houses. Those attending the meeting were Messrs. A. W. Bradley (St. Helens), district chairman, John S. Brodie (Blackpool), Chas. Brownridge (Birkenhead), T. Burrows (Burscough), Randle Burslam (Congleton), Thos. A. Clare (Leigh), William Clough (Audenshaw), H. W. Corrie (Lower Bebington), D. J. Diver (Marple), William H. Elce (Bacup), Henry Entwistle (Swinton), Chas. Hall (Droylsden), T. H. Hartley (Colne), Charles E. Hines (Windermere), J. W. Hipwood (Morecambe), F. H. Holden (Accrington), J. D. Hurst (Wardle, near Rochdale), I. Johnson (Rawtenstall), L. Kenyon (Tottington), John S. Loble (Stoke-on-Trent), T. W. Maxwell (Preston), J. Mitchell (Birkdale), T. S. Picton (Eccles), Arthur J. Price (Lytham), A. Rothera (Liversedge), J. Rowbottom (Ashton-under-Lyne), J. A. Settle (Bury), W. Shackleton (Nelson), William Stubbs (Blackburn), E. D. Thompson (Preston), W. H. Travers (Wallasey), Wm. Welburn (Middleton, Manchester), Geo. H. Wild (Littleborough), B. J. Wolfenden (Bootle), Ernest Worrall (Old Trafford), H. Yarwood (Rochdale), members; Wm. Bentley (Bolton), Frank J. Boydell (Leigh), A. V. Cole (Nelson), J. Cunliffe (West Didsbury, Manchester), Wm. Debney (Birkenhead), S. Brasse Edwards (Liverpool), E. Pilling (Lytham), Alfred J. Price (Eccles), W. H. Price (Leeds), B. Milnes (Birkenhead), Wm. Moss (West Didsbury, Manchester), F. W. Mozley (Nelson), G. Whittaker (Fylde Water Board), associate members; H. Ashcroft (Preston), A. Entwistle (Preston), Arthur A. Harrison (Preston), J. D. M. Morton (Lytham), Thos. W. Noblett (Preston), student members; F. E. J. Bradshaw (Tamworth), C. T. Hague (Ulverston), Percy Leigh (Swinton and Pendlebury), Stanley A. Royle (Lytham), Stanley Walker (Birkenhead), and Councillors J. Pearson (chairman of the council), E. R. Lightwood (chairman of the Highways and Sewerage Committee), W. F. Holden (chairman of the Finance Committee), J. Ainscough, H. N. Whittle, J. Chadwick, T. V. Barker, and J. J. Beesley.

The members were cordially welcomed by Councillor J. Pearson, J.P., chairman of the urban district council, who said he felt it was a privilege to welcome a number of gentlemen representing such a highly technical branch of public work. He had had only a short experience of council affairs, but it had shown him the value of the work they carried out. He did not think the community at large or the man in the street quite realised their indebtedness to municipal engineers for many of the comforts they enjoyed in their daily life, but took them as a matter of course. They were very proud of their own town, which they thought in its way was almost unique. The two miles of greensward, which was a feature of the front, was a great asset to them, and the trees from which they took the name of "Leafy Lytham" contributed greatly to the beauty of the town. He hoped the meeting of the institution would prove both pleasant and profitable.

Mr. E. R. LIGHTWOOD, chairman of the highways department, said it was also a great pleasure to him to see the members there that day, because he was quite convinced from his knowledge of Mr. Price that they were all very busy men. Their duties were onerous from more than one point of view. The greatest asset a community could have was a surveyor who was absolutely independent—a very difficult position to take up. They all knew how committees were constituted in many townships, and it was both a trying and dangerous position that a surveyor occupied when he had to deal with men who had a certain amount of authority over him and to consider at the same time the conflicting interests of the rate-payers. Very little reflection enabled them to recognise that not only the health of the people, but many

other things, depended to a very large extent on the work they did. Meetings of the kind were essential for the good of the community. They enjoyed the possession in Lytham of a surveyor who was able on his own account to carry out very important work, and he hoped that one result of their visit would be that they would be able to learn something that might be of advantage to them.

Mr. J. S. BRODIE said he heartily appreciated the very kind welcome which had been extended to them. It was particularly gratifying to hear one of their members so highly spoken of. Meetings in the smaller communities were of quite as much as, and frequently of greater interest than, meetings in larger towns, for in the smaller towns the surveyor was able to give a personal attention to details that was impossible in the larger places. He proposed that the thanks of the North-Western District be accorded to the council for the cordial welcome which had been extended to them.

Mr. W. STUBBS (Blackburn), in seconding, said he agreed with Mr. Brodie that it was not in the largest towns that they gained the most information.

The vote of thanks was carried, and the chairman of the council acknowledged the compliment.

Mr. Brodie then took the chair.

SUPERANNUATION.

Mention was made of the scheme which is being considered by the National Association of Local Government Officers as a basis of a Superannuation Bill on national lines, and the chairman, in alluding to this, mentioned that some important steps in connection with the question had been taken as recently as the previous Thursday, when a deputation of medical officers and sanitary inspectors waited on three Cabinet Ministers, who received with every sympathy the views of that deputation, not only in regard to superannuation, but also security of tenure. Judging by the remarks of Mr. Lloyd George and Mr. Herbert Samuel, he really thought an advance had been made with regard to the attitude of the Government on this subject far ahead of anything attained before. He thought municipal engineers ought to do their best not to be left out in the cold, for the Chancellor of the Exchequer told the deputation that it was not a case of dealing piecemeal with the question, but with all the municipal officers in the country. Unless they asserted themselves, however, in all probability, and deservedly so, they would be left out of the arrangement.

Mr. C. BROWNIDGE (Birkenhead) said he considered that, in addition to passing resolutions on the subject, every member should endeavour to assist by bringing pressure to bear on their Parliamentary representatives.

Consideration was afterwards given to the following paper:—

MUNICIPAL WORKS AT LYTHAM.

By ARTHUR J. PRICE,

Engineer and Surveyor to the Lytham Urban District Council.

The surveyor's work in a small town makes up in variety what it lacks in importance, for, while in many large towns the engineering, surveying, and architectural departments are separate, the house drainage work controlled by the health department, the collection and disposal of refuse under the charge of a cleansing superintendent, and the sewage works under the separate control of a manager, the surveyor in the small district is generally responsible for all these works, and is, in addition, frequently his own chief draughtsman, clerk of works, and building and drainage inspector; in short, he holds as many offices as the illustrious "Pooh Bah."

Again, the work of the engineer in a large town is mainly of an administrative character dealing with the control and organisation of a large staff of expert assistants; but the surveyor to the small authority must not only possess a power of organisation sufficient for dealing with the workmen and staff he controls and directs, but, owing to the scarcity of skilled assistants, his work is largely executive, and of a more intimate and personal character than that of the engineer of a large town.

As will be seen from the plans hung in the council room, the author's work in Lytham during the time

he has acted as surveyor to the Lytham Council has been sufficiently varied to satisfy any craving for change, and there has been no ground for complaint of monotony, or fear of rust or sleepiness.

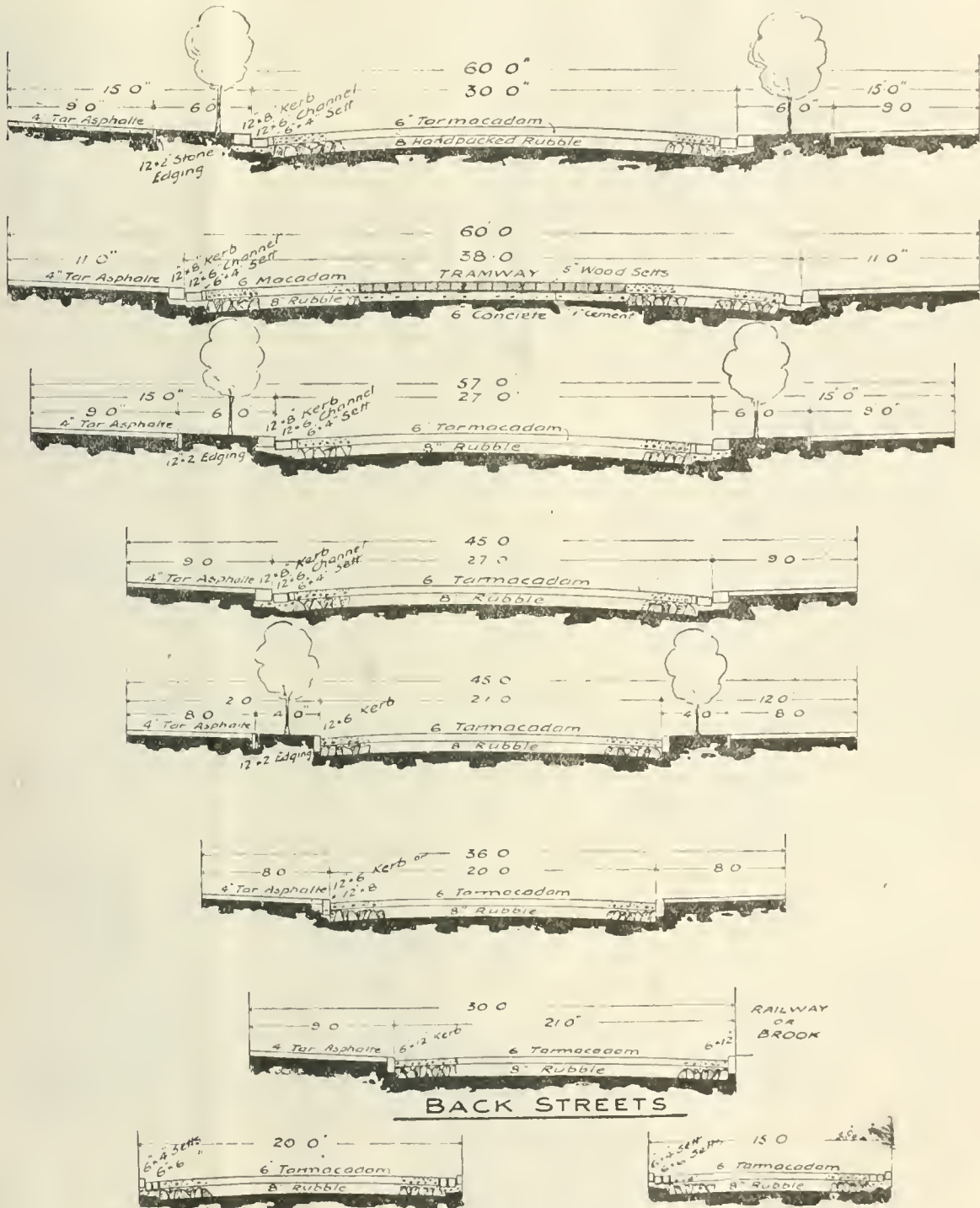
Lytham is an old town whose name is found in Domesday Book as "Lidun," and a Benedictine priory was founded here in 1188, in the reign of Richard I., though, like many other religious houses, it was dissolved by Henry VIII., and only a few remains of the buildings are now to be found in the Lytham Hall Park.

Though much has been done to modernise the town

The council spare no efforts to preserve the sylvan aspect of the town by planting trees in many of the new streets, and protecting those which now line the chief shopping and residential streets.

Twenty years ago the population was under 5,000, with a rateable value of £31,832; to-day the population exceeds 10,000, and the rateable value is £77,975. The district rate is 3s. 2d., and the area is 3,539 acres.

When the author came here the town was just beginning to go forward, consequent, very largely, upon an alteration in the land tenure, by which the leases were extended from 99 to 999 years.



LYTHAM PRIVATE STREET SECTIONS.
(Plate 1.)

during the past twenty years, it still retains much of that old-world charm and natural beauty which appeal so strongly to the cultured English man or woman.

While we willingly admit that we owe much of our growing popularity to the proximity of our go-ahead neighbour Blackpool, we make no effort to emulate them on the lines which have placed them in the forefront of pleasure resorts.

Lytham is essentially a quiet and select watering place relying more on its wealth of foliage, pleasant surroundings and residential qualifications than upon the amusements which form the main attractions for the majority of holiday seekers.

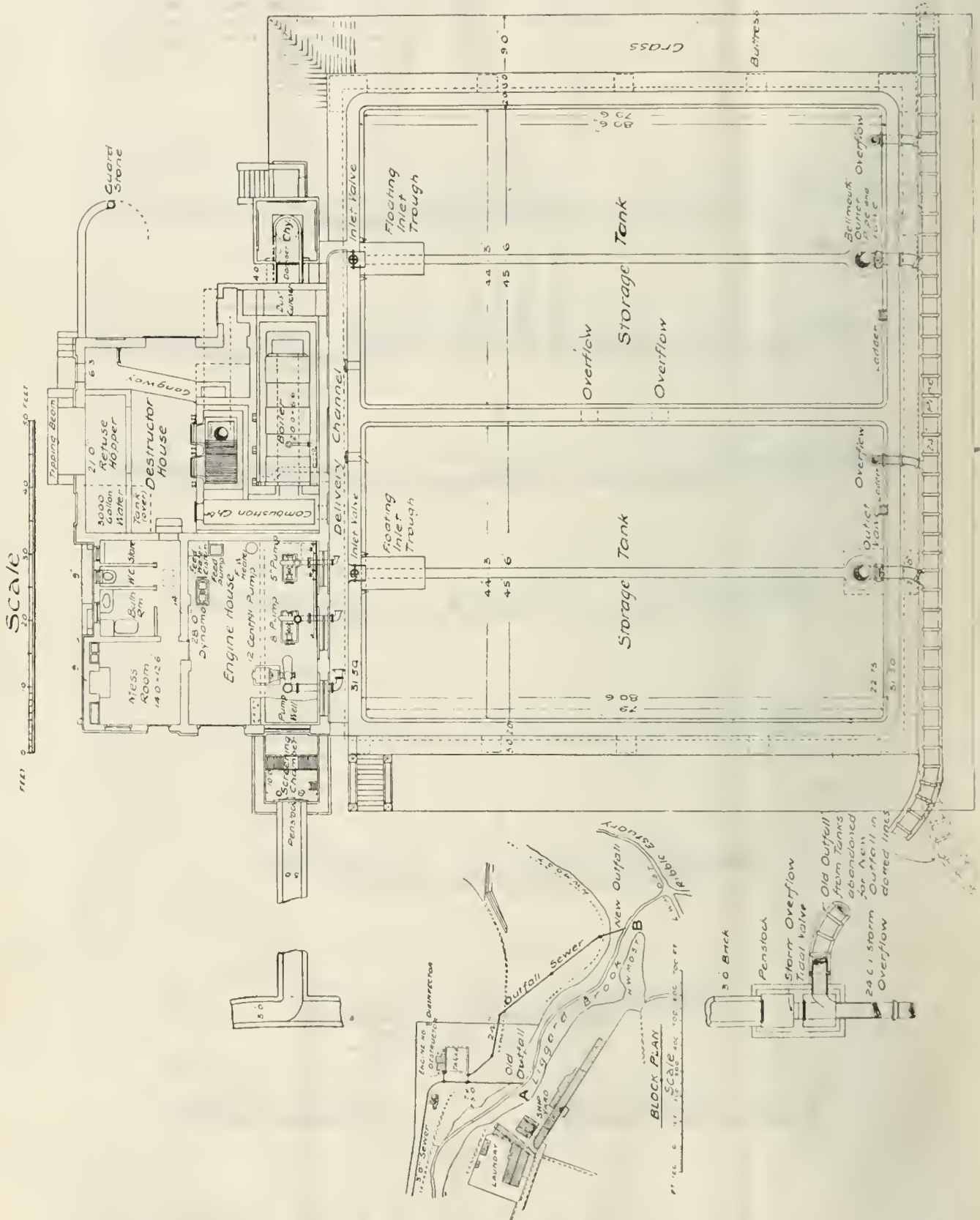
Practically the whole of the land in Lytham and our neighbour St. Anne's is leasehold, and belongs to Mr. J. Talbot Clifton, of Lytham Hall, and it is due to Mr. Clifton, and the skill and experience of his agents, Messrs. Thomas Fair & Son, that Lytham is laid out on such satisfactory lines, and so largely in accordance with the views of present-day town planners.

The lay-out of the town has provided a sea front with 3 miles of promenade, with a stretch of green-sward adjoining the promenade varying in width from 50 yds. to 120 yds., nearly 2 miles long, and 45 acres in area. This stretch of green is a feature almost

unique to Lytham, and forms an ideal promenade. Another length of promenade, about 1 mile long, at the extreme west end of the green, skirts the Fairhaven Lake. This lake, which has an area of 15 acres, is largely used for boating and open-air bathing, and a large number of tennis courts and a bowling green adjoin the lake and provide for the recreation

Gardens and the Lytham Hall Park, and a recreation ground of 6½ acres is leased to the Ratepayers' Association on easy terms.

Several smaller plots of land have recently been presented by Mr. Clifton, and laid out by the council as public gardens, and as a municipal bowling green at the east end of the town, and the Green Drive, which



LYTHAM REFUSE DESTROYER AND PUMPING STATION. (Plate 2.)

of the inhabitants and visitors at the west end of the district.

The Lowther Gardens—a park of 13 acres, laid out at a cost of £12,000, and presented to the town by Mr. Clifton—is a very fine example of small park designing. A bandstand, shelter and public conveniences have been erected in the gardens during the past few years, and tennis and croquet lawns are largely used by both visitors and residents.

A cricket ground of 10 acres lies between the Lowther

forms a beautiful and shady avenue of trees nearly 2 mile long, adjoining the recently opened golf links, is a favourite walk with all visitors to Lytham.

Golf has done much to popularise Lytham, and the well-known Lytham and St. Anne's Golf Club, together with the Fairhaven Golf Club, are partly in the Lytham district and partly in St. Anne's, while a new 18-hole course within five minutes' walk of Lytham Station was opened last year, and a private links is formed in the Lytham Hall Park.

The chief shopping street is parallel to the sea front, lying between the sea and railway, and the principal residences face the sea looking south, or follow the prevailing fashion and go west. The industrial portion of the population is housed at the east end of the town, where a shipyard, employing at times over 400 hands, and the other main industries of the town are to be found.

ROADS.

To come to matters of more immediate professional interest to municipal engineers, the length of the roads when the author came here at the beginning of 1899 was 14½ miles; to-day it is 24½ miles.

In the country they were mostly formed with gravel or broken gravel, and many were moss-grown; but the chief roads in the town were made with granite macadam. Tar-macadam had been used on two streets at the east end, but these were so unsatisfactory, and the council had so much trouble with the contractor—the roads having to be broken up and relaid as ordinary macadam—that a strong prejudice against tar-macadam—and for several years none was used by the council. One or two very good roads in tar-macadam had been made, one of which, running to the pier, may be of interest to the members, as it has been laid, as far as can be ascertained, something like twenty-four years, during which time it has never been repaired beyond making good a trench, has not had a coat of tar, and, though somewhat rough, is still a good road likely to last for many years.

For many years now we have used tar-macadam with very satisfactory results, and at the present time 8 miles of streets are laid with tar-macadam, and 4½ miles are tar-painted. With the exception of one short trial length of roadway, which was carried out for the council by a well-known firm of contractors, who had afterwards to take a portion of it up and relay it, the whole of the tar-macadam streets in the centre of the town have been laid by the council's own workmen with material mixed in the council's store yard, and with tar from the council's gasworks.

On the principal roads the tar-macadam is made with Penmaenmawr granite, as being more durable and less dusty and slippery than limestone. In the purely residential streets limestone is used, this material being very suitable for light traffic, as it wears very smoothly, and from the hygienic and economic point of view is almost an ideal road material when properly mixed and laid.

Much of the success of our tar-macadam work is due to the excellent quality of the tar supplied from the council's gasworks.

The tar occasionally varies considerably, according to the quality of coal used and the amount of light oils extracted, and it is necessary for the road foreman and man in charge of the boiling to exercise great care in the boiling so as to obtain tar of the proper consistency, and suitable for the situation in which it is to be laid.

The position of the street with regard to the sun and wind, the extent and nature of the traffic, the difference of temperature in winter and summer, all make it difficult to adopt a universal standard for tar. The personal factor cannot altogether be eliminated, for the man in charge of the tar boiling will have to make the tar harder—i.e., with more pitch in its composition—for a road where it is exposed all day to the sun and is subjected to a heavy traffic. In a back street, where neither sun nor much traffic finds its way, less of the lighter oils should be distilled or evaporated, for more "life" is required in the tar in such a position, to avoid the brittleness and subsequent disintegration of the road, which is the chief danger in such a position.

Also with tar-painting, a tar with a larger proportion of the lighter oils left in it than for tar-macadam work is necessary.

We have not had half-a-dozen bad consignments of tar during the past twelve years, and when these have happened it has been due to the inferior quality of the coal being used, or to too great a demand for tar having led to the tar tank getting too low, and water being supplied instead of tar. It was the latter cause chiefly that in 1912 led to a failure of one short length of road which had been tar-painted, though a spell of very wet weather was also, to some extent, responsible.

We have a small drying hearth which is used for drying stone in wet weather, but if possible the stone is dried naturally, as this is not only more economical, but avoids any danger of the stone being overheated and converting the tar into pitch.

Tar-painting has been carried out in Lytham for

the past nine years, this town being probably the first in the North of England to adopt it. Some 300 yds. of the road along the sea front, which was an ordinary macadam road, was tried experimentally, half with limestone and half with granite chippings.

The portion laid with limestone was for a time almost as dusty as ordinary macadam, but the granite, being a harder material than the limestone, was practically dustless when put on, and nothing but granite has since been used for tar-painted roads.

When tar-painting a new road we use an ordinary 160-gallon tar-boiler, which is convertible into a sprinkler with gas piping perforated to form a spray; but for repairs we chiefly use a small 80-gallon boiler fitted with a pump and movable spray.

In 1903 the principal street was paved with 4-in. Jarrah blocks on a 6-in. concrete foundation. The blocks were laid with a close joint directly on the concrete foundation, after being dipped into a mixture of pitch and tar, and were grouted with tar. Practically this street has needed no repairs during the past ten years, and the blocks are in so good a condition that they will probably last another ten years.

The footpaths in the main street are laid with concrete flagging, and portions of the other main streets with natural stone flagging. The residential streets are chiefly in tar-asphalt, and country roads have footpaths of gravel or fine clinker. Some very interesting cobble-paved footpaths are to be seen in the streets leading from the beach; those in Bath-street, in which are the date at which they were laid—1831—with designs of a ship, compass, anchor, rose, &c., picked out in white pebbles, are in a very fine state of preservation, and are well worth inspection.

PRIVATE STREET WORKS.

During the past fifteen years plans and apportionments for over 100 new streets have been prepared, and, with the exception of some half-a-dozen awaiting construction, have been carried out. They were until a few years ago mainly carried out by the council's staff, but, owing to the objection then first raised by the Local Government Board to the council's regular workmen being employed on work carried out by a loan, the work has since been carried out by contract, and not always with equal success.

The width and lay-out of the streets is shown in the sections submitted in Plate No. 1, varying from 60 ft. to 30 ft. for front streets, with 20-ft. and 15-ft. back streets.

They are now nearly always carried out in tar-macadam, and the footpaths have almost invariably been of tar-asphalt.

It will be noted that where the streets are 45 ft. or greater width the footpaths have a 4-ft. or 5-ft. wide plot set apart for the plantation of trees. These trees have grown well in most situations, and are much appreciated by the residents in the avenues where they are planted.

SEWERAGE, SEWAGE DISPOSAL AND DESTRUCTOR WORKS.

When the author came to Lytham main outfall sewers were just about to be laid at the east and west ends of the district, the schemes being carried out by two well-known firms of Manchester engineers.

The east end and central portions of the town were sewered by a 24-in. main outfall, which discharged by gravitation into a tidal creek near to the Preston-road. This position was not, on sanitary grounds, very desirable, and so a scheme for providing a new outfall, storage tanks and a pumping station at the east end of the district was designed.

The outfall sewer was partly carried out, but when the author (who, on his appointment as surveyor, had been requested to act as resident engineer on the work) came to fix the sight rails for the outfall, he found that a serious mistake had been made in the levels, and that it was impracticable to carry out the scheme as designed by the engineer. On Major Tulloch, M.E., C.B., late chief engineering inspector to the Local Government Board, being consulted on the matter, he advised that a new scheme should be adopted.

The council instructed the author to prepare a new scheme for dealing with this portion of the district, and this scheme, which included a pumping station, refuse destructor, and storage tanks, was carried out as now described and illustrated on Plates Nos. 2, 3 and 4.

About two-thirds of the sewage of the district flows to the sewage and destructor works, where it is screened and pumped into storage tanks, and then discharged, on the ebb tide, into the sea.

The dry-weather flow is about 250,000 gallons per

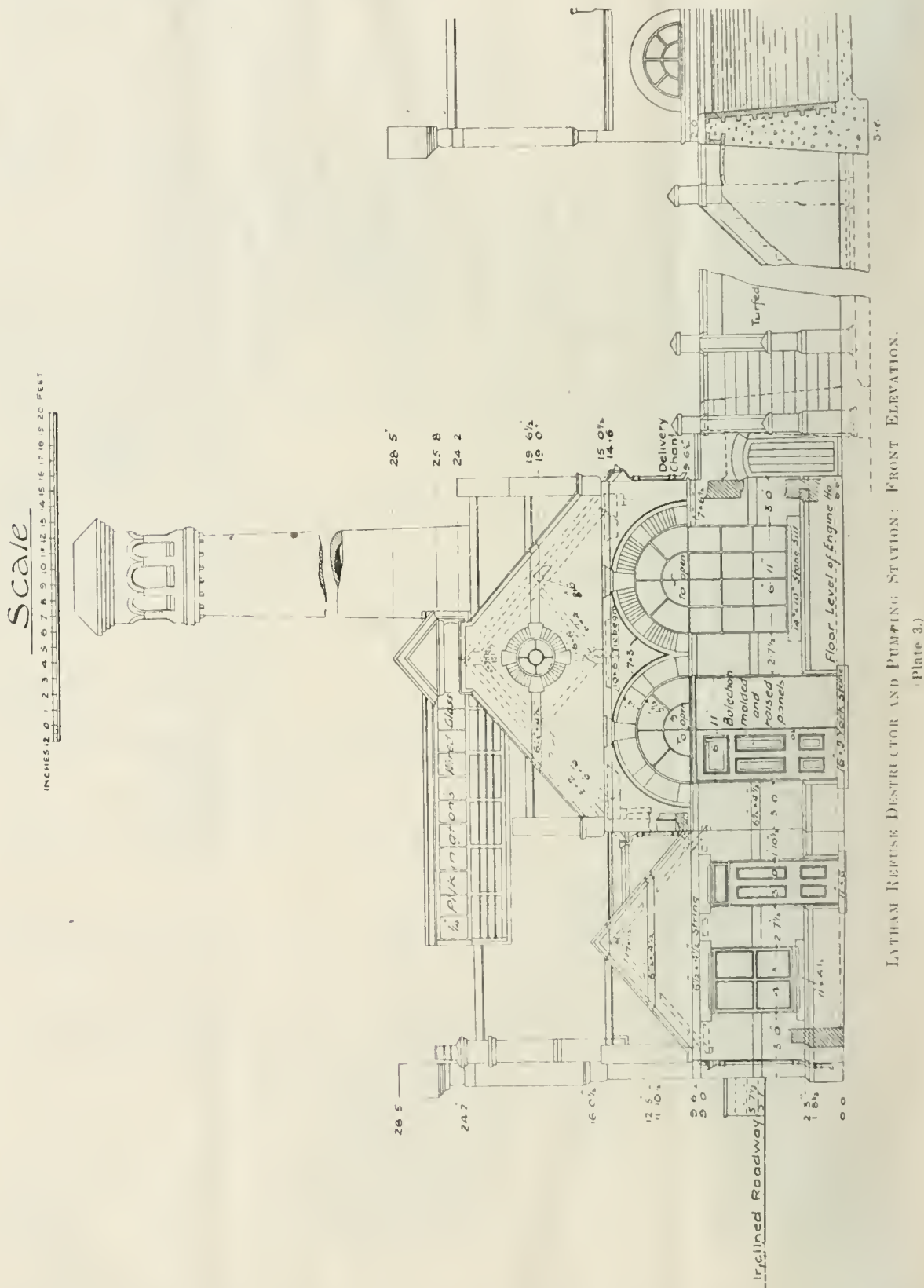
day, and a 5-in. and an 8-in. centrifugal pump, capable of lifting eight times this quantity, were put down when the works were opened.

While a margin of eight times the dry-weather flow is more than sufficient to meet the Local Government Board's requirements, it is, however, hardly necessary to point out to a meeting of municipal engineers that, with the growth of population and an increased paved area, a much greater quantity of sewage and storm

centrifugal pump. This is capable of lifting 2,500,000 gallons per day, making the total pumping capacity 4,500,000 gallons per day.

The 5-in. pumping engine has a single cylinder, the 8-in. pump has a tandem compound engine, and the 12-in. pump has a twin-cylinder engine, all the pumps being direct driven, and made by Messrs. Gwynnes, Limited.

The sewage is pumped into a delivery channel, from



water has now to be dealt with at the works during a heavy storm. This difficulty would not be so great if the storm overflows could always come into operation; but as the heaviest storms frequently occur near high tide, the main overflow near the works is then practically useless, and the other smaller overflows are frequently not of great use for some time. To meet this difficulty and prevent backing up in the sewers, the council have just put down another 12-in.

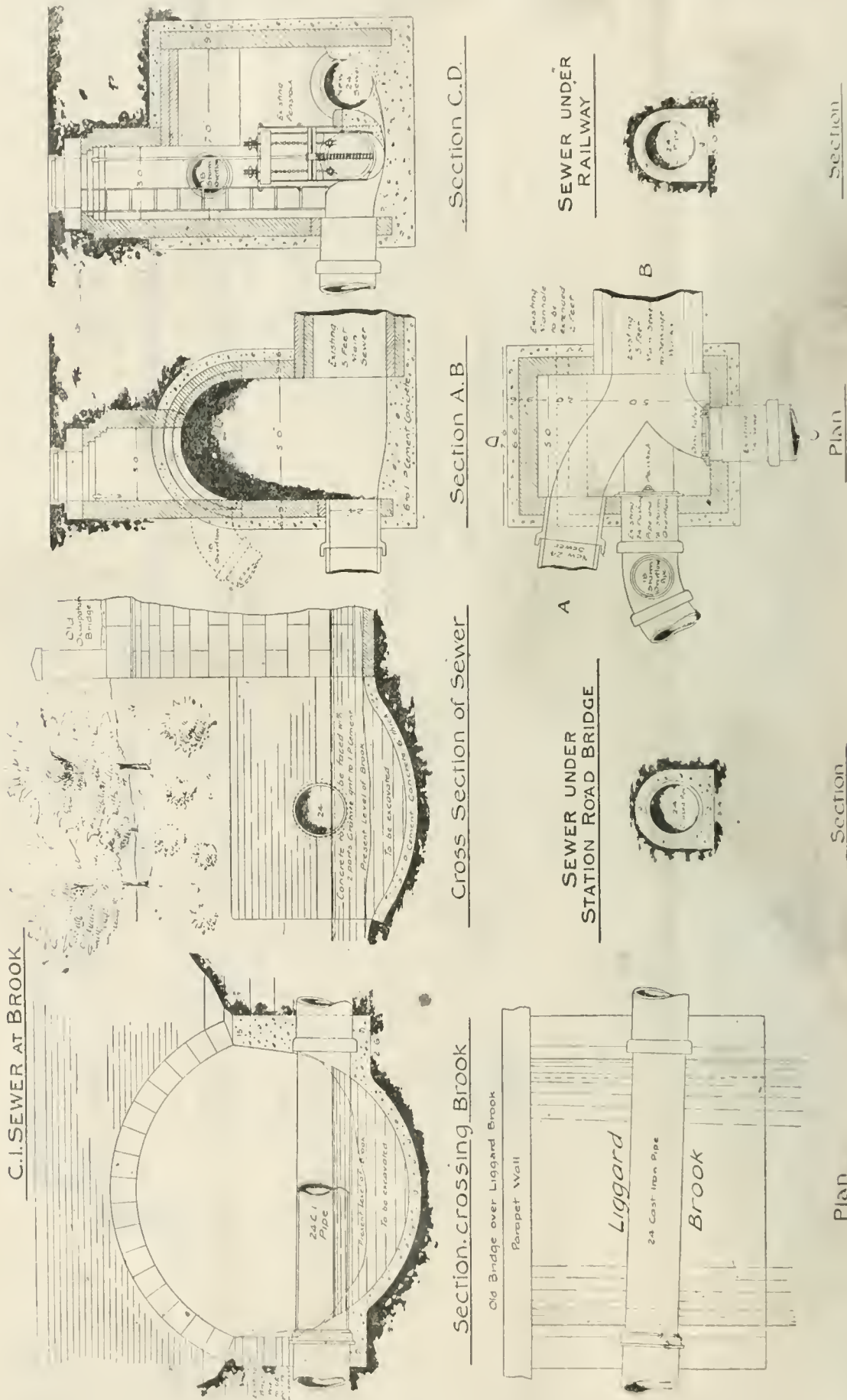
which it flows into the tanks. There are two tanks, each holding 200,000 gallons, and, as they can be discharged twice a day, they have a total capacity of 800,000 gallons per day, or just over three times the dry-weather flow required by the Local Government Board. The plan of the tanks is given in Plate No. 2, and a section of the tanks, pump well and engine-house is given in the paper on "Seaside Sewage Disposal," read by the author at the Plymouth annual

meeting, and published in Vol. xxxvii. of the institution "Proceedings."

The power for pumping is obtained from the destruction of the refuse in a two-cell destructor adjoining the pump-house.

by Messrs. Dawson & Manfield, of Manchester, who reconstructed the furnaces.

Instead of the air for the blowers being heated by passing over the regenerator tubes, the air is now drawn over the top of the combustion chamber and



Scale 3 in. to 3 ft.
 DETAILS OF SEWERAGE WORKS, LATHAM.
 (Plate 5.)

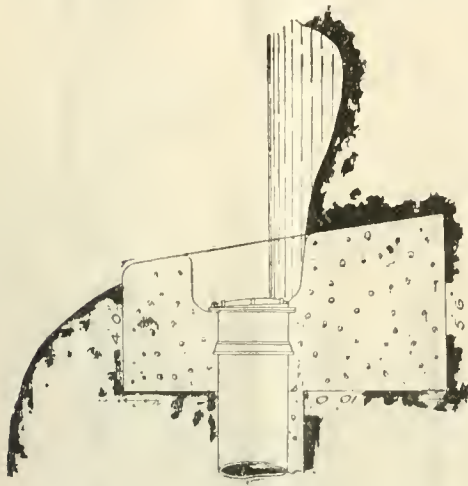
Originally it was a Meldrum two-cell destructor with regenerator, but after ten years' constant use it was found necessary to rebuild the furnaces, and as the regenerator tubes gave considerable trouble, these were dispensed with in favour of the system designed

furnaces, by which means not only is the air heated, but the foul air is drawn out of the destructor-house, and the ventilation greatly improved. The cells are front and hand fed, and the total quantity burnt averages about 12 tons per day.

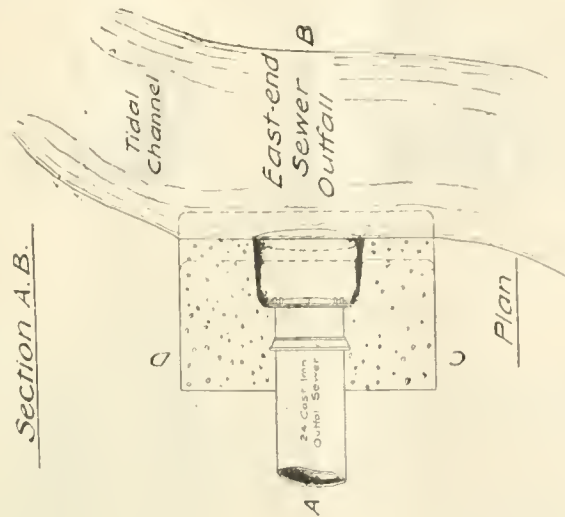
While the reconstruction was being carried out, the opportunity was taken to put in an offal door in the top of the furnace, with a gangway from the inclined

as forced draught is used for the furnaces, the chimney is only 50 ft. high.

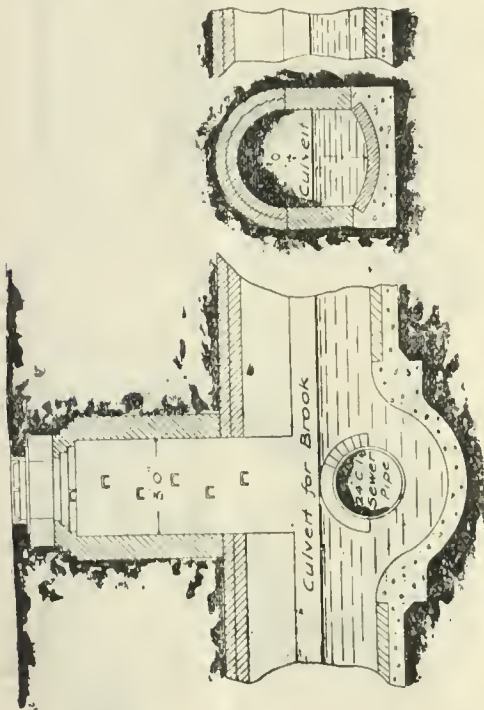
The boiler provides not only all the steam for



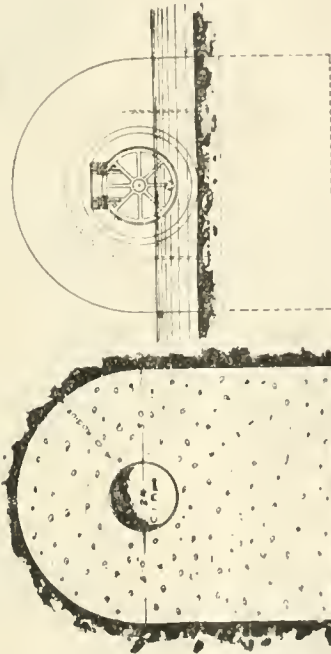
Section A.B.



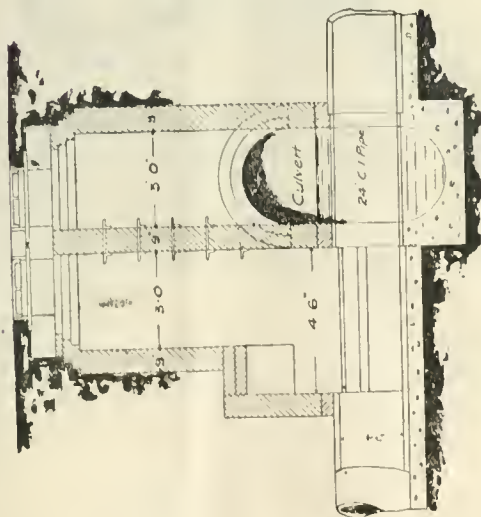
Plan



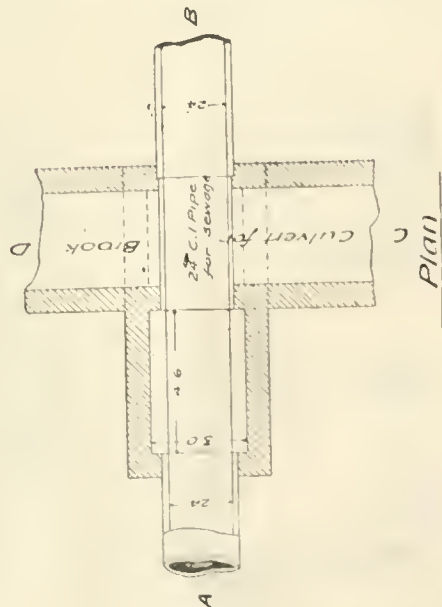
Section C.D.



Elevation



Section A.B.



Plan

Scale 1/4 in. to 3 ft.
 DETAILS OF SEWERAGE WORKS, LYTHAM
 (Plate 6.)

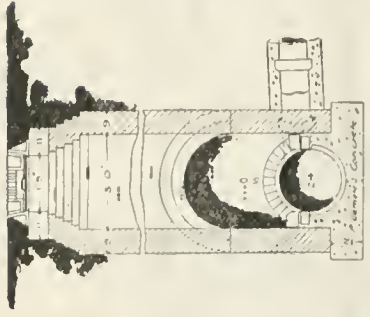
roadway, to give easy access for emptying the fish or other offal tins directly through the charging door, without a second handling.

The boiler is a 20-ft. by 6-ft. 6-in. Cornish boiler, and,

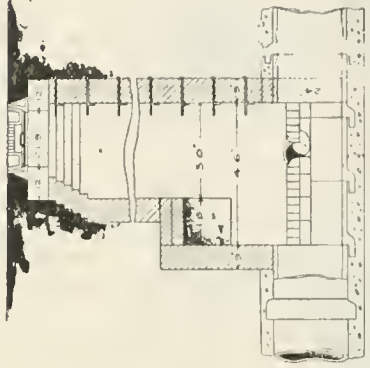
pumping, but also for the generation of electricity for the works and for the steam disinfector which stands in a building near to the destructor.

The engine house, in addition to the pumps, con-

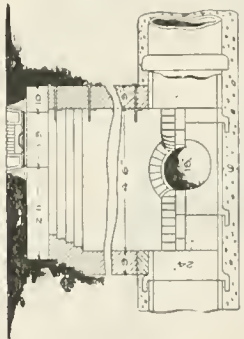
MANHOLES C. TO M.



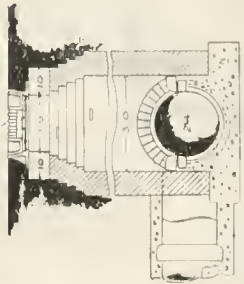
Section C.D.



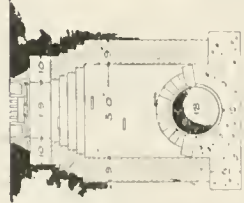
Section A. B.



Section C.D.
MANHOLE C.



Section A.B.



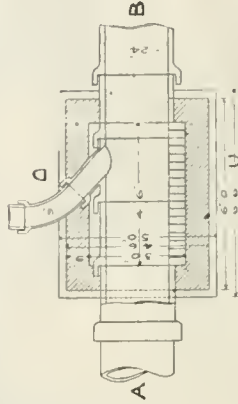
Section C.D.



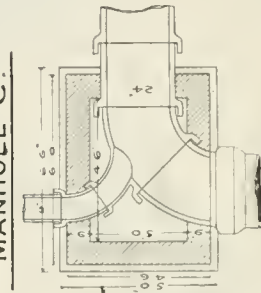
Section A.B.



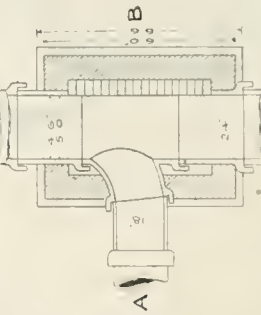
Section



Plan



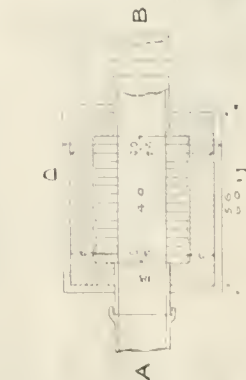
Plan



Plan



Plan at Top
Section

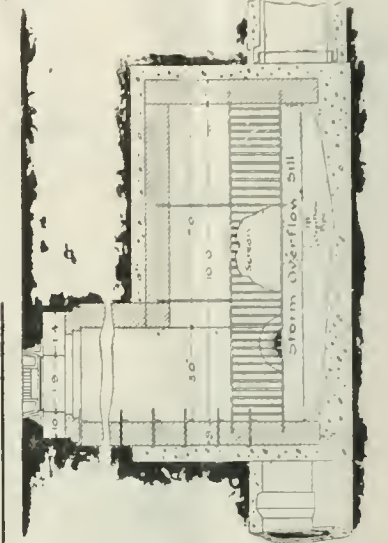


Plan

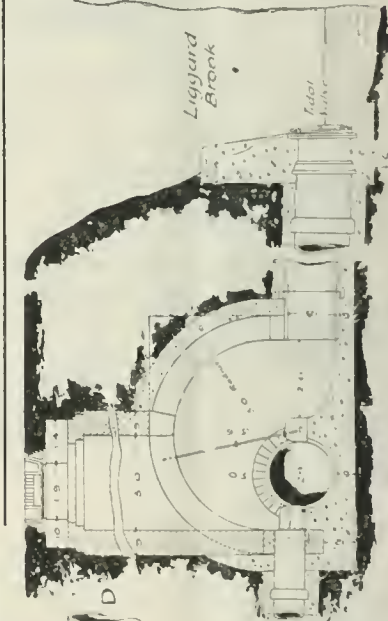
STORM-OVERFLOW CHAMBERS



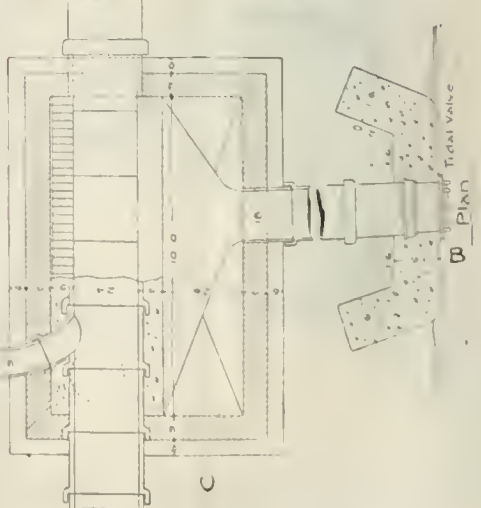
Elevation at Brook



Section C.D.



Section A.B.



Plan at Top
Section

Scale 1/4 in. to 3 ft.
DETAILS OF SEWERAGE WORKS, LYTHAM.
(Plate 7.)

tains the feed-water pump, feed-water heater, dynamo, and crane.

The dynamo, provided by the Lancashire Dynamo Company, has a capacity of 50 amperes, is driven by a 7-h.p. Robey engine, and lights the engine and destructor houses, manager's cottage, disinfecting station, and the outside of the works.

When the site for the east end outfall was chosen, the council was compelled by the engineer to the Ribble Commissioners to place the outlet in the creek opposite the shipyard, at the point A shown on block plan on Plate No. 2; but as a large number of men were frequently working almost over the outlet, it was not surprising that complaints were made of the position of the outfall. The council recognised that these were justified, and have removed the outlet some 800 ft. nearer to the sea, as shown at B on the block plan on Plate No. 2.

A large portion of the old 24-in. main on the south side of the Liggard Brook was laid in very bad ground, and was found to be in such a bad condition that it was considered advisable to abandon it. A new 24-in. main sewer was laid in its place on the north side of the brook, and this also served the purpose of opening out the land on that side for building purposes.

As the brook had to be crossed twice, the scheme involved either syphoning the sewer under the brook or deepening the brook, so as to allow the water to pass under the sewer with an equal water area to what it would have had if the sewer had not interfered with the flow.

This was done as shown on Plate No. 5, the bottom of the brook being deepened and concreted, and the sewers—12-in. and 18-in. cast-iron pipes—were carried straight across the brook.

A somewhat similar case is dealt with in the manhole on Plate No. 6, where a small brook crosses the line of sewer. This brook may form the centre of a roadway in the near future, and will be culverted. It was necessary that the flow of the brook should not be interfered with, as it drains a prospective building area, so the water in the culvert is syphoned under and passed over the sewer in the manhole provided for inspection and clearing of the culvert when necessary. The ordinary manhole for the sewer adjoins the manhole for the culvert.

These have been found in practice to require very little attention, while they are much more accessible for cleaning and freer from nuisance than the sewers would have been if laid with inverted syphons.

The storm overflows, shown in Plate No. 7, are of the usual sill type, and the sills come into operation when the sewers are running three-fourths full.

Owing to the nature of the ground in the district, which is largely alluvial with running sand and peat in parts, and the increased loads now being carried on the roads, trouble has been experienced with the older sewers. The absence of concrete foundations and concrete protection has led to serious breakdowns in several of the main sewers, and in the case of the west end outfall necessitated putting down temporarily an 8-in. pulsometer pump, fed by two vertical boilers, by which the sewage was pumped some 200 yds. for six weeks, while the damage to the sewer was being made good.

Since that time, on the author's recommendation, the council have allowed no sewers to be laid unless they are laid on and encased in concrete. Sewers less than 10 ft. deep are laid on 6 in. of concrete and covered with 4 in. of concrete, and sewers over 10 ft. deep have to be laid on a 9-in. concrete foundation and be surrounded with 6 in. concrete.

All drains in the roadway, either for house drainage or street gullies, have to be incased in 4 in. of concrete, and are only allowed to be laid under strict supervision by the council's officers.

The west end sea outfall sewer, at Fairhaven, is a 15-in. cast-iron pipe carried for 100 yds. through a 4-ft. cast-iron surface water pipe, and was originally carried some 80 yds. beyond the end of the 4-ft. pipe. The low water channel of what is known as the North Hollow is constantly changing, and this change makes it difficult to maintain a constant position for the outlet.

Owing to the difficulty of obtaining any storm overflows on the west end main sewer, it has for some years past been incapable of carrying off the sewage and storm water in time of heavy storms, especially if the storm occurred at high water. The consequence has been that basements in a number of buildings draining into this sewer have been flooded,

and it is to remedy this nuisance that the works illustrated on Plates Nos. 8 and 9 have been designed.

The trouble in the past has been the want of storage, and as this part of the district has developed rapidly it was likely to be a growing want.

The works now being carried out consist of a 30-in. cast-iron sea outfall carried on timber piles for a portion of its length, and where buried under the sand on concrete. These cast-iron pipes end at the tidal valve chamber fixed under the promenade. From this chamber to the screening chamber the pipes are 30-in. concrete pipes, which are laid on a 9-in. concrete foundation and covered with 6 in. of concrete. The ground was found to be running sand, and it has been necessary to lay a timber decking to support the concrete and leave the bottom frame of timber in for the protection of the pipes.

The screening chamber, in which a screen and raking apparatus are to be fixed, and the storage culvert, are to be placed under the roadway of the promenade.

The storage culvert, of which details are given in vol. xxxvii., will hold 400,000 gallons, which is equal to the capacity of the tanks at the east end. As it can be discharged twice per day, the total daily capacity is 800,000 gallons, and this it is hoped will prove sufficient to remove any danger from flooding.

SLAUGHTER-HOUSES.

The council have owned the slaughter-houses in Lytham for the past fifty years. Until seven years ago, however, they were not public slaughter-houses, but eight small private slaughter-houses in a somewhat dilapidated condition. These stood on land which the railway company wished to acquire for the purpose of widening the railway, and the council obtained from the railway company £800, the materials in the old buildings, and 1,132 sq. yds. of land in exchange for the 800 yds. given up to the railway company.

After considering some half-a-dozen different schemes for public and private slaughter-houses, the council finally adopted the scheme the plans of which are given on Plates Nos. 10 and 11.

The site is not an ideal site to plan, and it is not quite the scheme the author would have adopted had he had a free hand with regard to land and expenditure. The scheme has, however, the merit of having made the best use of the site, is economical, and it meets all reasonable requirements in a sanitary and convenient manner.

The slaughter-houses consist of a public slaughter-hall, 40 ft. by 30 ft., fitted up with hoisting and overhead gear, and is well lighted and ventilated. Cattle lairs are placed conveniently at each end of the slaughter-houses. The hanging room is a building, 40 ft. by 30 ft., detached from the slaughter-house, being cut off by a covered but open passage. This will probably be large enough for many years to come, and will serve for a future slaughter-hall on the east side when required.

The pig slaughter-house is fitted with overhead fittings, hoist and scalding tub. A boiler-house containing a vertical boiler and a tripe boiler, attendant's office, piggery, skin and hide stores, and outside cattle and sheep lairs, are also provided.

SANITARY CONVENIENCES.

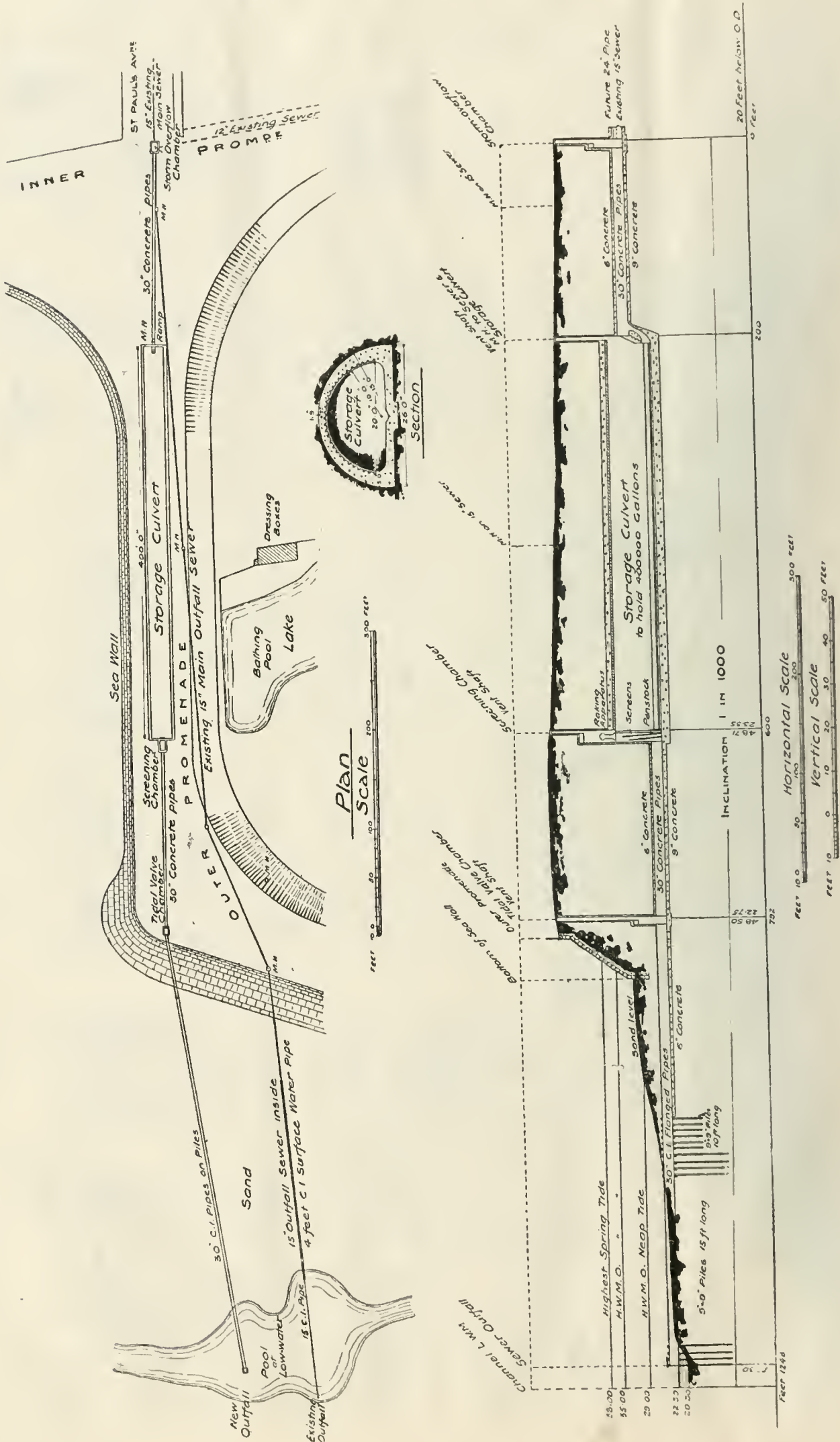
The selection of suitable sites for public conveniences is always a matter of some difficulty, and especially so in seaside resorts of the character of Lytham. Continental nations rather poke fun at what they consider our extreme sensibility in such matters, but, while it is very important that these conveniences should be put in positions where the public can easily find them, it is at the same time desirable that they should be screened and made as little obtrusive as possible.

The underground conveniences in Clifton-square, which is the most central spot in the town, have been planted round with flowers and shrubs in such a way that the square is, in most people's eyes, improved by the placing of the conveniences there, while there is no difference of opinion as to their value and necessity.

On the East Beach, near the old Windmill, one of Lytham's oldest landmarks, conveniences are constructed half in and half out of the ground, these, again, being well screened by a shrubbery, as are also the conveniences erected at the Lowther Gardens.

Other public conveniences have been erected at the Market Hall, and others are projected for the west end of the district.

The council have erected stabling, which adjoins a



LATHAM SEWERAGE: SEA OUTFALL AND STORAGE CULVERT, FAIRHAVEN. (Plate 8.)

fire station well equipped with steam engine and other fire appliances, have a good store yard, shedding and other accommodation, and generally are well equipped for carrying out the sanitary and highways work in an efficient manner.

Lytham has had a most successful gasworks for the past sixty-four years, supplying gas at 2s. per 1,000 ft. nett, which is the lowest in the Fylde district, and lower than any gasworks in the country of the same size. An installation of vertical retorts is just nearing completion, and it is confidently expected will lead to much cheaper gas in the near future.

The success of the gasworks has in the past militated against the introduction of electricity; but this is shortly to be introduced. The council have recently obtained an order from the Board of Trade to provide electricity, and are awaiting the result of the Local Government Board inquiry into their application for £23,700 to carry out the scheme prepared by their electrical engineer, Mr. J. H. Tonge, M.I.E.E., ASSOC.M. INST.C.E., of Preston.

The water supply of Lytham is provided by the Fylde Water Board, which is composed of members of the Blackpool, Fleetwood, Lytham and St. Anne's Councils. The gathering grounds are at Grisedale, near Garstang, where a new reservoir is now being constructed under the engineer to the board, Mr. J. Cook, ASSOC.M. INST.C.E., an old and valued member of our institution. Powers have recently been obtained from Parliament for acquiring extensive gathering grounds on the upper reaches of the Hodder in Yorkshire, and to carry out works estimated to cost over £1,000,000, so as to provide for future requirements.

The district is well served by the Blackpool, St. Anne's and Lytham Tramway Company, whose cars run right through from Blackpool Central Station to the Cottage Hospital at the east end of Lytham. The cars have materially assisted the development of the district, and are very largely used by visitors during the summer season.

In conclusion, the author wishes to acknowledge the valuable assistance he has received in preparing the plans accompanying the paper from his chief assistant, Mr. E. Pilling, and from Mr. J. D. M. Morton.

DISCUSSION OF MR. PRICE'S PAPER.

The CHAIRMAN (Mr. J. S. Brodie) moved a formal vote of thanks to Mr. Price for his paper.

Mr. E. WORRALL (Stretford), in seconding the vote of thanks, said there were many features in the paper which commended themselves to those engaged in municipal work, but he ventured to join issue with Mr. Price when he spoke of a surveyor's work in a small town as lacking in "importance." If he had substituted the word "magnitude" he would have agreed with him. Municipal works in Lytham were just as important to the inhabitants of that town as were those of Manchester, Liverpool, and other large cities. The comprehensive detail shown in the diagrams accompanying the paper would be of great use both to the older and the younger members of the institution. In the matter of town planning, Lytham was situated very much as they in Stretford were, as they also had practically only one landowner of an energetic and pioneering frame of mind, the result having been that they had been able to formulate a town planning scheme without any of the usual formalities, although, in order to secure for it an official status, they might go to the Local Government Board later on. It was interesting to know that Lytham had gone one better than their big neighbour—Blackpool—and provided a public park. That was one thing Blackpool had not done. [Mr. Brodie: The sea front is our park.] A park was one of the necessities for those in search of quiet retirement. [Mr. Brodie: They don't want quiet at Blackpool.] (Laughter.) After inquiring as to the powers under which a 60-ft. roadway had been provided in Lytham, Mr. Worrall went on to say that it would be interesting to have a little more information, if it could be given with due propriety, as to the reasons which led to the submerged outfall to which reference had been made. Some of the tar-paved roads in Lytham appeared to have a very remarkable life—twenty-four years being the maximum given. The occurrence of storms at times of high water was interesting, and he would like to know whether this was peculiar to the district, and, if so, whether there were any recorded facts available. He took it that the pumping capacity of the centrifugal pumps referred to a twenty-four hours' day. [Mr. Price: Yes.] The practice of laying pipes in concrete was, as a rule, a good one, but not one

that was always infallible—that was to say, one could not always rely on it in all circumstances. He would like some explanation as to Mr. Price's statement that, although the council had owned the slaughterhouses in Lytham for the past fifty years, they were not public slaughterhouses. The diagram of these buildings, which accompanied the paper, was, however, very useful material for members who contemplated the provision of such structures. The progressiveness of Lytham was, he thought, shown very clearly by the statement towards the end of the paper that a modern installation of vertical retorts was being installed at the gasworks, with a view, presumably, of further reducing the low price of gas.

Mr. S. PICTON (Eccles) said he thought there were several excellent ideas in the paper, especially for the younger members of the institution. One was in the remark of the author as to the work he had been able to do since his appointment to Lytham. They all knew the old adage about a rolling stone gathering no moss, and what Mr. Price had accomplished seemed to prove that to go about from place to place was not the best thing to do. He would like to know the price per yard of the tar-painting; also, in regard to the private street works, whether the council provided their own materials or allowed the contractors to purchase them. He was rather sorry to see the work was not done under direct labour, which was more beneficial. Did the owners pay for the provision of the streets under the statutory regulations? He was informed they could not legally charge the owners.

Mr. J. LOBLEY (Hanley), who said he had watched the progress of Lytham for nearly forty years, expressed a hope that the council would not spoil the broad stretch of greensward in front of the town by converting it into gardens.

Mr. W. STUBBS (Blackburn) inquired what would happen in the event of a breakdown of the single boiler that was available for the pumping of sewage.

Mr. H. YARWOOD (Rochdale) asked whether the entire cost of the 60-ft. road mentioned was borne by the abutting owners, or did the local authority or freeholders contribute something to the extra width?

Mr. T. BURROWS (Lathom and Burscough) asked whether it was the practice in Lytham to season the tar-macadam, and what size of stone was used for the aggregate. Was the tar tested for viscosity by an apparatus such as Hutehinson's viscosimeter? Was anything in the nature of resin or pitch put into the tar? He saw it was strengthened by pitch, but in what way? [Mr. Price: That is only in regard to wood paving, I think.] Was the tar distilled? Also, was the surface of the old macadam road scarified before the tar-macadam was laid?

Mr. J. HIRWOOD (Morecambe) remarked that the 45 acres of greensward on the front at Lytham was unique, but he considered it could be improved, and made a place of unrivalled attraction. Mr. Price was to be congratulated on being in a position to obtain such reliable tar that he was able to use it successfully at all times. He would like to know whether the tar was refined before delivery or whether Mr. Price dealt with it himself; also, were any viscosimeter tests applied? Were the concrete flags used for footpaths 2-in. or 2½-in.? [Mr. Price: 2½-in.] As regarded cross-overs on the footpaths, what paving was allowed for means of private access?

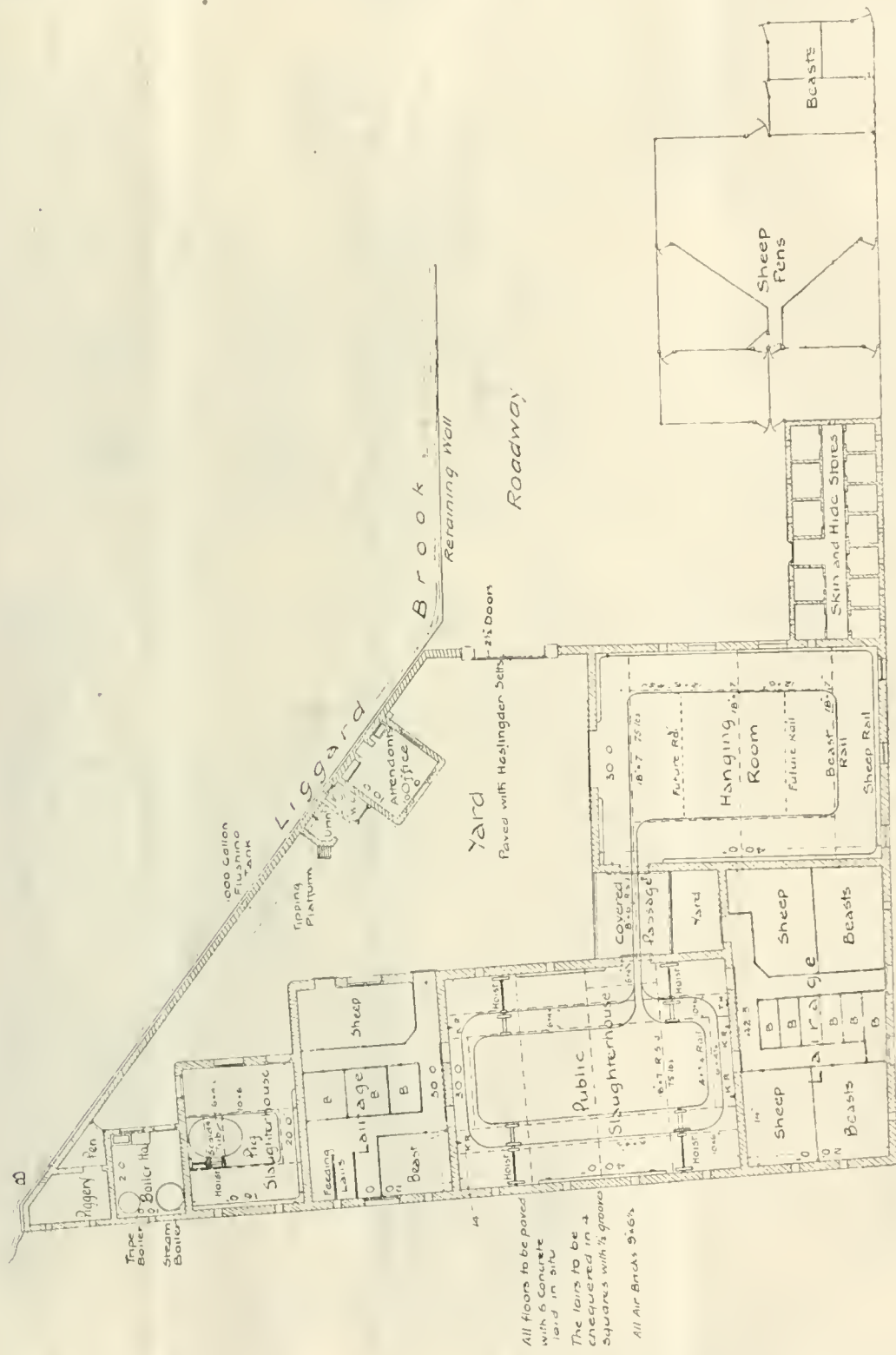
Mr. W. H. TRAVERS (Wallasey), following some remarks appreciative of the paper, said he was interested in the question of town planning as applied to Lytham because he was blessed in his town with a multitude of owners. He thought Lytham was to be congratulated on having a ground landlord who had taken a broad view of his responsibilities, and assisted the authorities to develop the district on such satisfactory lines. He should like to know whether the requirement of a 60-ft. road emanated from the estate office or the ground landlord, or whether it was a by-law requirement. If a by-law requirement it showed that the district had been very far-seeing, and anticipated problems like few other places.

Mr. C. BROWNRIDGE (Birkenhead) suggested that the addition of some particulars as to costs would add to the value of the paper. He would like to have some information as to the procedure adopted in regard to the mixing of the tar-macadam—whether Mr. Price mixed the stone only with the tar or put in a small proportion of chippings and mixed the larger with the smaller stone; because he thought many failures were caused by expecting stone to become cemented together simply by putting a liquid on the outside of it. Three different kinds of pumps had been alluded to by Mr. Price, and he would be glad to know the

efficiency of these; at the same time, in regard to the destructor, would he state what was the calorific value of the refuse?

The vote of thanks was carried.
 Mr. PRICE, in replying, thanked those present for the kind manner in which they had referred to his paper. He had had very great pleasure in preparing the contribution and in seeing them at Lytham. He had said at the outset of his paper that the surveyor's work in a small town made up in variety what it lacked in importance, but he agreed with

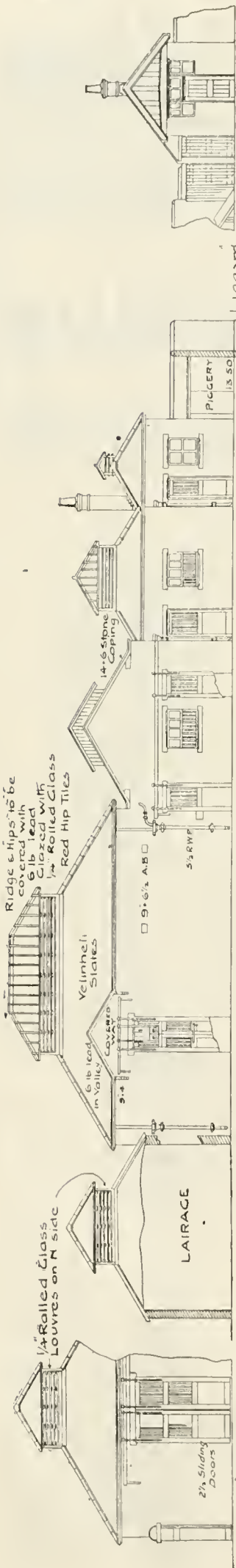
of tar got too low and some water got in, and he was afraid there had been occasions when they had been supplied with water instead of tar—which, as a rule, however, was excellent. One could not get a standard tar, or a tar that could be used in every situation. In the back street on which there was little traffic and sun it was desirable to retain the lighter oils in the tar, but on the front streets where there was a good deal of traffic and more sun, the effect of the traffic was to bring the tar to the surface. Therefore they could not eliminate the personal factor alto-



Scale 24 ft. to 1 in.
 LYTHAM PUBLIC SLAUGHTER-HOUSES.
 (Plate 10.)

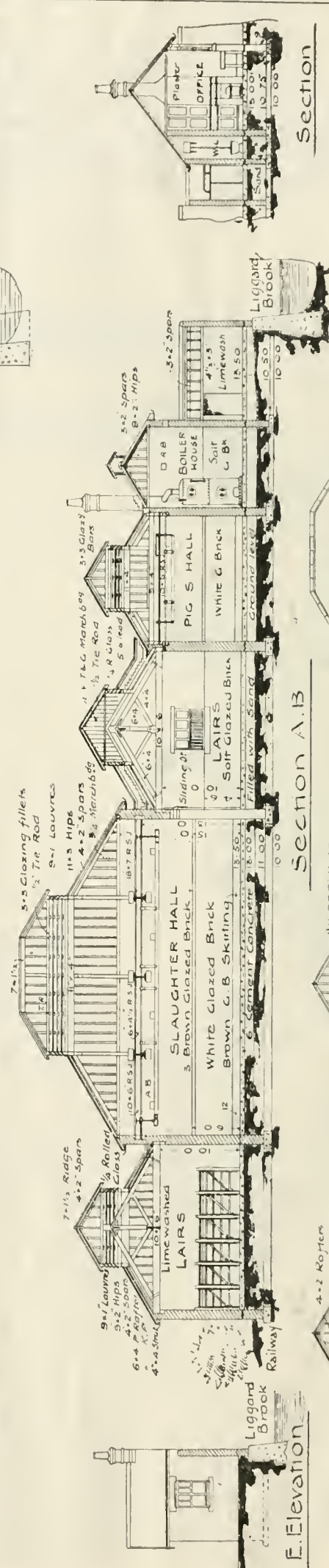
Mr. Worrall that "magnitude" would have been a more correct word than "importance." At the same time, he thought they understood what he had meant to convey. The only reason for the submerged outfall given by the engineer was that he could not take the levels because the tide was up. It was a rather singular explanation to give, but the fact of the matter was it was due to a mistake the engineer had never anticipated, and was compelled finally to admit. With regard to tar-painting, he might say that they never used any pitch at all, so long as the tar was in its usual condition. Sometimes the store

together. The mixing of his tar-macadam was done by hand. When he first went to Lytham he found a yard full of chippings, and in order to make use of these he mixed them with larger stone for the tar-macadam. From that time on they had done that, and one of the largest contracting firms in the country whom he told of the step he had taken immediately patented the process and put it on the market—(laughter)—in spite of the fact that he had been putting down the material in Lytham years before. They put a barrow load of chippings into a yard of stone. He had often thought of getting Hutchinson's appa-



N. Elevation

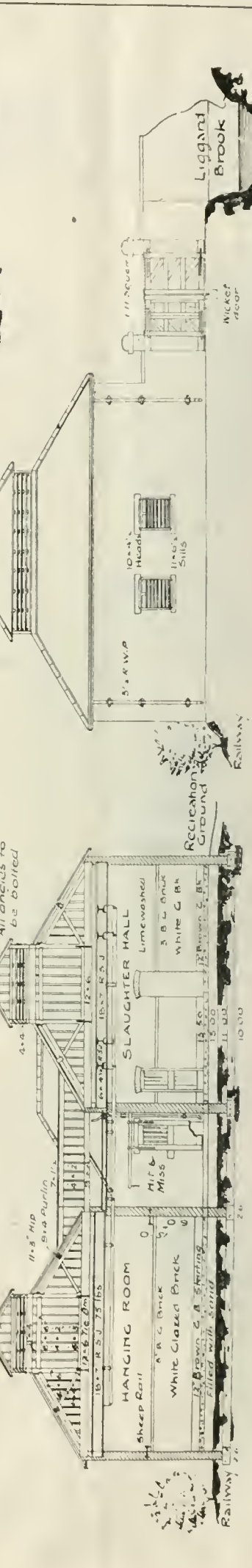
East Elevation to Yard



E. Elevation

Section A.B

Section



Section C.D.

Front Elevation looking East

LYTHAM PUBLIC SLAUGHTER-HOUSES.
(Plate 11.)

ratus for testing the viscosity of tars, but he had been doing so well that he was rather afraid to adopt more scientific methods. He did not know what the new system of vertical retorts at the gasworks might do, but it might alter the character of the tar. The 60-ft. road to which reference had been made was laid out for them by the estate. With regard to the syphon, all he could say now from his experience was that he would not attempt to syphon a sewer under a brook. As it was, cleansing operations were easy; the bottom of the brook had been concreted, and there was sufficient velocity of water to clean it out. In regard to the provision of trees, they were met very well by the ground landlord, who presented them with all the trees they wanted for new streets. With only two cells at the refuse destructor, and a single boiler, he agreed that they required a stand-by plant. In a statement prepared since the meeting Mr. Price deals as follows with other questions raised in the course of the discussion: "I should like also to point out that on Plate 8 an error has been made in the tracing, as the level 23.35 on the section should be at 200 ft., not at 600 ft., which is 22.95. The cost of the private street making, asked for by Mr. Brownridge, is, less sewerage and lighting, about as follows: 60 ft. wide, 28s. per foot-run for total width; 45 ft. wide, 24s. per foot-run for total width; 36 ft. wide, 18s. per foot-run for total width; 20 ft. wide, 12s. per foot-run for total width. The prices for sewers vary considerably, according to the depth and nature of the ground, but a 9-in. sewer 6 ft. deep costs about 8s. per yard, 8 ft. deep 10s. The slaughter-houses, as shown on the plans, when completed cost £3,000. The destructor and engine-houses with furnaces and pumping plant cost, including pump well, roughly £4,500, and the tanks £1,500. These prices would, however, hardly rule to-day, and I should estimate that the cost of materials and labour have gone up quite 40 per cent since this work was carried out."

Before the meeting terminated Mr. Brodie made a sympathetic reference to the late Mr. Alfred M. Fowler, whose death was recorded in *THE SURVEYOR* of the 5th inst. A vote of condolence with the relatives was passed, the members upstanding.

SCOTTISH DISTRICT MEETING AT DUNFERMLINE—(2).

Elsewhere in this issue we reproduce one of the three town planning papers submitted at this meeting—that of Mr. Raymond Unwin, entitled "A Town Planning Scheme: Its Effect on Housing and Architecture"—and we hope to be able to print next week the contributions of Mr. A. Horsburgh Campbell, the burgh engineer of Edinburgh, and Mr. John L. Jack, town clerk of Dunfermline, together with a report of the discussion which followed their presentation.

BEDFORD MEETING PROGRAMME.

To-morrow's Eastern District meeting of the Institution of Municipal and County Engineers at Bedford will open at the town hall at 2 p.m. There will be a short business meeting, at which a sub-district secretary for Bedfordshire, Buckinghamshire, and Northamptonshire will be elected. Afterwards an inspection will be made of the tar-macadam mixing plant of the county council and the Bedford Corporation, and this will be followed by a visit to tar-macadam roadworks in progress.

If time permits the members will proceed later to inspect the new sewage disposal works in course of construction.

Cardiff Housing Scheme.—The Housing Committee of the Cardiff Corporation have decided to appoint a sub-committee to act with the city engineer, Mr. W. Harpur, in preparing a housing scheme. The Lord Mayor stated that 1,400 or 1,500 houses were wanted in the city—300 immediately.

Maldens and Coombe Council's Employees.—On Saturday the officers and workmen, to the number of twenty-four, on the invitation of Councillor G. C. Hodgson, chairman of the Highways Committee, were taken to Box Hill in motor chars-à-banc. After luncheon Mrs. Hodgson was presented with a bouquet given by the wives of workmen, and Councillor Hodgson with a silver-mounted ebony walking-stick, given by the employees. After sports in the evening, a vote of thanks was cordially accorded to Mr. and Mrs. Hodgson, on the proposal of Mr. H. A. Jeffes, the surveyor.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MASSINGER: "The Fatal Dowry," Act ii. 2.

THE CONTROL OF ASHPITS.

To the Editor of *THE SURVEYOR*.

SIR,—I have read the very interesting article on "The Control of Ashpits" in your issues of the 5th and 12th inst.

My council have for many years maintained all wooden ash tubs at the cost of the town, the owner paying for the tub in the first instance. New by-laws have recently been adopted which call for a galvanised iron tub, and the council are considering whether these shall be maintained free of cost to the owner or occupier as tending to better sanitary conditions.

Can you refer me to any town where the authorities do this work free of charge?

Can the council legally incur this expense?—Yours, &c.,

INQUIRER.

June 13, 1914.

[We cannot find any statutory provision expressly authorising a local authority to repair ashpits free of charge. The Public Health Act, 1875 (sec. 35), prohibits the erection of a house without an ashpit, and (sec. 36) empowers the authority on the owner's default to provide one and recover the cost from the owner, or as private improvement expenses. Sec. 42 empowers the authority to undertake the cleansing of ashpits, but says nothing about their repair. We think it is, to say the least, very doubtful whether the council can legally incur this expense. Perhaps some of our readers may be able to refer "Inquirer" to towns in which the work is done free of charge.—Ed. *SURVEYOR*.]

LARGE HUMPHREY PUMPS FOR EGYPT.

An installation of Humphrey pumps has been ordered by the Ministry of Public Works of the Egyptian Government for the drainage of Lake Marcotis at Mex, near Alexandria. When completed this plant will be one of the largest pumping installations in the world, and will consist of eighteen pumps, each capable of delivering 100,000,000 gallons per day through a lift of 20 ft. The present order includes the first ten of these pumps together with the necessary gas-producer plant, Venturi water meters, travelling cranes, locomotive weighbridge, regulating gates and screens, and a complete gas-driven electric light and power installation.

The great size of the pumps may be judged from the fact that each unit is to be capable of delivering between two and three times that delivered by each large Humphrey pump unit installed at the Metropolitan Water Board's pumping station at Chingford. It will be recalled that the large pumps at Chingford have an output of 40,000,000 gallons per day each. The pumps comprised in the present contract have been designed with the aid of the valuable experience obtained with the Chingford station, and include many notable improvements although operating on the same cycle which has proved so successful at Chingford. The whole of the work will be carried out under the supervision of Messrs. Harper Brothers & Co., who are the consulting engineers to the Egyptian Government. They have prepared the specification and plans, and have designed the handsome buildings which will become a landmark in the neighbourhood of Alexandria.

Grants to Local Authorities.—In reply to a question in the House of Commons on Wednesday as to whether public health officers were included in the list of authorities to receive grants under the Finance Bill, 1914, Second Schedule, Part 1, England and Wales, line 25, *et seq.*, Mr. Herbert Lewis, Parliamentary Secretary to the Local Government Board, said the intention was to pay to local authorities one-half of the salaries of medical officers of health and their assistants, medical officers of hospitals, sanitary inspectors and their assistants, inspectors of foods, including milk, health visitors, veterinary officers, and any other health officers. It was not intended to make a grant in respect of the salaries of surveyors and analysts.

Road Carpeting in Surrey.

BITUMINOUS CARPETS FOR SUTTON URBAN DISTRICT.

At a recent meeting the Urban District Council of Sutton (Surrey) unanimously adopted a special report prepared by their engineer and surveyor, Mr. W. H. Grieves, relating to roads and traffic, and embodying specific proposals for the adoption of the bituminous carpet for the resurfacing of important roads. The report begins with a reference to traffic conditions, and to the classification of roads which is being undertaken by the Road Board for the purpose of deciding which roads are to be subsidised by annual grants of, respectively, 50 per cent and 25 per cent. The Sutton roads to be recommended for inclusion in the first class include portions of the London and Brighton main road, the Cheam road, the London road, the Carshalton road, and three other roads. Five roads are to be recommended for inclusion in the second class, including West-street and Banstead-road. At present the contribution of the county council towards the cost of main roads is £1,900 per annum, and £280 per annum on account of wood block paving; but this does not cover the whole cost of maintaining the present main roads. The Government grant will not directly advantage the urban council with respect to these roads, but the county, to whom the rates are paid, will have less money to find than at present, and this is partly how the local rates will be relieved.

In respect to the second class roads, the county council now pay half the cost of materials and haulage for "assisted" roads, the Carshalton road being at present the only road of this class in the urban district. Under the new scheme half the cost of second-class roads will be paid, partly by the county council and partly by the Government.

HEAVY TRAFFIC ON SECONDARY ROADS.

Heavy traffic is not confined to the main roads, for many motor vehicles of the large London stores, and other vehicles of a similar kind, traverse the secondary and other district roads, and were it not for the annual tar-spraying these roads would be ruined and the cost of repairs would become unbearable. The county surveyor, Mr. A. Dryland, showed in a recent report that in the last four years the number of heavy motor cars registered in the county of Surrey had increased by 132 per cent, and in the county of London by 201 per cent, and Surrey, being within easy range of London, was subjected to the increased traffic. During the past twelve months motor omnibus services have been extended into the Sutton urban district, on the London and Epsom road, the London and Brighton road (three services), and Sutton Common road (Putney Bridge to Kingswood service). The last named road is not even an assisted road. It has a flint crust, which has for the last two or three years been dressed with tar, and it is often breaking under ordinary conditions of traffic. Experience with water-bound, tar-dressed roads shows that an even surface cannot be maintained under present traffic conditions, and the expenditure on continual repairs is considerable. Sutton is reaping the benefit of the foresight and enterprise of its council in the matter of road maintenance, but further progress is necessary.

PRESENT METHODS.

In order to maintain the roads as provided by the agreement with the county council, the following surfacings have been provided. Five thousand square yards of creosoted deal blocks have been laid, on 7 in. of concrete crust, at a cost of 10s. 6d. per square yard. An area of 2,165 sq. yds. of Roadmant, 1 in. thick, has been laid on water-bound macadam, at a cost of 4s. 8d. per square yard. Over 6,000 sq. yds. of Roemac, with Penlee stone or Guernsey granite, have been put down at a cost of 3s. 9d. per square yard; 2,500 sq. yds. of tarred slag, in two coats, at 3s. per square yard; and 5,500 sq. yds. of Mexphalte, 3 in. thick, at 4s. per square yard. An area of about 2,000 sq. yds. of Quarrite has cost 3s. 4d. per square yard. The wood paving is considered too costly, although a more satisfactory and substantial pavement it is perhaps impossible to find."

THE CARPETING METHOD RECOMMENDED.

"My opinion is that, given a satisfactory foundation, even though it be an existing tar-macadam or water-bound macadam road, a carpet of bituminous

material such as this can be produced at much less cost than would be possible by a contractor carrying out the work, if the council would provide the machinery to dry and mix the necessary ingredients. It would be laid similar to the Mexphalte carpet on Brighton-road and the Roadmant at the bottom of High-street.

"The advantages of an asphaltic surface such as that produced by the Mexphalte and Roadmant carpeting would be many, as, for instance, the necessity of purchasing granite macadam could be largely done away with, as the sand, which is the chief ingredient, could be obtained within the county itself; roughly speaking, it (the sand) would comprise about 78 per cent of the whole, with about 12 per cent of bitumen and 10 per cent filler, or taking a less percentage of sand and adding granite chippings if thought desirable. Further advantages of this class of road is that the scavenging would be very much less, no watering at all would be required, and the saving each year in the tar dressing of the surface would be very considerable, in addition to which the wear and tear and repairs would be considerably less than on many other classes of roads. The remarkable feature of this class of surface is that slipperiness for horses is reduced to a minimum."

Mr. Grieves then quotes from the report of the county surveyor, to the effect that, with a suitable base, the life of an adequate thickness of a bituminous carpet might be taken at a minimum of seven years, with a maximum, according to traffic, ranging up to double that life, or even more; and continues:

"Up to the present I have simply referred to the surfacing of existing roads. It is, of course, quite necessary that good foundations are required for a road of this description, and where not already in existence some support for the sides of the road will also be necessary; but this does not need to be costly, as the same method that I introduced on Brighton-road for the Mexphalte itself—namely, a creosoted deal kerbing fixed with iron dogs, and stakes driven into the ground, and finished off level with the surface of the material—would be all that would be required, or Mr. Dryland's method of laying a 9-in. by 4-in. reinforced-concrete kerb left flush with the carpet, which would cost about 1s. 6d. per yard run."

THE PLANT REQUIRED.

The following is a short specification of the plant for preparing the bituminous carpeting material:—

One Coleman's patent stone and sand drier, consisting of one 5 to 6 h.p. petrol engine, with water tank and fittings complete; one dryer and furnace capable of drying and heating to a temperature of at least 400 deg. Fahr.; stone, slag, sand, chippings, or any other similar material for bituminous road making, and including all pulleys and fittings and elevator. The whole mounted on a steel frame, lock, steel wheels and axles of sufficient strength to carry the required load. The machine to be fitted with brake and draw-bar.

The total output of bituminous compound of the above machine is guaranteed to be approximately 40 to 60 tons per day, according to weather conditions.

One Coleman's mixer, mounted on steel frame, fore-carriage and lock with steel wheels and axles, the mixer elevated to a sufficient height to allow the material to empty into a cart.

One enclosed elevator for lifting the material into measuring bin, with the necessary raised platform for men to work upon.

One 10-h.p. petrol engine, with water tank and fittings.

One small hand winch and wire rope for elevating bitumen.

One measuring bin of 10 to 15 cwt. capacity.

Brake fitted, and mixer supplied complete with draw-bar. The above machine is capable of thoroughly mixing the material with the bitumen at the rate of about 15 cwt. in three to four minutes.

The total cost of the machinery would probably be about £900.

The main idea is that the sand should not only be absolutely dry, but it must be heated to a temperature not exceeding 180 deg. Cent.

The Road Board are prepared to grant a loan, free

The Surveyor

And Municipal and County Engineer.

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of interest, for the cost of the plant, and this could be paid off in five years. Assuming that the machine could be worked 150 days in the year at 40 tons per day, it would turn out 6,000 tons per annum. Allowing for one fore-man, two men feeding the machine, two mixing, one man at the bitumen tank, an engine driver, two men wheeling, three men laying the material, the cost of sand, bitumen and filler, and adding charges for maintenance, haulage, depreciation, depot rents and steam rolling, the cost per ton would be at least 50 per cent less than the price at which the work would be done by contractors, "and at a figure somewhat less than the cost of laying an ordinary tar-macadam road." Assuming that the machinery would do all that is claimed for it, then the cost will be equal to about 2s. to 2s. 6d. per square yard.

The cost of the main roads already repaired at the prices mentioned in the report amounted to over £6,000. There still remains to be repaired, on the main roads, an area of 24,870 sq. yds., which, at 5s. per square yard, would cost £6,217 10s. Putting the cost of the new method at the higher figure of 2s. 6d. per square yard, this would amount to £3,103 15s., effecting a saving of over £3,000, or more than enough to pay the cost of the machinery three times over. The machinery could also be used for mixing tar or asphalt macadam, and for this purpose stone taken up from other roads could be used in addition to new stone.

TEST OF THE MACHINERY.

The following test of the machinery was made at the manufacturers' works at Derby in the presence of a sub-committee appointed by the council for the purpose:—

Wet sand was put into a measure 3ft. 6in. square by 9 in. deep, and then put into the drier, and immediately came out of the drier at a temperature of 360 deg. Fahr. Within 5½ minutes 7½ cwts. were put through the machine, and came out at a temperature of 600 deg. Fahr.

A second lot was put in, to which 4 gallons of water was added to the already wet sand, and within 1½ minutes this was turned out of the machine at a temperature of 500 deg. Fahr. The temperature of the wet sand before it was put in was 70 deg. Fahr. One man fed the mixer with 7½ cwts. in seven minutes. Ordinary sand on a dry day was then put in, and the 7½ cwts. was passed through the machine in 3½ minutes at a rising temperature of over 400 deg. Fahr. In the combined stone and sand drier 2 tons of wet limestone macadam were put through the machine, and after

remaining in the same for ten minutes, came out at 470 deg. Fahr.; 21 to 22 cwts. of sand were passed through this machine in 8½ minutes, and came out at a temperature of 465 deg. Fahr.

This mixer will deal with 10 to 15 cwts. in three minutes.

Stone revolves in this machine at a rate of 14 miles per hour, and sand at the rate of 25 miles per hour.

RACE MEETING TRAFFIC.

Included in the report are the following figures—a traffic census taken for the four days of the Epsom Summer Meeting, from 11 a.m. to 10 p.m., at a point on the Brighton road just north of its junction with Banstead road:—

Nature of traffic.	No.	Weight, Tons.
Cycles	12,117	1,990.5
Motor Vehicles		
Motor cars	7,028	11,244.8
Motor cycles	1,696	220.18
Motor vans	267	517.5
Motor omnibuses	1,007	6,042
Motor lorries (rubber tyred)	47	282
Trailers to same	4	20
Motor lorries (steel tyred)	5	50
Motor lorries, trailers	2	10
Traction engine and trailer	1	20
Horse Drawn Vehicles		
Light, one-horse vehicles	3,693	1,257.2
Light, two-horse vehicles	444	260.4
Heavy, one-horse vehicles	322	402.5
Heavy, two or more horses, vehicles	118	295
Omnibuses (three or more horses)	178	534
Total all vehicles	26,970	23,222.38
Horses, &c.	5,551	1,847.9
Total weight of traffic on road		25,070.28

INFILTRATION OF SUBSOIL WATER INTO SEWERS.

[Extract from paper read by Mr. J. N. Ambler before the American Association for the Advancement of Science.]

Feeling the necessity of having some criterion upon which to base the engineer's acceptance of the work, so far as ground water is concerned, the writer read up all available data on ground waterflows, and came to the conclusion that it is a subject about which too little is known, and that what is known is conflicting.

There should, however, be some criterion to apply to work done by contract, and it seemed that nothing better could be done than to determine how much water the sewer might be allowed to carry without materially injuring its usefulness. The criterion should not be so severe as greatly to affect contractors' bids.

Such a criterion, it would seem, should be based upon the number and circumference of the joints.

The following clause appears in one of the writer's specifications, and is offered for what it is worth, until something better can be substituted. It at least has had the effect of securing some very careful work, and contractors were not disposed to regard it as severe when thoroughly explained to them:—

"It is the intent of these specifications that no more leakage of ground water into the sewer be allowed than is admissible with a first-class piece of work, in which care has been exercised to get as near as possible to a watertight result.

"To determine the admissible amount of leakage, the length of a joint will be considered as the outside circumference of the spigot end of a pipe.

"Leakage not in excess of 2 gallons per day of twenty-four hours for each foot of circumference of every joint will be considered admissible, the amount of flow to be determined by the engineer's gauging in each section, by means of a notch board.

"The contractor agrees that for each 10,000 gallons per day of twenty-four hours by which the total flow of the sewer exceeds what the total flow should be, when figured on the basis already given, a deduction of £20 from the contract price will be made.

"This will not apply further than to a total flow resulting from 3 gallons per day of twenty-four hours, from each foot of joint length, beyond which figure the sewer will be regarded as not in compliance with this contract."

The writer's opinion is that the above requirement is a very mild one, as he once laid a mile of large sewer through exceedingly swampy land, passing under several streams, with a result that not more than a stream ¼ in. deep was flowing in the bottom of the pipe at the lower end on completion.

However mild the criterion may be, it has had a powerful deterrent effect against bad work.

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

398. Road Construction.—Should the stones in a macadam road be all of one gauge, or are varying sizes preferable? Give reasons. (Junior.)

402. Column Design. A hollow cast-iron column is 9 in. in external diameter, its length is 12 ft., and its two ends are firmly built in. The compressive load it supports is 60 tons. What thickness must the metal be in order to have a factor of safety of 10? (T. R.)

403. Rain Gauge.—Describe, with sketches, a reliable form of rain gauge.

404. Collapsing Strength of Pipes.—What is the collapsing pressure in lbs. per square inch of a 3-in. cast-iron pipe, 12 ft. long, and of 3/4-in. thickness? Pressure on outside of pipe only. (H. V. A.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

400. Structures.—What is meant by a redundant member in a truss, and why are such members introduced? Sketch two simple trusses, each having at least one redundant member. (I.C.E.)

The following further reply to this question has been received:—

A redundant frame is one in which the stresses are statically indeterminate owing to there being more bars than are required to make the structure a complete triangulated frame, and may be generally



FIG. 1.

considered as two frames superimposed. They are most frequently used to avoid a reversal of strain



FIG. 1(a).

on certain bars in structures designed to carry a moving load. They are sometimes introduced to



FIG. 1(b).

increase the rigidity of a frame. They are further employed when it is desired to split up the load into a greater number of parts than would be possible with a single frame, and by so doing enable lighter sections to be used for their resistance. Two

of the most widely used trusses of this class are the lattice truss (Fig. 1) and the Whipple-Murphy



FIG. 2.

truss (Fig. 2). It will be seen that each of these examples may be split up into two independent



FIG. 2(a).

frames (a) and (b), each complete in itself. If one of these frames should act alone in the truss as a

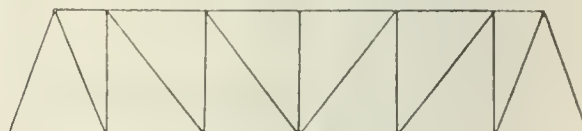


FIG. 2(b).

whole, then the bars of the other frame, not common to both, are redundant. (E. E. W.)

399. Fireproof Construction.—What fireproof preparations can be used for protecting timber, and what independent coverings may be applied for the same purpose? (S.A., 1905.)

Timber can be rendered fire-resisting with more or less satisfactory results by impregnating it with one or other of the following preparations: A dilute solution of silicate of soda and limewash applied in alternate coats, and then another and stronger coat of the silicate; "Burnetising," which consists of steeping the timber in a solution of 1 lb. of chloride of zinc to 4 gallons of water; "Payne's" system, which is an injection of sulphate of iron into the pores of the wood, and then a further injection of sulphate of zinc. Asbestos paint has given good results, and so also has tungstate of soda when applied as a paint. Wood treated in either of the above ways will not grow incandescent and burst into flame when exposed to the action of fire, but will merely become charred. This is subject to a reasonable time limit, however, for no material will withstand the action of fire indefinitely. Independent coverings to protect wood from fire may be porous terra cotta in specially shaped blocks according to the situation; 2 in. of concrete; or by plaster and expanded metal. (H. G. L.)

Bristol and Tramway Purchase.—The ratepayers of Bristol on Saturday were polled on the question of the purchase of the local tramway undertaking, with the following result: In favour of purchase, 18,057; against, 14,894; majority in favour, 3,163. The total on the register is 71,902, and the actual number who voted was 33,017, there being sixty-six spoilt papers.

Cause of Street Collapses in Paris.—Following the disastrous street subsidences in Paris during the great storm of Monday night, the Minister of Public Works announces that he has ordered an inquiry into the method of construction of the underground railways of the city. The *communiqué* says that the wash-outs followed the rupture of sewers and the flooding of the underground railway construction works.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Derby T.C. (June 11th. Mr. Edgar Dudley).—£4,050 for three schemes of main road widening.—In anticipation of an automatic increase of traffic, land already belonging to the corporation on the Mansfield and Uttoxeter roads, in each instance near the borough boundary, is to be thrown into the roadways, thus making them 50 ft. wide. The actual expenditure upon the Mansfield-road improvement will be £2,800, and on that in Uttoxeter-road £3,403, and the Road Board is making grants of £1,040 and £1,463 respectively. The third proposal affects the Wardwick, in continuation of the widening of which to 47 ft. is estimated to cost £350.

Newark T.C. (June 9th. Mr. Edgar Dudley).—£2,105 for the purchase of property in Middlegate to enlarge the town hall and provide a new police station. It was asked that the repayment should be spread over a term of sixty years.

Riccall R.D.C. (June 11th. Mr. F. O. Stanford).—£3,810 for a water supply scheme for Barby.—It was explained that it is proposed to take the supply from the Selby waterworks at a cost of 9d. per 1,000 gallons, and carry it by means of two 6-in. pipes across the bed of the River Ouse to the Barby side.

South Mimms R.D.C. (May 26th. Mr. Edward Leonard).—£2,750 for the erection of twelve cottages upon land forming part of the sewage farm.—The surveyor, Mr. G. Simcox, stated that his plan showed twelve cottages, each with large kitchen, scullery, and offices; and three bedrooms measuring 15 ft. 2 in. by 11 ft. 6 in., 11 ft. by 7 ft. 7 in., and 8 ft. 4 in. by 7 ft. 2 in. He estimated the cost at £185 per cottage on the basis of 8,000 cub. ft. at 5½d. The inspector: Why not less than 5½d.? Mr. Simcox: That seems to be about the current rate. Cartage is heavy. The inspector: Do the plans comply with the by-laws? Mr. Simcox: Except as to drainage. The clerk, Mr. C. D. Byfield, explained that when the architect to the Local Government Board saw the plan he suggested that the cost might be reduced by having "combined drainage." The plan was altered accordingly, and the council asked the Local Government Board to approve a by-law giving them a discretionary power to vary the by-laws in cases where it was considered desirable, but the board refused to allow a permissive by-law. Mr. Simcox, replying to the inspector, said if combined drainage was not allowed he must add to his estimate £3 or £4 per cottage. It was hoped that the rent would not exceed 5s. or 5s. 6d. at the outside.

Wigan T.C. (June 12th. Mr. W. M. Cross).—£50,638 for a new scheme of sewerage, together with £5,518 for supplementary expenditure on the old scheme.—The town clerk, Mr. W. H. Tyrer, stated that the town council concluded that it was useless spending more money on the old works. With regard to the over-expenditure, the town clerk said the corporation very much regretted it, but the old committee which had the matter in hand were not aware that the expenditure was going on in such a manner. Mr. W. Bolton, formerly borough engineer, admitted that there had been over expenditure, and said it ought not to have been incurred without the sanction of the Local Government Board, but the emergencies demanded action. The town clerk stated that Mr. Bolton had satisfied the Investigation Committee that all the unauthorised expenditure was legitimately spent and accounted for.

APPLICATIONS FOR LOANS.

- Ashington U.D.C.**—£5,000 for water mains.
- Bromyard (Herefordshire) U.D.C.**—£1,200 for a sewerage scheme.
- Ealing T.C.**—£5,500 for the erection of twenty-two workmen's dwellings.
- Feckenham R.D.C.**—£1,940 for the erection of ten workmen's houses.
- Gosport U.D.C.**—£2,000 for road construction.
- Grimby R.D.C.**—£3,376 for road improvement.
- Heath Town (Staffs) U.D.C.**—£1,000 for the provision of municipal offices.
- Newcastle-on-Tyne T.C.**—£2,075 for the Ouseburn culvert.
- Rhyl U.D.C.**—£650 for the enlargement of the isolation hospital.

Sunderland T.C.—£20,000 for electrical machinery, and a training college.

West Sussex C.C.—£550 for the purchase of a site at Bognor for a school.

Wortley R.D.C.—£4,400 for an infectious diseases hospital.

LOANS SANCTIONED.

- Baldock U.D.C.**—£420 for the Klondike water supply.
- Birmingham T.C.**—£65,428 for the enlargement of the council house.
- Bucklow R.D.C.**—£2,542 for the Northenden sewage disposal works.
- Carshalton U.D.C.**—£750 for a motor fire engine.
- Chorley R.D.C.**—£200 for water mains.
- Clacton U.D.C.**—£816 for a bathing pavilion.
- Darlaston U.D.C.**—£15,660 for works of sewerage.
- Frinton U.D.C.**—£600 for the extension of the sewer outfall.
- Hitchin U.D.C.**—£9,640 for an isolation hospital.
- Liverpool T.C.**—£3,500 for the Chorley reservoir, and £1,500 for water mains.
- Newton Abbot R.D.C.**—£4,350 for Hsington water supply.
- Normanton U.D.C.**—£1,800 for the erection of workmen's dwellings.
- Radcliffe U.D.C.**—£1,180 for street improvement.
- Reigate T.C.**—£765 for a first-aid motor tender.
- Wakefield T.C.**—£17,200 for workmen's dwellings.

FORTHCOMING INQUIRIES.

JUNE.		£
23.—	Cockermouth. For works of sewage disposal (Major C. E. Norton)	3,000
23.—	Dorchester. For the purposes of a hospital and disinfector (Mr. W. W. E. Fletcher)	1,100
23.—	Dudley. For street improvement (Mr. Edgar Dudley)	3,280
23.—	Eastbourne. For the electricity undertaking (Mr. H. R. Hooper)	4,656
23.—	Llanfyllin. For a housing scheme (Mr. F. O. Stanford)	1,585
23.—	St. Germans. For works of water supply (Mr. P. M. Crosthwaite)... ..	1,500
23.—	Tamworth. For improving the recreation ground (Mr. H. Shelford Bidwell)	1,400
24.—	Coventry. For road widening (Mr. Edgar Dudley)	332
24.—	St. Asaph. For works of water supply (Mr. F. O. Stanford)	1,100
24.—	St. Ives. For wharf improvement (Mr. P. M. Crosthwaite)	478
24.—	Sutton Coldfield. For the provision of a refuse destructor (Mr. H. Shelford Bidwell)	5,500
25.—	Axminster. For the purposes of water supply (Mr. P. M. Crosthwaite)	1,450
25.—	Biggleswade. For a housing scheme (Mr. H. S. Stewart)	6,600
25.—	Lyminster. For sewerage and other works (Mr. H. R. Hooper)	2,500
25.—	Millom. For the purposes of water supply (Major C. E. Norton)	2,250
25.—	Mountain Ash. For the purposes of water supply (Mr. H. Shelford Bidwell)	40,000
25.—	Reading. For street widening (Mr. Edgar Dudley)	975
25.—	Sudbury. For the provision of water pumping plant (Mr. W. M. Cross)	6,400
26.—	Bootle. For works of water supply (Major C. E. Norton)	170
26.—	Cosford. For works of water supply (Mr. W. M. Cross)	500
26.—	Havant. For sewage disposal works (Mr. H. R. Hooper)	570
26.—	Hayes. For road widening (Mr. Edgar Dudley)	300
26.—	Yeovil. For a housing scheme (Mr. P. M. Crosthwaite)	1,760
JULY.		
1.—	Heysham. For the purposes of an isolation hospital (Mr. W. W. E. Fletcher)	600
TOWN PLANNING.		
JULY.		
10.—	Merton and Morden. (Mr. Thomas Adams)	—

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Bognor, Huddersfield £5,000, Southport, Sunderland; housing and town planning—Salfron Walden; roads and materials—Haddingtonshire, Isle of Wight £50,000; sewerage and sewage disposal—Grimsby £20,261, St. Austell, Skelmersdale; water, gas and electricity—Hitchin, Manchester.—Particulars of other projected works will be found in our "Local Government Board Inquiries" page.

BUILDINGS.

Bognor U.D.C.—The provision of a public slaughter-house is to be considered by the council.

Clydebank T.C.—With respect to division walls and fences in back courts, the master of works has been instructed to prepare an amendment to the by-laws, prohibiting the erection of spiked railings, which were declared to be dangerous, and asking power to insist on a bar of iron along the top of fences.

Hamilton T.C.—It has been agreed to erect premises for the fire brigade, at an estimated cost of £1,451. New stables are also to be provided for the cleansing department, at an estimated cost of, including site, £3,400.

Huddersfield T.C.—It has been decided to enlarge the girls' high school, at an estimated cost of £5,000.

Radcliffe U.D.C.—The surveyor, Mr. W. L. Rothwell, has received instructions to prepare the plan of a tramway shelter.

Redditch U.D.C.—The surveyor, Mr. A. J. Dickinson, has prepared a scheme for the erection of a ferro-concrete bridge over the River Arrow at Beoley brook, and the construction of a new road, at an estimated cost of £1,458. A contribution of £200 has been promised by the Bromsgrove Rural District Council, and £150 by the Worcestershire County Council, and the former council, on being appealed to, have declined to increase their grant. In the circumstances, Mr. Dickinson has advised his council to carry out the scheme by degrees, as opportunity and means permit.

Romford U.D.C.—The surveyor, Mr. H. T. Ridge, has been instructed to prepare a plan and estimates for a public convenience for both sexes upon a site in Laurie-square.

Southport T.C.—A site at the corner of Eastbank-street has been acquired for the purpose of municipal offices.

South Shields T.C.—Arrangements have been completed for the purchase of the Olympia skating rink for the purpose of a public shelter, at a cost of £250.

Sowerby Bridge U.D.C.—The surveyor, Mr. J. Eastwood, has been instructed to prepare plans and estimates for the enlargement and alteration of the swimming baths as a preliminary to adopting a filtration scheme.

Sunderland T.C.—Plans and estimates are to be prepared of a proposed scheme for the extension of the town hall.

Sunderland T.C.—Preliminary steps have been taken with a view to the preparation of a scheme for the enlargement of the town hall.

HOUSING AND TOWN PLANNING.

Bognor U.D.C.—The surveyor, Mr. O. A. Bridges, has received instructions to prepare plans for the erection of houses in accordance with suggestions received from the Local Government Board. The board wrote with respect to a scheme proposed by the council that they did not consider it advisable that two houses should be placed on such a restricted site, but were advised that it would be quite possible for the council to prepare a scheme for the erection on the site of one house of a better type than the two proposed and let it at the proposed rent of 6s. 6d. without incurring any charges upon the rates.

Bray U.D.C.—A proposal is being considered for a housing scheme estimated to cost £7,000.

Crewkerne U.D.C.—The surveyor, Mr. B. Slade, has received instructions to prepare the plans of a housing scheme to consist of twenty houses.

Dewsbury T.C.—The council have approved a block plan submitted by the borough surveyor, Mr. H. Dearden, and the medical officer, for laying out the Old Borough Park and the erection of houses thereon, and the surveyor has been instructed to submit further plans showing the arrangements of the interiors of the houses.

Dore (Hereford) R.D.C.—A letter has been received from the Local Government Board stating that the board had had under consideration the report made by their inspector, Mr. W. H. Collin, after the inquiry held by him during a recent visit for the purpose of investigating housing conditions in the rural district. The board gathered from the report that the housing conditions in the district were very unsatisfactory. The inspector reported that a large number of the houses were in a defective and insanitary condition; that some appeared to him quite unfit for habitation, and probably not worth the cost of repair. The board requested the council to give these extremely unsatisfactory conditions their immediate and serious attention, and the council decided to consult the parish councils on their housing requirements.

Dumfries T.C.—Plans are to be prepared for forty-eight additional workmen's houses.

Newquay U.D.C.—The council are inviting tenders for twenty workmen's cottages.

Pebworth R.D.C.—The sanction of the Local Government Board is being asked for a loan for the erection of ten workmen's cottages.

Saffron Walden R.D.C.—The council have adopted a housing scheme the cost of which is estimated at £6,000. The proposed dwellings will be distributed over various parishes.

Thetford T.C.—It was reported last week that there had been a saving upon the contract for the erection of fifty houses of nearly £37, and that with extras the contract was only exceeded by £14. The council considered this quite satisfactory, and accorded Mr. Waring, the architect, a vote of thanks for his services.

Wigston U.D.C.—Subject to the necessary loan being obtained, arrangements have been completed for the erection of twenty-four workmen's dwellings.

PARKS AND OPEN SPACES.

Bognor U.D.C.—The council have purchased for £6,150 certain freehold properties overlooking the Marine-parade, with a view to converting the site into a pleasure garden.

ROADS AND MATERIALS.

Aldershot U.D.C.—A mild protest by the surveyor, Mr. F. C. Uren, on the subject of his professional discretion, had the desired effect at a recent meeting, when Mr. Smith, referring to the remaking of a footpath in Station-road, alleged that the old path had been good enough to last for ten or fifteen years more, and suggested that the chairman of the Highways Committee should go round and ascertain what paths required repairing. Mr. Calvert spoke in similar terms. The surveyor: If the chairman of the Highways Committee is going round to inspect the whole of the paths which are mapped out for execution in the six months, he had better take over my job. Isn't there anything left to my discretion? I say emphatically this path did require repairs. It was full of water during rain, and there wasn't sufficient fall to it. In my discretion, and in accordance with the programme arranged by the Highways Committee, I had the work executed. Mr. Calvert said he was pleased to hear it, and he was sorry if anything he said reflected on the surveyor. It was very satisfactory to be able to explain it. He could not before, but he could now. Mr. Ainger: So could Mr. Smith.

Axminster R.D.C.—It has been agreed to proceed with the improvement of the tidal road between Axmouth and Seaton, and the widening of Stedcombe-lane, at an estimated cost of £560.

Barnsley T.C.—Estimates of £371 have been adopted for works of street improvement.

Bognor U.D.C.—An 8-ton steam roller with awning and scarifier is to be purchased from Messrs. Wallis & Stevens, at a cost of £467.

Bournemouth T.C.—The borough engineer, Mr. F. W. Lacey, has received instructions to construct a temporary approach to the beach at Southbourne. Mr. Lacey has also been asked to prepare a more permanent scheme for the consideration of the Beach Committee.

Cannock U.D.C.—Contributions of £590 have been promised from the county council and the Road Board towards the proposed widening of Stafford-road, which is estimated to cost £1,018.

Gromer U.D.C.—The council have approved the plan of the surveyor, Mr. R. Croome, for the widening of Overstrand-road, at an estimated cost of £944.

Haddingtonshire C.C.—The Eastern District Committee have adopted a five years' scheme for the main post and coast roads. The cost amounts to £12,493, towards which the Road Board have agreed to make a grant estimated at £3,436, in addition giving a loan estimated at £7,616, free of interest and repayable in five years. The cost of the plant will be £2,434. In connection with the experimental road construction scheme, a station is to be established in the vicinity of the Knowes, where observations are to be taken daily.

Hemel Hempstead T.C.—It is proposed to carry out a highway improvement scheme at an estimated cost of £3,510.

Isle of Wight R.D.C.—Plans have been adopted for strengthening and resurfacing with granite and tar about 40 miles of main roads radiating from Newport to the coast towns. Towards the estimated outlay of £50,000 the Road Board will give a grant of £10,000, and will further lend £30,000 free of interest.

Romford U.D.C.—The council have approved the specification of the surveyor, Mr. Herbert Thomas Ridge, for works of widening and street improvement in Hornchurch-road, from the south end of the Great Eastern Railway Company's goods yard to the Territorial Force Association's premises, also from opposite Brentwood-road to the north end of the South Essex Waterworks cottages.

Stonehaven T.C.—Sections of Dannottar-avenue are to be treated experimentally with tarmac, tar-grouting, and tar-macadam.

Wath U.D.C.—The engineer and surveyor, Mr. J. H. Drew, has received instructions to prepare a report on the wear and tear of local highways by motor-bus traffic.

Wolverhampton T.C.—The Streets Committee have accepted a tender of the Improved Wood Paving Company, Limited, for repaving part of Lichfield-street, and a portion of Snow-hill.

Wood Green U.D.C.—The council have adopted a scheme for a 40-ft. road from White Hart-lane to Glendale-avenue, through the town hall grounds, the cost being estimated at £3,083.

SEWERAGE AND SEWAGE DISPOSAL.

Abercarn U.D.C.—Sewer extensions are to be carried out at a cost of £630.

Ashington U.D.C.—A new sewer is to be constructed at Hirst Park, at an estimated cost of £2,000.

Audley U.D.C.—The scheme of sewerage recommended by Mr. Whitehead, engineer, has been approved, and will be submitted to the Local Government Board for confirmation.

Grimsby R.D.C.—Sanction is being sought for a scheme of sewerage at Immingham which is estimated to cost £20,264.

Haltwhistle R.D.C.—A sewerage scheme is to be carried out at Townfoot, at an estimated cost of £3,500.

St. Austell R.D.C.—Consequent upon an outbreak of scarlet fever, the question of a sewerage scheme for St. Denis, which the medical officer declares is much needed, has been referred to the Sanitary Committee.

Skelmersdale U.D.C.—For some time the council have had under consideration the question of improving their system of main drainage and sewage purification works, and last year Messrs. Taylor & Wallin, of Newcastle-on-Tyne, were authorised to report fully upon the matter. A scheme was duly submitted and approved by the council, and in due course application

was made to the Local Government Board to borrow the sum of £12,200 for the execution of the works. There will be several miles of new sewers, and the disposal works are of the most modern type. Dr. Brightmore, one of the Local Government Board inspectors, has just held the inquiry, at which there was practically no opposition.

Spalding U.D.C.—With respect to the proposed sewerage scheme, which is estimated to cost £30,000, a letter has been received from the Local Government Board insisting upon the appointment of an expert engineer to assist the surveyor, Mr. J. Bailey, in the revision of the sewerage scheme (the plans for which he had prepared), and declining to sanction the scheme unless revised by an engineer. The council resolved that an engineer be appointed, at a fee not to exceed £250, to confer with the surveyor on the subject, on the understanding that the surveyor should be reasonably remunerated for the plans prepared by him.

Whitstable U.D.C.—Land has been purchased at Swalecliffe for the purpose of purification works.

Whiston R.D.C.—Subject to official sanction it has been decided to carry out a sewerage scheme.

Worsborough U.D.C.—The council are giving consideration to the advisability of supplanting the horses in the sanitary department by motor vehicles.—The Local Government Board have written pointing out that during the last ten years only forty-eight privies had been converted, and that there were still 1,073 in the township. The clerk was instructed to reply that the council were alive to the importance of the matter, and were pushing ahead as quickly as they could. As an inducement to property owners to make conversions the annual charge for water for water-closets was reduced to 2s. 6d.

WATER, GAS, AND ELECTRICITY.

Chard T.C.—The council on Monday decided to accept the following tenders in connection with the water scheme: Contract No. 5 (cast-iron pipes, bends, junctions, and castings), the Sheepbridge Coal and Iron Company, Chesterfield, £3,120; contract No. 6 (sluice valves, fire hydrants, surface boxes, &c.), Messrs. Stone & Co., London, £278; contract No. 7 (construction of reservoir, tunnel, &c.), Mr. E. Ireland, Bath, £8,606.—It was agreed that the borough surveyor, Mr. E. W. Hearn, be resident engineer, at a salary of £2 per week, and that an assistant be engaged temporarily, at 30s. per week.

Chirk R.D.C.—Messrs. Bevington have been instructed to prepare a survey for a water supply scheme for Nantyr, including a service reservoir.

Colwyn Bay U.D.C.—Acting upon a report by Mr. E. M. Lacey, Westminster, the council have adopted a scheme for the erection of electric lighting and destructor works at Bronyant. It was further resolved that Mr. Lacey's services be retained to carry out the scheme at a fee of 1,200 guineas, to include the preliminary fee of 50 guineas. In the event of the capital expenditure being less than £25,000, the fee to be at the rate of 5 per cent on the cost of the combined scheme.

Cwmaman U.D.C.—A contract has been sealed with the local gas company to supply gas for public lighting at 3s. per 1,000 ft., with meter rents at 2s. 6d.

Devizes T.C.—The formal opening took place last week at the Shepherd's Store pumping station of a new set of pumps and engine, driven by a newly-installed gas plant, which has been put in at an expenditure of over £3,000. The pump has been fixed into the new well which was sunk some few years ago, and it is capable of raising about 25,000 gallons per hour. The suction gas plant has been installed with a view to economy in the working, both as regards fuel and the haulage of the same. The contractors were Messrs. F. Rendell & Sons.

East Grinstead U.D.C.—Mr. J. B. Morgan, electrical engineer to the Horsham Urban District Council, is to be asked to confer with this council's surveyor, Mr. W. E. Woollam, as to the advisability of an electric lighting scheme.

Faversham R.D.C.—It has been decided to supplement the water supply scheme by a distributory main, in addition to the rising main, along a part of the route, at an estimated cost of £270.

Hitchin R.D.C.—The council have adopted the amended scheme for providing an adequate water supply for the parishes of Codicote, Kimpton, King's

Walden, and St. Paul's Walden. This matter has been a source of trouble to the council for over twenty years, and is now being overcome through the generosity of Viscount Hampden and the Earl of Strathmore, the former not only giving the site for the well and pumping station, but contributing £3,400 towards the cost, and the latter £380. The estimated cost of the scheme is £10,700.

Keith T.C.—It has been agreed to borrow £800 for the construction of a reservoir at Cuthil.

Llandudno U.D.C.—A committee recommended the council to instal the Fiddes Aldridge machine at the gasworks, and the gas manager, in conjunction with the deputy engineer, have received instructions to prepare an estimate, with specification, of the proposed work with a view to an application to the Local Government Board for a loan.

Lynn T.C.—The accounts of the electricity undertaking for last year show a profit of £1,776.

Manchester T.C.—It is intended to carry out improvements at the Longden Valley waterworks, at an estimated cost of £160,000. Messrs. G. H. Hills & Sons, Manchester, have been appointed engineers.

Market Harborough R.D.C.—Mr. Herbert G. Coales, ASSOC.M.INST.C.E., has been instructed to report upon a water supply scheme for Fleckney.

Northampton T.C.—The Water Committee recommend the acceptance of the tender of Messrs. Moss & Sons, Limited, Bedford, at £16,131, for the construction of the tunnel from Hollowell to Ravenshorpe in connection with the waterworks extension.

Slough U.D.C.—It has been ascertained that the total cost of the purchase of the waterworks system is £108,981. The council acquired the works by Act of Parliament upon arbitration terms. The award of the arbitrator was £90,623, and the cost of arbitration £5,612. Compensation to directors and officials of the late company came to £1,430, and the Parliamentary expenses accounted for the remainder of the total.

Winchester T.C.—The nett profit for the year earned by the electricity undertaking was £101, which has been placed to the reserve fund.

Worcester T.C.—In a letter to the town council the Local Government Board state, as regards the water supply of the city, they are strongly of opinion that the council would be well advised to provide for storage of the water prior to filtration. They also urge the council to make such arrangements as will enable the water from each filter to be obtained separately for bacteriological examination in order to test the efficiency of the filters respectively. These examinations should be made at frequent intervals. The council should also be prepared to carry out such works as may be found necessary to render the water supply perfectly safe.—The accounts of the electricity department for the past year show a deficit of £504. It was explained that the income was £500 more than the previous year, but that the council had been compelled by the Board of Trade to spend that sum on a transforming chamber.

MISCELLANEOUS.

Clacton U.D.C.—It has been decided to purchase a motor lorry of about 35 h.p., capable of carrying 3 tons, for haulage purposes. It is estimated that the change will result in an economy of about £81 a year.

Port Elizabeth T.C.—It is not many years since the flotation of a "million" scheme for sewerage, electric light, and additional water supply took place, but it has now been resolved to proceed with further works to the extent of an additional £500,000, consisting of electricity undertaking (£100,000), town attractions (£30,000), Baakens River improvement (£55,000), enabling ordinance (£100,000), abattoirs (£25,000), relaying steel water main in cast iron (£175,000), and expenses (£15,000). Mr. A. S. Butterworth, the city engineer, will thus be sufficiently occupied for some time to come.

Southampton T.C.—The Fire Brigade Committee propose to convert the horse-drawn steam engine into a motor vehicle, at a cost of £700.

Sowerby Bridge U.D.C.—It is proposed to purchase a combined motor-propelled tender and fire escape, at an estimated cost of £750.

PERSONAL.

Mr. John Barker, burgh surveyor and sanitary inspector, has received an increased salary of £25, making it £330.

Mr. Herbert Thomas Ridge, assistant surveyor, has been appointed surveyor to the Romford Urban District Council, in succession to the late Mr. Jonas Tovey, at a salary of £250.

Mr. O. Parry, of Tycroes, has been appointed by the Cwmaman Urban District Council engineer for the local scheme of sewerage, which is estimated to cost from £10,000 to £14,000.

Mr. H. Clegg, surveyor to the Felixstowe and Walton Urban District Council, has received an increase of salary from £275 to £300 a year.

Mr. Wentworth Jones, borough surveyor and inspector to the Thetford Town Council, has received an increase of salary, and has also been voted £30 for extra services.

Mr. R. G. Coles, surveyor to the Wells (Norfolk) Urban District Council, has been appointed borough surveyor and sanitary inspector to the Wilton Corporation, at a salary of £135.

Mr. E. H. Colgrove, of Nottingham, has been appointed as junior assistant in the office of the Ilford Urban District Council surveyor (Mr. Herbert Shaw) at a salary of £80, rising to £100.

Mr. William Frank Gardner, assistant in the borough engineer and surveyor's office, Morecambe, has been appointed to a similar position under the Earby (Yorks) Urban District Council.

Mr. Albert Garratt, surveyor and assistant inspector to the Drayton Rural District Council, was on Tuesday appointed highway surveyor and sanitary inspector to the newly-formed Market Drayton Urban District Council.

Mr. Edward Bindon Martin, who carried out many important engineering works in the Midlands, and who was the pioneer of the Staffordshire main drainage scheme, died, we regret to state, on the 8th inst. He was in his 83rd year.

Mr. E. H. Barber, ASSOC.M.INST.C.E., assistant surveyor and engineer to the Sheffield Corporation, has been appointed engineer and surveyor to the Rhondda Urban District Council. The commencing salary is £500 per annum rising to £750.

Mr. E. Southall Moule, assistant in the department of Mr. J. W. Tomlinson, ASSOC.M.INST.C.E., borough engineer, Luton, has been appointed first assistant to the Cannock Urban District Council, under Mr. Robert Blanchard. He served his articles and remained for some years assistant to Mr. A. J. Dickinson, engineer and surveyor to the Redditch Urban District Council.

Sir Maurice Fitzmaurice, C.M.G., M.INST.C.E., Messrs. Henry C. Adams, M.INST.C.E., M.I.MECH.E. A.M.I.E.E., Westminster, F. E. P. Edwards, F.R.I.B.A., Town Hall, Sheffield, and J. Parry, M.INST.C.E., water engineer, Liverpool, have been elected fellows, and Messrs S. E. Axon, assistant city engineer and surveyor, Adelaide, South Australia, N. C. Staveley, ASSOC.M.INST.C.E., borough engineer, Wanganui, New Zealand, J. B. Thomson, ASSOC.M.INST.C.E., Town Hall, Southall, Middlesex, and R. W. Watson, ASSOC.M.INST.C.E., borough engineer's office, Durban, South Africa, members of the Royal Sanitary Institute.

Mr. A. E. Brookes, county surveyor of Cornwall, has been unanimously recommended for the post of county surveyor of Durham by the Main Roads Committee of the county council. The salary is £800, rising to £1,000. He will take up his new appointment in September. Mr. Brookes has had an experience of county administration of nearly a quarter of a century, having been previously engaged under the Worcestershire and Hertfordshire County Councils. In Cornwall he became surveyor of the Western district in the first instance, and since the retirement of Mr. Jenkin, the surveyor of the Eastern district, he has assumed control of the whole county. His removal to a more lucrative appointment will not come as a surprise to members of the Cornwall County Council, for it was only recently that the chairman of the Highways Committee (Mr. A. Carleek) warned his colleagues that if they desired to retain his services they must be prepared to treat him with more generosity.

FOR OTHER ADVERTISEMENTS

See End of Paper.

DISTRICT ENGINEER required for Public Works Department by British Guiana Government. Engagement for three years, with prospect of permanency. Salary, £300—£20—£400 per annum. Travelling allowance, £100. Free passage. Age, 25-40. Should have served articles with Corporate Member of Institute of Civil Engineers, or possess diploma from a recognised Engineers' College, or have been engaged since completion of articles on Public Works for at least ten years. Capable of designing and carrying out buildings, bridges and other structures, of taking out priced bills of quantities, and preparing detailed estimates. Knowledge of book-keeping and accounting essential. Candidates should be competent to execute surveys, take sections, and lay out and construct roads, and be familiar with use of surveying instruments, including theodolite, dumpy level, prismatic compass and box sextant. Apply at once, by letter, to the Crown Agents for the Colonies, Whitehall-gardens, London. (1,726)

CITY OF WESTMINSTER.

PAINTING, &c., WORKS.

The Westminster City Council invite Tenders for Internal and External Painting Works and Repairs at the Marshall-street Public Baths.

Conditions of Contract, Specification, and Form of Tender may be obtained on application on and after Thursday, the 18th June, to the City Engineer, Westminster City Hall, Charing Cross-road, W.C., between the hours of 10 a.m. and 4 p.m.

The Contractor will be bound by the Contract in the case of all workmen employed by him to pay wages at rates not less, and observe hours of labour not greater, than the rates and hours recognised by the Associations of employers and employed, and in practice obtained in the district where the work is to be executed.

Tenderers are prohibited from directly or indirectly canvassing Members or Officials of the Council in reference to any Tender, and the Tender of any person who does so canvass will be rejected. The Contract Deeds will be prepared at the expense of the Council, and the Contractor will, if necessary, be required, together with two sureties, to enter into a bond for the due fulfilment of his contract, or, in the alternative, to agree to the retention by the Council during the period mentioned in the Form of Tender of certain monies.

Each Tender, on the official Form supplied, is to be enclosed in a sealed cover, addressed to the Town Clerk, Westminster City Hall, Charing Cross-road, W.C., and marked "Tender for Painting, &c., Works, Marshall-street Baths." Tenders may be placed by or on behalf of tenderers in a locked box at the City Hall provided for the purpose.

No Tender will be received after 12 o'clock noon on Wednesday, the 8th July, 1914.

The Council do not bind themselves to accept the lowest or any Tender.

JOHN HUNT,
Town Clerk.

Westminster City Hall, W.C.
June 16, 1914. (1,723)

RUISLIP-NORTHWOOD URBAN DISTRICT COUNCIL.

PRIVATE STREET WORKS.

The above Council invite Tenders for the making up of the Private Street known as Hilliard-road, Northwood (about 600 yds. in length).

Plans may be seen at, and Specification, Form of Tender and all other particulars obtained from, the Office of the Surveyor to the Council, Council Offices, Northwood, upon the deposit of £1, which will be returned upon the receipt of a *bona-fide* Tender.

Tenders, sealed and endorsed "Street Works," must be delivered to the undersigned not later than Twelve noon on Saturday, 4th July next.

The Council do not bind themselves to accept the lowest or any Tender.

EDMUND R. ABBOTT,
Clerk to the Council.

Council Offices,
Northwood, Middlesex.
June 16, 1914. (1,720)

RUISLIP-NORTHWOOD URBAN DISTRICT COUNCIL.

RECONSTRUCTION OF SEWER.

The above Council invite alternative Tenders for the reconstruction, with iron or earthenware pipes, of 362 yds. of 9-in. Sewer at Eastcote.

Plans may be seen at, and Specifications, Form of Tender and all other particulars obtained from, the Office of the Surveyor to the Council, Council Offices, Northwood, upon the deposit of £1, which will be returned upon the receipt of a *bona-fide* Tender.

Tenders, sealed and endorsed "Street Works," must be delivered to the undersigned not later than Twelve noon on Saturday, 4th July next.

The Council do not bind themselves to accept the lowest or any Tender.

EDMUND R. ABBOTT,
Clerk to the Council.

Council Offices,
Northwood, Middlesex.
June 15, 1914. (1,721)

RUISLIP-NORTHWOOD URBAN DISTRICT COUNCIL.

PRIVATE STREET WORKS.

The above Council invite Tenders for the making up of a part of the Private Street known as Dene-road, Northwood (about 260 yds. in length).

Plans may be seen at, and Specifications, Form of Tender and all other particulars obtained from, the Office of the Surveyor to the Council, Council Offices, Northwood, upon the deposit of £1, which will be returned upon the receipt of a *bona-fide* Tender.

Tenders, sealed and endorsed "Street Works," must be delivered to the undersigned not later than Twelve noon on Saturday, 4th July next.

The Council do not bind themselves to accept the lowest or any Tender.

EDMUND R. ABBOTT,
Clerk to the Council.

Council Offices,
Northwood, Middlesex.
June 16, 1914. (1,722)

TOTTENHAM URBAN DISTRICT COUNCIL.

TO CONTRACTORS.

The Council invite Tenders for laying creosoted deal wood block paving and other works in the portion of Turnpike-lane within their District.

The Plans can be seen, and General Conditions, Specification, Bill of Quantities and Form of Tender can be obtained, on application to Mr. W. H. Prescott, M.INST.C.E., Engineer to the Council, at the Town Hall, The Green, Tottenham.

The sum of £5 will be charged for the Quantities, which sum will be forfeited by the person whose Tender is accepted if the Contract be not executed within seven days from the date he is informed it is ready for signature; otherwise it will be repaid.

The Contractor will be required to pay all workmen on the Council's Work the recognised Trade Union Rate of Wages. A Schedule of such wages will be inserted in the Contract, and a copy of the Schedule must be exhibited on the Pay Office at the Works.

Canvassing members of the Council is strictly prohibited, and if any Members, Agents or Representatives of Firms tendering for this work interview or canvass members of this Council, Tenders sent in from such Firms will be immediately disqualified.

Sealed Tenders, on the Form supplied, endorsed "Tender for Wood Paving Turnpike-lane," to be delivered to me by Twelve o'clock noon on Tuesday, the 30th June, 1914.

No other Form of Tender will be received.

Security will be required for the due performance of the Contract.

The Council will not be bound to accept the lowest or any Tender, and reserve the right to accept a part only of any Tender received.

(By order)
E. CROWNE,
Clerk of the Council.

Tottenham.
June 19, 1914. (1,725)

RESIDENT ENGINEER and Building Surveyor, disengaged, well trained and experienced; five years with County Council, four years with Borough on Public Works and Buildings.—Box 1,435, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,724)

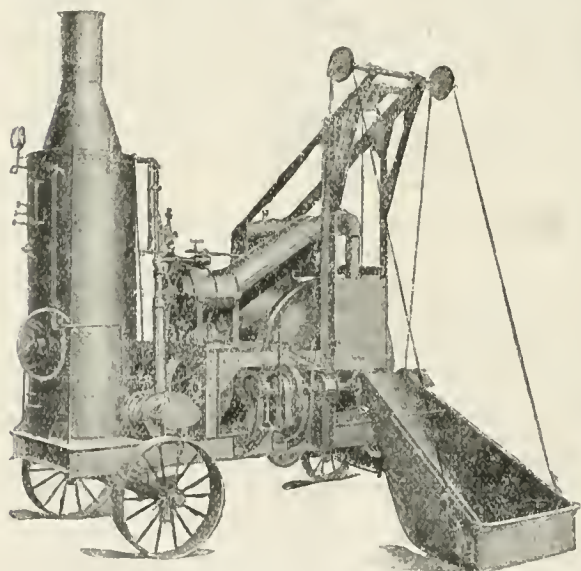
KOEHRING PORTABLE HOT MIXER FOR TAR-MACADAM AND BITUMINOUS ROADS.

Some very interesting and important road work has recently been carried out with a machine known as the Koehring hot mixer. Although the machine has been very well known and very largely used on the American Continent for over three years, it is only during the last eighteen months that it has been employed in England. The first machine here was bought by a well-known firm of bituminous road contractors, and has been used in their works for eighteen months with excellent results on their special material.

The Kent County Council had one of these machines last August after making exhaustive trials, and they have since then done a very fine stretch of bituminous work on the London-Sevenoaks road between Bromley Common and Green-street Green, this including the well-known Farnborough Hill. This is a very good specimen of modern road work, and we understand the costs are remarkably low, owing to the economies rendered possible by the Koehring hot mixer.

The Essex County Council have adopted these machines, and are using a No. 20 size for the bituminous road work they are carrying out on the main Cambridge road at Epping. They are also producing with this machine, in spare time and during wet weather, tar-macadam and tar-pitch-macadam, and we understand all the work is most satisfactory, and produced at exceptionally low cost.

We find a large number of English and Scottish



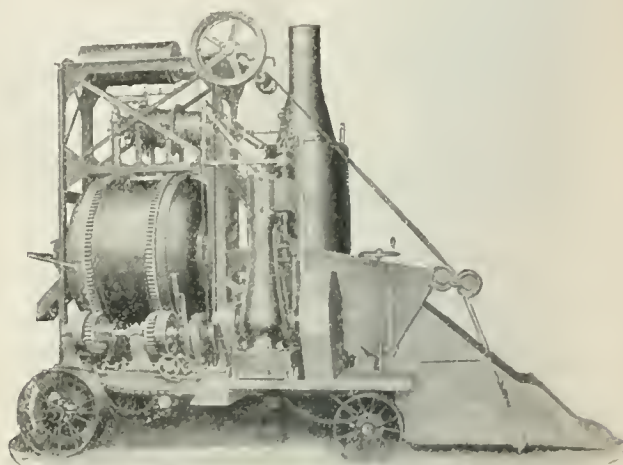
KOEHRING MIXER: SIDE LOADING AND DISCHARGE TYPE.

county and borough surveyors and their committees have viewed these machines running, and have decided to use them for their own particular work, and we certainly think all interested in tar-macadam and bituminous roadwork should investigate the merits of the apparatus. We have ascertained that the machines have proved themselves to be very reliable, as up to the present time there has not been a single breakdown with those in use here.

It may be of interest if we explain some of the principal features of this machine. It is a combined heating and mixing plant, suitable for the various types of road paving materials now on the market, and is usually supplied complete with its own power unit on the same frame as the heating and mixing arrangements, the whole being mounted on suitable axles and road wheels for easy movement. The batch of stone and sand is shot into a loading bucket which lies on the ground. This elevates through suitable mechanism and discharges the batch quickly into a constantly revolving drum having a special form of blading which causes the materials to shower continuously through the centre of the drum while a hot blast from an oil furnace passes through the separated particles. The oil furnace is fixed above the drum, and a lined conduit is carried over to one side of it, finishing with a nozzle which projects into one side of the drum. Fuel oil feeds automatically into the burners of the furnace, and the pressure is main-

tained by a powerful blower fixed on the machine. When the materials have reached the desired heat, which is known by timing, tar or bitumen flows from a measuring tank through a pipe, which conveys it to the inside of the drum, the blast not coming into direct contact with this. The mixing of the binder with the stone and sand then takes place in about one minute, and on raising a lever the finished material discharges from the drum. This mixing appears to be perfect, as every stone has an equal coating of binder and sand.

What most interested us and others who have seen the machine is the extremely efficient and rapid way in which the moisture is driven from the stone and sand, this being brought about by the peculiar manner in which the materials are made to scatter



KOEHRING MIXER: END LOADING AND DISCHARGE TYPE, WITH TRACTION.

and separate while the intensely hot air is driven through them, each particle in turn passing again and again through the hot blast, the moisture being very rapidly driven off through the orifices on the discharge side of the drum.

A distinct advantage is that the same machine can be used for cement-concrete by disconnecting the oil furnace and connecting up to the water measuring tank, thereby making it possible to lay a concrete base and do a variety of other work.

The machines are made in several sizes and types to suit various working conditions, and can be supplied without power and arranged for belt-driving, and in some cases are being furnished with a match hopper instead of elevating loader, this being done to suit certain conditions in some quarries where they will shortly be used. In some cases, also, a special elevating hoist is being supplied to elevate and tip the finished material into wagons, this, of course, saving hand labour.

Rural Housing.—At the annual conference of rural district councils, held at the Guildhall, London, on Wednesday, a resolution was adopted requesting the Government to include in their proposals for rural housing legislation the giving of an annual grant in aid of housing schemes carried out by local authorities to meet the needs of certain classes who could not, under any probable schemes of increased wages, pay an economic rent.

Town Planning Schemes.—In the House of Commons on Wednesday it was stated that the Local Government Board now have information as to 232 town planning schemes. Of these, two have been finally approved by the board, four have been submitted for approval, sixty-two have been authorised by the board to be prepared, and in twenty-two other cases application has been made to the board for authority to prepare the scheme.

New Oxford-street Paving.—The Works Committee of Holborn Borough Council have recommended that, as New Oxford-street has, approximately, the same traffic throughout its length—motor buses and other heavy vehicles bulking largely—the conditions afford a good opportunity to test the comparative methods of different road materials, including creosoted deal blocks, Acme sectional Jarrab blocks, and fine-dressed Grey Royal granite blocks. The borough council have approved this recommendation.

Institution of Municipal Engineers.

SOUTH-WESTERN DISTRICT MEETING AT TISBURY.

A South-Western District meeting of the institution was held at Tisbury, Wilts, on Saturday last. Those present included Messrs. Henry C. Adams, vice-president of the institution, E. Plummer Davies (Tisbury), W. J. Potter (Andover), W. E. Groves (Dulverton), A. Carter (Droxford), H. B. Rogers (Wells), W. W. Earwaker (Cerne), V. C. Munckton (Wimborne), S. W. Crittall (Lymington), A. J. Redfern (Honiton), E. H. Knapman (Wincanton), D. T. G. Brown (Sherborne), members; A. S. Northover (Tisbury), T. A. Sims (Tisbury), C. N. Butler (Tisbury), R. D. D. Massy (chairman, Lymington Rural District Council), G. W. Child (Droxford), A. T. Squire (Dorset), E. E. Hibberd (chairman, Tisbury Water Committee), S. J. James (Sherborne), R. A. Skeeton (Wilton), Sidney F. Ford (Camelford), E. J. Padfield (Wincanton), G. F. Fowles (Salisbury), G. H. Gibson (Radstock), and Dr. C. A. Ensor (medical officer of health, Tisbury), visitors; and B. Wyand, secretary of the institution.

The VICE-PRESIDENT, in opening the business meeting, held at the Victoria Hall, apologised for the absence of the president, Mr. Horace L. P. Boot.

amount of stress had been put on the roads. He might say that there were 40 miles of main roads in the Tisbury district and 160 miles of district roads. The cost of the main roads per mile ten years ago was £43, as compared with £53 per mile to-day. He thought the members would agree, having regard to the amount of motoring, that the increase had been very moderate and reasonable. He claimed that they gave good value for the money expended. No one ought to call himself an engineer unless he could make that claim. He did not think it would be easy to give a better account for money expended than the Tisbury Council was showing under its contract for the maintenance of the main roads with the Wilts County Council. The tendency to-day was to take the main roads from the local councils. He did not dispute for a moment that the county councils produced improved roads under direct management, but only because more money was spent upon them. Anybody could improve the roads by spending more money on them, and the local councils could do it. Calling attention to the day's programme, Mr. Plummer Davies alluded to a bridge which he had constructed



INSTITUTION OF MUNICIPAL ENGINEERS AT TISBURY, WILTS.

He (the vice-president) had also to express regret that Mr. Owen Baines, of Paignton, the secretary for the district, was unable to attend. Mr. Baines was only just recovering from an attack of influenza, and he had a domestic affliction in the illness of his wife. He (Mr. Adams) suggested that a letter should be sent to Mr. Baines expressing sympathy with him in his trouble.

The vice-president then called upon Mr. E. Plummer Davies, engineer and surveyor to the Tisbury Rural District Council, to present his paper.

Mr. PLUMMER DAVIES, in introducing his paper, said he had received a most encouraging letter from the chairman of the district (Mr. Frank Latham), who was unable to attend, and messages from the chairman and vice-chairman and other members of the Tisbury Council. Turning to his subject, Mr. Plummer Davies said the members would understand that it was difficult to go very far into details of the past because the records of road management had not been kept as they ought to have been, the roads had grown from lanes into roads without the public being really aware of the change. He thought there were a few points of interest in the paper, and possibly points that would never have been recorded at all but for the meeting that day, and the necessity for the preparation of a paper on the subject of the roads. He ought to have mentioned in the paper that one cause of the great increase in the cost of the maintenance of Wiltshire roads had been the introduction of the military camps into the county near Amesbury and Tidworth. Little towns had sprung up like mushrooms near the camps, and an immense

by direct labour, remarking that several eminent engineers had valued it at double the actual cost.

The paper was then presented to the meeting.

WILTSHIRE ROADS, PAST AND PRESENT.

By E. PLUMMER DAVIES,

Engineer and Surveyor to the Tisbury Rural District Council.

The author in preparing a paper on the above subject finds his information somewhat limited to probe in detail into the past, but believes that sufficient incidents will be quoted to enable the members of the Institution of Municipal Engineers to appreciate the varied conditions that have existed, and the improvements that have taken place, especially during the last thirty years, in the condition of, and the method of maintaining and managing, the King's highways in a county almost entirely agricultural.

In order to give you a glimpse into the past, I am indebted to Mr. J. M. Bennett Stanford, Pyt House estate, for his kindness in showing me a deed, executed January 7, 1789, by seven trustees of the Old Turnpike Trust to Thomas Bennett, Esq., of Pyt House, Tisbury, for the sum of £100 advanced for amending, widening and keeping in repair a section of road passing through this district, and known as the Salisbury and Shaftesbury Turnpike, being a section of the trunk road between London, Salisbury, Exeter, and Penzance. The said Mr. Bennett was to receive such proportion of the tolls arising as the said sum did bear to the whole sum advanced until paid off, with 4½ per cent interest thereon.

However, the secretary of the Turnpike Trust

wrote to the exors. of the late Mr. Benett, June 14, 1859, seventy years afterwards:—

"Dear Sir,—White Sheet Turnpike. The trustees have made no order for the payment of any interest accrued due since June 7, 1844, and there is no probability that any further interest ever can be paid. For some years past the tolls have not produced sufficient to keep the roads in repair, and they will be still further diminished by the opening of the Salisbury and Yeovil Railway. Under these circumstances it will be impossible, I think, to find a purchaser to your client's bond."

We may reasonably infer from the said letter what was the position of the Turnpike Trust and the condition of their roads from 1844 to 1859, resulting from the change in the method of travelling, &c., consequent on the advent of railways. The great trunk roads of the country were very little used from the time the coaching days ceased until the advent of the motor cars; long stretches of turnpike roads had, and needed, but little attention, and this was true as recently as fifteen years ago, except for short sections that might happen to come in the radius used to get from the



MR. E. PLUMMER DAVIES.

village to the nearest railway station. This change of conditions resulted in the county council considering the question as to what turnpike roads should be scheduled as main roads, and what roads or sections of turnpike roads should be classified as district roads. About 7 miles of turnpike roads passing through this district between Salisbury and Shaftesbury were then classed as district roads, and have remained so till this day, notwithstanding that quite 300 motor cars per day pass over some of these sections at certain periods of the year, and the same applies to other districts, and if the tolls of the coaching days had been revived, they would yield a substantial revenue. I should also add that when this adjustment took place local roads and lanes leading from villages to railway stations were taken over by the county council and classed as main roads, and have been so maintained ever since. That fact accounts for so many of the main roads in Wiltshire that are not trunk roads being so narrow, and in many instances having high banks on each side, as the following extract from the county surveyor's report a few years ago, under the heading of Tisbury, indicates:—

"This district is one of the most satisfactory in the county for general excellence of surface. The roads are maintained with suitable cross-sections, care having been taken to strengthen the sides where necessary, so as to give as much available surface as possible for traffic. Many lengths are narrow and lie considerably below the level of the adjoining land, but the ill-effects of situation have been minimised by the attention given to the hedges and trees to enable sun and wind to exercise their drying effects as freely as possible."

A Mr. Henry Weaver was county surveyor of Wilts for some years prior to January 7, 1887, when Mr. C. S. Adye was appointed to succeed Mr. Weaver on his retirement. The late Mr. Adye told me that Mr.

Weaver stated in his last report to the county council that he had got rid of the ruts that were general following the coaching days, except in the case of two of the roads in the county which he named; and Mr. Adye stated these were "the legacies Mr. Weaver left for me when I took on." From that period till 1906, when Mr. Adye's health failed, Mr. Adye threw himself whole-heartedly into the work of improving the general condition of the main roads, and during that period, especially during the latter years, a great change had become general in the method of management and the manner in which repairs to highways were performed.

Mr. Adye was fortunate during the period of transition that there lived in Southwick by Trowbridge a man carrying on the business of mineral water manufacturer, by the name of Thomas Barnes. Mr. Barnes told me how strongly convinced he was at that period that steam rollers were to play an important part in the road making and road repairing of the future, and that consequently he decided to purchase a steam roller. Mr. Barnes was of a naturally engineering turn of mind, and one day in the year 1888 Mr. Barnes left home for Rochester. He travelled *via* London, taking with him sufficient money in hard cash to purchase a steam roller, and when the purchase price was agreed Mr. Barnes took the cash out of his pocket and paid Mr. Aveling, who, after counting the cash, looked at Mr. Barnes in amazement, remarking, "How in the world did you come through London with such a sum of money on you without being robbed?" Mr. Barnes replied by asking another question, "Look at me, and tell me honestly if you would have thought by looking at me that I was likely to be in possession of such a sum?" Mr. Aveling answered, "Well, honestly, I must say I would not," and Mr. Barnes retorted, "And I knew that the London pickpockets would be of that opinion too."

Mr. Barnes brought the steam roller back with him to Southwick, and it was soon at work for the first time in Back-street, Trowbridge, for the Trowbridge Urban District Council. Being in close proximity to Trowbridge, where the county council offices are, increasing demands for steam rollers kept pouring in to Mr. Barnes, so that he purchased one roller after another, and by the year 1906—the year in which he died (and now this splendid business is successfully carried on by his sons)—he was the owner of over forty steam rollers, besides traction and other engines, with modernly equipped engineering works. During that period not only did steam rolling and scarifying of main roads become general in Wiltshire, but by to-day there are only a few unimportant district roads that are not being repaired with the use of steam rollers. The coincidence referred to no doubt will, to a great extent, explain why steam rolling in the county of Wilts became general somewhat earlier than in the other counties of the West, and this proved a great boon to the public and a source of assistance and encouragement to traders.

A successful merchant in the county gave it as his opinion fifteen years ago that their firm benefited in the save of wear and tear and in horse labour to the extent of £200 per annum (because the steam rolling of Wiltshire roads had then become general) as against their experience prior to that.

In January, 1907, Mr. A. Dryland, now the popular county surveyor of Surrey, was appointed county surveyor of Wilts in succession to the late Mr. Adye. The experience and energy controlled by the trained mind that Mr. Dryland brought to bear on the work of the department, and the courtesy and kindness he extended to the district surveyors, soon won their confidence, and ensured their best endeavours in the discharge of increased duties which have gradually developed into a much higher technical character.

In December, 1908, Mr. J. George Powell, the present county surveyor, was appointed to succeed Mr. Dryland, and his keen and practical adaptation continued the beneficent work outlined by his predecessor, and the success soon became evident in the general condition of the roads, notwithstanding the effect of greatly and continued increased traction and motor traffic. The marked improvement in the general condition, in the uniformity of width, contour and straightness in the Wiltshire roads will remain a successful and lasting monument to the resourcefulness and ability of Mr. Powell. Most of the districts in Wiltshire are deficient in suitable stone for successful road making, especially for modern traffic, flint, with few exceptions, being the only material that can be successfully used, with a suitable proportion of

Mendip limestone to ensure a good wearing and tenacious surface. Flints cannot be successfully consolidated without suitable binding material, and when that has not been ensured the newly metalled portions of the road readily break up and become very unsuitable, and particularly annoying to motorists.

Such being the case, a large quantity of road material has to be imported into the county, consisting of limestone, basalt, quartzite, granite, &c., and this of necessity has increased annually. Mendip limestone mixed with local flints in suitable proportions constitutes a splendid wearing surface for roads of medium traffic. Where the amount of traffic necessitates the use of quartzite or granite, flint is unsuitable. For low-lying and shaded roads, and especially on weak subsoils, I find that basalt stone has been eminently satisfactory, forming a good successful crust and ensuring a uniform, even surface.

Mr. Powell has devoted considerable attention to tar-spraying, and, fortunately, has introduced it largely into the county with most satisfactory results, thereby improving the surface and increasing the life and utility of the sections of roads so treated, and reducing the necessity for patching motor squats at least 90 per cent on sections so treated.

The Wilts County Council are recognised as a body keeping abreast of the times, and with endeavouring to provide the public with roads that successfully meet requirements, and, acting on the advice of the county surveyor, the county council has secured a grant and a loan from the Road Board of £70,000 towards reconstructing over 34 miles of road, being the portion through Wiltshire of the London and Bath great trunk road, and this work is now being performed. The reconstruction involves straightening of verges, making up low quarters, and increasing the width of road surface where necessary, and the conversion of same from ordinary or water-bound systems to bituminous-bound macadam.

Several other trunk and the more important roads are being widened and strengthened, so that the general condition of the main roads in Wiltshire has wonderfully improved during the last six years.

The mileage of main roads in 1899-1900 was 745 miles 1 furlong 247 yds., and the cost of maintenance £51,743. The mileage in 1914-15 will be 760 miles 7 furlongs 153 yds., and the estimated cost £86,648, exclusive of the London and Bath trunk road improvement scheme.

Having regard to the increase that has taken place during that period in the cost of labour, material and haulage, and to the increased mileage, the improved efficiency insisted upon and the immense increased traffic to be contended with, the additional amount of £35,000 in expenditure is absolutely necessary in order to make the roads better for the users, and to reduce the causes productive of accidents. All who are keeping themselves well informed in such matters are satisfied that the increase is very moderate, and, having regard to developments, eminently satisfactory, and the money was never better expended.

The methods adopted, if faithfully followed as persistently in the future as they have been in the past, will maintain the good name of Wiltshire in the honoured position it has hitherto held among its friendly rivals.

(To be concluded.)

Business Announcements.—Messrs. A. Grimwood & Co., 47 Victoria-street, Westminster, S.W., inform us that they have transferred their business as asphalt merchants to Messrs. Grimwood & De Geus, Limited.—Mr. W. E. Horsman having, as already stated in our columns, severed his connection as London representative of Messrs. George Waller & Son, gas, hydraulic and general engineers, the firm ask that orders and inquiries should be addressed direct to them at the Phoenix Ironworks, Stroud, Glos.

Public Health Law.—This concise little work* has been prepared mainly for the use of all concerned in local government work who may find the larger books too elaborate. In twenty chapters it covers the ground sufficiently for its purpose, including such matters as highways, but omitting rating, elections, &c. For students it should be of assistance in preparing for examinations in Public Health Law, while the practitioner will find its arrangements well suited for easy reference.—*The Law Times.*

* A Manual for Municipal and County Engineers and Surveyors, Town Clerks, Clerks to District Councils, and other officers and members of local authorities. By S. G. Turner, of the Middle Temple, Barrister-at-Law, A.M.I.C.E., &c. London: St. Bride's Press, Limited. Price 10s. 6d.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Whether the members of the Institution of Municipal and County Engineers will relish carrying about with them at Cheltenham next week the formidable supplement to the "Journal" which has just been issued, and if they would not prefer to have the papers in separate form as hitherto, so as to be able to discard them at the close of the discussions? Was this innovation decided upon merely on the score of economy?

* * * * *

Why do not more municipal authorities throughout the country follow the example of Southend-on-Sea and other towns by purchasing a fleet of motor omnibuses, and running them as a municipal undertaking? Would not such a step tend to minimise the friction now existing between the road authority and the owners of the commercial motor omnibus? And would it not be better for the municipality thus to secure complete control of the design, weight and speed of these vehicles?

* * * * *

What is the opinion formed by municipal engineers as to the future possibilities of the Bachelet Levitated Railway? Have any of them invested their money in the company which has recently been formed to exploit this "flying" railway?

* * * * *

What is all this outcry now being made by some medical men about dirty money and the necessity for having it thoroughly washed and disinfected before it is issued from the banks? Are not most of us quite willing to accept money whether dirty or not so long as we receive it with "clean" hands?

* * * * *

Why is it that Committees of the House of Commons often blow hot and cold with the same breath? Is it not rather curious that, whereas only a few weeks ago a committee granted the Middlesex County Council powers to levy a tax of 3d. per vehicle-mile on the new West road, a committee has now refused the Walsall Corporation permission to include in their Bill a clause to the same effect? What is the difference between a trolley omnibus and a self-propelled ordinary motor omnibus which caused this committee to allow a tax on the former vehicle and not on the latter? Why should there be any difference in the flavour of the sauce for the goose and that of the gander?

* * * * *

When will the Government find time to pass an Act of Parliament under which the advertisements which now disfigure the country on every line out of London shall be heavily taxed? Are they not aware that the Government of France have passed such a law, which comes into force next year? And why should we be behind in endeavouring to secure a revenue out of these methods for disfiguring the land, instead of taxing improvements?

* * * * *

What is a nuisance? May the following definition of what constitutes a legal nuisance be taken as approximating to a correct definition? "A nuisance may be considered as a condition or set of conditions working harm to one or more persons through an assault or offence to the sense of decency, propriety or comfort. The effect is positive, not slight or partial. An odour or a sight which seriously disturbs the peace of mind which is necessary to the ordinary vocations of life may constitute a nuisance."*

* * * * *

Why is it that aluminium galvanising paint is not more generally used for painting public lamp-posts and tramway standards, and so forth, than is now the case? Is it not apparent to everyone that the appearance given by this paint is brighter and more cheerful than some of the colours selected for this work, and would not a uniform colour be an advantage over the various colours now selected?

* * * * *

Who is the highway engineer who advises H.M. Office of Works on the construction and maintenance of the roads coming under their jurisdiction, and does he read THE SURVEYOR? or what steps does he take to keep himself informed as to the developments now taking place in road construction reforms?

* Extract from the report of the Board of Experts on the Future Sanitary Policy of the City of Chicago.

A Town Planning Scheme: Its Effect on Housing and Architecture.*

By RAYMOND UNWIN.

A town planning scheme consists of two parts. There is first a plan, and second the text of the scheme, which includes a series of regulations of the nature of by-laws covering a very wide range of subjects, which may be independent of the plan, or may consist of interpretations of the plan, or regulations which take effect in particular areas defined by the plan. The effect of the scheme therefore depends on the constructive meaning of the two parts read together, and it will only to a limited extent be possible to deal with the parts separately. So far as it is possible, however, it may be well to take the plan first.

There are certain considerations in connection with it which appeal strongly to the architect, whether he is considering the effect in architecture as a whole, or the effect on the domestic branch which we have summed up under the word "housing." The architect's special point of view may perhaps be stated by saying that he looks upon the scheme as a design; as something thought out as a whole, aiming to produce some definite total effect which will depend on the relation and proportion between the different parts. A design must not, however, be taken to mean merely a pretty picture on the paper. Many natural features of the site, many existing conditions, such as the position of railways, waterways, roads, or buildings, will determine the planning, and will very often prevent that symmetry and balance over large areas of ground which would produce the pretty paper pattern. The town plan is not made primarily to be beautiful, but to provide for the convenient and efficient arrangement of all the different component parts which go to make up the modern city. When the architect is asked to design some decorative feature he is right in concentrating his attention almost exclusively on the creation of a beautiful object; but when he is asked to design a building he must first consider the purposes for which the building is required, its efficiency for these purposes, and its convenience for those who are to occupy it. These considerations will determine the main disposition of the parts, their relation to one another, and the size and detail accommodation required in each; but it is the function of the architect to find a solution of these dispositions, relations, and sizes that will not only give the utmost convenience and efficiency, but in addition will create a beautiful building by the proper adjustment of the different relations, and by the harmonious proportioning of the parts. It is quite possible to create an efficient and convenient building which will be devoid alike of interest and beauty; such a building is not architecture. It is also possible to design a building of considerable superficial beauty of proportion and interest of design which may, nevertheless, be most inefficient for its purpose and inconvenient for its occupants; such a building is equally not architecture in its true sense. It is when the utilitarian objects are efficiently satisfied by a building of beautiful proportions and interesting detail that we have genuine architecture produced.

Exactly the same is true of town planning. In the disposition of the areas, the arrangement and alignment of the roads, the position allotted to the main buildings, the sizes of the different open spaces, and the widths of the highways, the plan may be such as to provide efficiently for the needs of the town, and yet may not contain the elements of design, may lead to no beautiful grouping of the buildings, no distinction resulting from their placing, and no interest arising from the relative position and proportion of the different parts.

It is only when all the utilitarian considerations are fused into some consistent design by the exercise of an imagination specially trained to find beautiful forms by means of which to satisfy useful purposes that a really fine town plan is produced. This is the contribution which the architect, as architect, has to make. A few individual architects may know

enough of engineering and surveying to handle the whole problem, just as some engineers and surveyors may have enough architectural feeling to confer that crowning quality of beautiful design on their schemes; but the knowledge required by these different professions, and the cumulative effect of their practice is so different, that usually it will be necessary for a successful result that representatives of the different professions should work together, so that the total contribution of skill may be higher than can ordinarily be expected from an individual who knows a little of each branch. But if this co-operation is to be effective, each party must have sufficient knowledge and appreciation of the importance of the other departments to give due weight to their representations. The engineer must not sacrifice main architectural matters for quite minor considerations of gradient or convenience; nor must the architect sacrifice the utility of roadways by piling them up on embankments in order to maintain some preconceived effect not suitable to the particular problem in hand. In the main it will be found that while the aims and purposes of the architect, the engineer, and the surveyor are different, they are not conflicting; and that a simple, definite scheme with wide, handsome roads and well-designed crossings and road junctions will be the best form in which to provide easy and convenient thoroughfares.

In considering the scheme of

ROADS

it is important to remember the two main purposes for which they are required—to accommodate traffic and to afford frontages for buildings. Roads generally serve both these purposes, but their treatment depends largely on the relative importance of the two functions; those that are required to serve as main roadways for traffic should be planned primarily for the convenience of traffic, and their junctions should be considered from this point of view first. On the other hand, those roads, the traffic on which is mainly concerned with the buildings fronting upon them, should be considered primarily from the point of view of affording economical, serviceable, and therefore valuable building frontages. As far as possible such roads should either follow approximately the lines of the contours or should travel at right angles to those lines, so that the plane of the land, in whichever direction it may slope, may be nearly square with the building. Both the satisfactory placing of the building on the ground and the convenient treatment of the garden depend considerably upon this. Not only is the importance of traffic secondary in these roads, but it is even desirable that they should not be planned so as to afford short cuts for main lines of traffic. The only way in which it is possible, without great total cost, to secure adequate width for main arterial roads is to design the minor roads so that they cannot become trafficways: the actual width of the carriageways and footways in these may then safely be reduced to a minimum, and the saving in land and cost thus effected can be set off against the extra width and cost of the main traffic highways. This does not mean, of course, that the width between the building lines on minor roads should be reduced, nor even that the width dedicated to the roadway should always be reduced. There will be cases in which it may be desirable either to provide space for the decoration of the roadways with grass margins, shrubberies, or trees, or to provide space for possible future widening of footways or carriageways, where, owing to the planning of the roads, an increase of traffic seems possible.

It is hardly necessary to emphasise the degree to which the health and attractiveness of dwelling-houses depend on the planning of the roads. The spacing of the roads influences the frontage given to the houses, and the area of open ground available to provide air, light, and outlook for the windows. Their adjustment to the nature of the slopes of the ground will have a marked effect on the cost of roadway per house; careful planning will preserve the residential roads from through traffic, thus reducing

* Paper read at the meeting of the Institution of Municipal and County Engineers, held at Dunfermline on June 5th and 6th.

both noise, dust, and danger, and will, moreover, keep open many attractive views of open spaces and distant objects of interest or beauty. The orderly arrangement of the houses themselves and the decoration of the streets with trees and shrubs will add enormously to the pleasantness of the dwellings; and at the same time a good system of main trafficways, by adding to the facility for getting from place to place, will increase the efficiency of the people as industrial workers, and add to their opportunities of enjoying social life and culture.

Some sacrifice of the building convenience may wisely be made on arterial roads; in order to increase their directness, or improve their gradients, we shall be justified in carrying out an extent of cutting and filling that would be unpardonable on a building road. Where there is a choice between cutting and filling, it may be taken as a general rule that filling is most objectionable in roads where dwelling-houses are to be erected, and cutting in roads for business premises. Dwelling-houses are much better built above the road than below it. On the other hand, business premises must be entered on a level with the road, and can usually employ a basement story profitably; this means that when the road is in a cutting, heavy expense must be incurred in excavating the site, and sometimes also in sinking cellars still further below the level. The main consideration on the arterial roads, however, must be the traffic; and it is important to consider this in planning the scheme of minor roads. In order that their traffic should interrupt that on the main roads as little as possible, it should be collected by secondary roads, and delivered by them at not too frequent intervals into the main arteries. It should not be forgotten when planning that every needless junction or crossing on a main artery reduces its efficiency as a traffic carrier. Moreover, when arterial roads are broken into by too many minor roads, the façades of the buildings are apt to become ragged, to lack sufficient breadth and dignity; here as often we find the architectural considerations in harmony with the traffic convenience. On the other hand, in the minor residential roads, the variations which will give further adjustment of the roads to the site, and the limited vistas which will be produced by so planning the roads that, while they divide up the land conveniently, they do not form tempting short cuts, will help the architectural effect with the type of domestic building for which they are intended. The importance of so planning the roads and road junctions as to give at least a favourable opportunity for the beautiful grouping of the buildings must not be overlooked. A straight approach on an axial line to an important building, and the development of the whole of any civic or other centre composed of a group of public buildings on such an axial line, will be found to give a sense of order and dignity. Certain types of building are usually characterised by more handsome architectural treatment; it is desirable that the most should be made of these opportunities, and that these buildings should, as far as possible, be placed where they will confer distinction upon several street pictures, and serve as central features for architectural groupings from several points of view.

In most localities there are features connected with the history of the city's development in commerce, civilisation, or culture, around which there cling the most cherished associations of the people, or which keep alive the memory of heroic citizens of the past. Underlying and infusing all the planning which we have been considering from utilitarian and aesthetic points of view, there must be a sympathetic appreciation of these higher elements of the individuality of the city, and an imaginative enthusiasm for their expression in the outward form of the town, if the result is to be a work of art of the higher order.

We must pass now from the town plan to

THE TEXT OF THE SCHEME.

Here the architect's point of view is somewhat peculiar. He usually sympathises with the aims of by-laws and building regulations, but is intensely irritated by their methods; and if town planning schemes are to work smoothly, the municipal authorities must try to understand this point of view.

The architect is delighted that adequate space about his buildings should be secured, but he is annoyed when that space is required to be exactly in one position, and of an exact dimension throughout the width. He would willingly support the municipal authorities if they would ask for two or three times as much average space about the build-

ings, if only he could be allowed some liberty to dispose this space as may best suit the circumstances of each individual case. He is in full sympathy with the local authorities when they require a certain minimum cubic space to be provided in a living room; but when he is required to reduce the size of a room by cutting off the angles to provide a minimum height to the springing of the ceiling, either wasting the space or providing cupboards that are not wanted, then he is tempted to put in dummy cupboards and remove them after the building is completed.

He is in agreement with the local authority which has sought to prevent the erection of stuffy and congested closes; but when he finds that he cannot erect a quadrangle of buildings without leaving gaps in each angle, or carrying the road right through to avoid a *cul-de-sac*, then by-laws are apt to become his bugbear, and the defeating of them one of his chief delights!

The town planning scheme is largely an extension of the field which may be covered by building regulations, but it is freed from many of the technical difficulties under which by-laws have been made by the local authorities in the past.

Strictly speaking, there are only comparatively few matters on which, previous to the Town Planning Act, by-laws could legally be made, and much ingenuity has been expended by the local authorities and the Local Government Board to make by-laws produce indirectly effects which they deemed desirable, but which they were not legally empowered to secure directly. One result has been that large sums of money have been wasted in making wide roads, because a by-law could not fix a minimum distance between the houses. There is only one way in which building regulations can be made to work satisfactorily, and that is for them to provide sufficiently generously for the requirements to enable a considerable amount of freedom to be left as to the particular method in which they are satisfied. If you secure a sufficiently ample provision of open space about buildings, you can disregard the exact position in relation to the individual building, and the exact distance at any point across a particular bit of open space. This is a very important consideration when framing regulations under the scheme for limiting the number of houses to the acre. It is in every way wise and practicable to reduce the average number of houses to the acre over a reasonable area to such an extent as will secure not only ample light and air space for the houses, but a sufficient proportion of garden ground in relation to the population to provide quite a considerable addition to the economic basis of the family, and sufficient recreation areas for both children and adults; but if this result is to be attained considerable elasticity must be secured. I find that with an average disposition of ten houses to the acre for a rectangular building plot measuring 10 acres there may be usually sixteen or seventeen houses on 1 acre in the corner. If the space is not rectangular, and should be bounded by roads meeting at an angle of 60 deg., there may be twenty houses to the acre on the corner; or, if the road should meet at a still more acute angle—say, 15 deg.—the number of houses to the acre may go up to twenty-four or twenty-five if the full use is made of the road frontage, and all the houses are of the smallest type. While, therefore, over the whole unit of 10 acres it is desirable to reduce the number to ten, twelve or fifteen to the acre, very great care must be taken not to cause a needless waste of road frontage at junctions by insisting on too low a maximum of houses on the individual acre, or on too arbitrary a method of measuring it. It will be seen that, if the acre at the corners were measured to include more of the back land instead of being made square, the lower maximum number of houses on the individual acre would be practicable without causing waste of road frontage. For this reason I think it is a good rule that the general limitation should be sufficiently drastic to secure plenty of open space, but that the particular limitation applying to the individual acre should be sufficiently generous not to cause unnecessary waste of road frontage. Further, if open space is secured generally by the limitation of the number of houses to the acre, any requirement as to the area of open space at the back of the building, or as to the proportion of an individual plot which may be covered by buildings, should leave the greatest possible elasticity in the laying out of buildings around corners.

It is not generally realised how difficult it is to stereotype the minor development of a plan for a large area without causing very serious waste. For example,

if a town planner were to lay out the detail roads on 20 acres of land on a basis of ten houses to the acre, under the expectation that the average frontage per house would be 30 ft., he would have to secure a certain depth of plot and distance between his roads and provide 2,000 yds. of road frontage; but should the type of house eventually built be a narrow house having an actual building frontage of only 15 ft. or 16 ft., probably the average frontage of road required would not much exceed 20 ft.; but he would have laid out 666 yds. of frontage, or 333 yds. of roadway on these 20 acres more than was required, and the unfortunate person who had to develop the land would have wasted £1,333 if the roadway cost £4 per lineal yard. Now it is not possible to foresee exactly what type of house will be built in different places, and therefore elasticity in the number of minor roads, their arrangement and placing on a plan must be permitted if waste is to be avoided. On this account I am inclined to think that the best arrangement for limiting the

NUMBER OF HOUSES TO THE ACRE

is to fix units of reasonable size, taking, as far as possible, areas that are defined on the town plan by main roads, railways, streams, or other definite features not likely to be changed. There should, then, in connection with each unit, be fixed a maximum average density for the whole of the unit, and a maximum density for any one acre within the unit.

But there is still one point to consider: Houses vary very much in size. If it is permissible to have a certain maximum number of large houses on an acre of land, is it not permissible to have a greater number if the houses are each only of one-half or two-thirds the size? In deciding this matter, we must consider the reasons for limiting the number of houses to the acre. These are mainly two: First, limitation aims at providing a sufficiency of open space about dwelling houses to secure an ample supply of the freshest of fresh air and full access for sunlight, both of which are necessary for health. So far, then, as this reason goes, it would seem to be important to take into account the size of the building in fixing the number to the acre, otherwise the larger the building the less would be the open space. There is, however, a second reason for limiting the number of houses—viz., to secure, on the average, to each family the use of a certain amount of ground for recreation, for the growth of garden produce (a matter of great economic importance), and for the preservation of the pleasantness, or, as it is called in the Act, "the amenity," of the area. For this purpose the amount of land required is rather a fixed quantity per family, and does not necessarily depend on the size of the house. The family living in the small house really needs as much land as the family living in the larger house; but it can hardly be contended that it needs more. So even here there is reason for making some difference, because with a given number of houses to the acre a small house, owing to the less area which it covers, will be left with a larger area for garden than the large house, and the utmost that can be said under this heading is that as much land is needed.

There is, however, another pressing reason for doing something to adjust the area of land to the size of the house, and this is the increasing ratio which the cost of the site bears to the cost of the house as that cost decreases. In a house costing £1,500, the cost of the site, including the cost of road making, will usually be no more than one-sixth of the value of the house; in the case of the £150 cottage, the value of the site will not uncommonly be found to represent one-quarter or even one-third of the value of the house. This means that, relatively, the smaller the house the greater is the expense of providing it with a site. If, then, we fix a given limit to the number of houses without reference to their size, we shall add still more to the relatively higher cost of site for smaller dwellings. This is not desirable, for already there is a strong inducement to the builder to build on each plot as big a house as possible, because the bigger house will carry a little more ground rent or site value than a small one, even for the same actual area of ground.

For all these reasons, therefore, it seems to me of importance that the number of houses to the acre should be limited by means of a schedule, which should fix the number in relation to the size of the house, and for the purpose of determining the size of the house one needs to take the effective size, and to eliminate accidental matters, such as the difference between a high-pitched roof or a low-pitched roof, or

the difference between a house that has a large cubic space occupied by foundations and one that has a minimum of foundations. On the whole, therefore, I think the best plan is to fix the number according to the cubic contents of the building, measured to the outside of external walls, to the centre of party walls, and excluding from the measurements all unused space above the level of the highest ceilings and below the level of the ground floor of the building. The schedule would then be somewhat as follows, the actual numbers being adapted to suit the individual circumstances:—

Houses containing not more cubic feet than.	Maximum average to the acre	Maximum on any one acre.
5,000	15	20
6,300	14	19
8,000	13	18
10,000	12	16
12,000	10	14
14,000 and over	8	12

The question of

THE BUILDING LINE

in town planning schemes has considerable bearing upon the building of houses and the architectural effect of the streets, and it is not easy to frame regulations that will work satisfactorily in all cases. There are existing roads on which it may be desirable to fix a building line for the purpose of securing the possibility of road widening at some future date should the traffic on the road develop sufficiently to require it. A line that is fixed for this purpose must, if it is to be effective, apply to all buildings, and must not be subject to exceptions on corner sites, or for the purpose of giving a sense of enclosure to the street view at certain points. On the majority of roads that are mainly used for building purposes, and have only to accommodate local traffic, and on new roads laid out of ample width, the question of street widening beyond the limits of the street boundaries hardly arises. Here the building line is fixed for the purpose of providing adequate width between the rows of houses to secure light and air, and the amenity of the streets; for this last purpose it is desirable that there shall be some opportunity for varying the building line. In some schemes the minimum amount of set-back which could be accepted for any building is all that has been secured, leaving anything further entirely to the option of the builder; in other schemes an attempt has been made to secure a more generous depth of forecourt over the general frontage of the street, but at the same time to give opportunities both to bring forward certain limited lengths of frontage here and there, and also to bring forward, to some extent, the houses at the corner of two streets, so that the amount of road making which must be wasted at street corners may not be unduly increased. While it is certainly desirable in town planning schemes that there should be an opportunity for a settled building line more interesting than the simple continuous street line, it is obviously not desirable that houses should be dotted down along the road irregularly, just where each individual builder may think fit. For this reason, perhaps, the best solution of the building line difficulty is to require a minimum length of building frontage to be submitted as a definite scheme where the ordinary building line is to be departed from. Clauses to this effect are provided for in the Ruislip scheme.

Where the land slopes steeply it is not at all desirable that the buildings on each side should have to be an equal distance from the centre of the road; generally speaking, and where land in several ownerships has to be dealt with, the building lines may need to be set out equidistant from the centre of the road; but provision should be made in the scheme for cases where it is desirable that houses should be set much nearer the road on one side, generally where the ground is falling from the road. This may be compensated for by setting back the houses on the higher side of the road, the distance between the two building lines remaining the same.

Having secured ample space about buildings, perhaps the next most important point is to secure that adequate

FRONTAGE

shall be provided for each house, and that long projecting wings shall not be permitted in such a way as to block proper access of light and air to the windows. There is in the Ruislip scheme a somewhat complicated clause dealing with this matter which secures an angle of light of 45 deg., but it does not prevent the window to a living room being placed at the end of a narrow space between two wings. A

simple regulation requiring that all the living room windows should have a certain angle of light vertically and horizontally would, I think, be more effective, and more readily secure the desired result; such angles should not be less than 60 deg. This would allow of reasonable projections to buildings, but would prevent their undue extension in length, or their undue proximity to each other in the manner that is so objectionable in a very large number of buildings erected under the ordinary by-laws.

Where an attempt is made in a town planning scheme to fix the height of buildings, or to limit the number of stories, care must be taken that this is not effected in such a rigid manner as to require on a sloping road the stepping down of every building. Provision should be made that a level roof may be carried over a group of four or six buildings, and the extra height of the lower buildings utilised for an additional story.

In a similar way, one might go through many other individual regulations which aim at something which is desirable, and might point out how easily, if these regulations are looked at apart from the point of view of those who have to build under them, they may prevent many things which are quite harmless from being done, and may even entail the doing of much that is undesirable. For this reason it is most important in framing town planning schemes that the local authorities should enlist the co-operation and assistance of architects and builders. It is perhaps natural that the busy official of a local authority who is trying to put through a town planning scheme in the short spaces of time he can snatch from his other work should be somewhat impatient of criticism and suggestions; but he should remember that he looks at a regulation purely from one point of view, and that no regulation is good which only satisfies the point of view of the official. The Town Planning Act is so framed that any new regulation that is included in the scheme can be carefully adjusted to meet the

NEEDS OF EXCEPTIONAL CASES.

and to suit the varying circumstances of different districts, and even different areas within the same district. The framing of such regulations is by no means easy, because it is not only the effect of the particular regulation that has to be considered, but the constructive effect of two or three regulations taken together. For example, in the draft of one scheme it was provided that on certain roads houses should be set back 35 ft. from the boundary of the road, and it was also provided in another part of the scheme that no house in a certain area should be more than two stories in height. Where land was sloping steeply, the result of setting back the houses 35 ft. would be that one story would be below the road, and would be in effect a cellar; so that these two regulations, taken together, would mean that on certain sites houses could only be built having cellars and bedrooms, with no proper ground floor rooms at all. What we need is so to frame our regulations that they will effectively prevent anything that is detrimental to health or injurious to the amenities of the district, but will leave the utmost possible freedom for every builder to do anything that he may desire to do that is in itself harmless and unobjectionable.

So far we have been considering the regulations of a town planning scheme as affecting the placing of buildings and the distribution of space about them; but the town planning scheme affords an

OPPORTUNITY FOR MODIFYING BY-LAWS

in England, or regulations made under the Burgh Police Acts in Scotland; and these are much needed. In England the by-laws were framed especially to prevent the evils springing from an overcrowded development of small houses packed together in long rows, without proper access, air space, or sanitary conditions. Such packing together of small houses produced certain dangers which had to be met by a fairly complex system of building regulations, aiming to secure protection from fire risks, sanitary conditions, and a certain standard of stability; but if once the overcrowding of these dwellings is prevented by a definite limitation of the number of buildings which may be placed upon an acre of ground, the whole character of development is changed; the relative importance of many matters must necessarily change also. For example, with endless rows of dwellings packed together closely, the risk of fire spreading from house to house over a large area may be sufficient to justify the by-law re-

quiring parapet walls to be carried up through the roof between each pair of houses; but with the development which follows from the limitation of houses to the acre, such risk is greatly reduced, and the requirement ceases to be one on which it is desirable that the local authorities should insist, for not only can the cost of complying with it be spent to much greater advantage in other ways on the building, but it is in itself an ugly and inconvenient expedient, only justified by a very serious danger.

In Scotland the Burgh Police Acts have been largely framed with a view to meeting the difficulties arising from the prevalence of many-storied tenement dwellings. With a limitation of the number of dwellings on the acre, there can be no doubt that this system of housing families one above the other will give place to that of housing them each in their own house, standing on its own plot. It is necessary, therefore, that all the regulations embodied in the Burgh Police Act, or enforced by Dean of Guild Courts, should be reviewed in the light of the new conditions set up by the Town Planning Act. For example, where population on the acre is as dense as it usually is with many-storied tenement house development, certain expedients have been adopted to try to secure a modicum of fresh air for each person. Among these, the heights of rooms have been fixed much greater than is commonly adopted where cottage dwellings are built. It may, or may not be some slight advantage for comparatively small cottage rooms to be 9 ft. or 10 ft. high; opinions widely differ as to whether any height above 8 ft. is really of advantage in such rooms; but it is hardly open to doubt that it would be a much greater advantage to secure an extra foot in the size of the room, and, further, that additional height over 8 ft. when all the rooms have windows looking out upon ample open space is, to put it at the highest, such a very small advantage that the local authority is not justified in compelling it. The cost had much better be spent in making the rooms a little larger, and under the town planning scheme, which allows rooms to be 8 ft. high, a provision requiring a minimum floor space or a minimum cubic space, or both, can be inserted. The two-story cottage also does not need such a heavy form of construction. Questions of climate must, of course, be considered, but there is no reason to suppose that an 11-in. hollow wall would not be as weather-proof in Scotland as it is found to be in all parts of England; and it is doubtful whether in walls having one air cavity there is any necessity to strap the inside of the wall under the plaster to form a second cavity. Exactly what modifications in detail should be made, and how far differences of climate would affect these, as compared with the modifications found desirable in England, can only be determined after careful consideration of the new conditions by those having a knowledge of both systems of development. I wish only to emphasise the point that a local authority should not attempt to secure in connection with the dwelling the utmost in every direction that the particular surveyor may think desirable, but that they should secure the main conditions necessary for health, and should then leave to the individual builder some freedom to develop in one direction or another as may seem desirable for different classes of tenants.

Above all, let it not be supposed that housing reformers are asking for by-laws to be relaxed; nothing could be further from the truth. In asking for a limitation of the number of families which should be allowed on the average to occupy an acre of ground, housing reformers are calling for a far more drastic regulation than anything which has ever been proposed, one which so alters the character of development that it renders many old regulations no longer necessary, and what they seek is that certain minor requirements chiefly applicable to the older types of development, which are found to hamper the newer and better system, should be removed or adapted to the new conditions.

Certain other regulations should be considered also in reference to the introduction of

NEW BUILDING MATERIALS.

notably in regard to concrete and reinforced concrete, for both of which there is undoubtedly a future as building materials for dwellings in those districts where suitable aggregates are plentiful, and where the more ordinary building materials, brick and stone, are not so easily obtained.

The Town Planning Act gives power to control the character of buildings, and this would seem to carry

with it the right to exercise some supervision over the general character of their designs and the materials of which they are composed, with a view to preserving or securing the amenities of the scheme. Such power has been exercised in the past by enlightened ground landlords in developing their estates, but has not been given to local authorities. It is admittedly a matter of some difficulty, because design or character cannot be defined in precise terms of a number or measurement, and, moreover, is subject to a certain variation of individual taste and opinion; but, none the less, I believe that some such control is desirable, and that the difficulties are less than appear. It is true that if you asked a dozen architects to design a building to fit a certain position, you would receive probably a dozen different designs; but, on the other hand, if you submitted any design for a building to a dozen architects, you would probably get an almost unanimous opinion as to whether that design was such as could reasonably be allowed to be erected in the particular place. There would be a general consensus of opinion which would rule out all designs below a certain quality, although of the designs above that quality there might be some difference as to which should be placed first. Now, in the regulation of design by a local authority, what is aimed at is not to secure absolutely the best among the many good designs, but to maintain a certain average standard, to preserve streets from being spoilt by the erection of buildings which are monstrosities of ugliness or bad taste. This I believe to be both practicable and desirable; but it is work that should not be attempted by a committee of laymen. The layman will very often know what he likes, and what he does not like, and his taste may be good, but he cannot tell what it is that causes him to like a building, and does not understand how a design fails or how it can be amended. Only the trained architect is qualified to exercise this function, and where the local authority desires to criticise the general character or design of buildings, it is at least due to those submitting plans that the criticism should be only entrusted to a well qualified architect, of such standing and independent position that he is not likely to be influenced by petty considerations.

What the municipal authority can do for architecture by means of a town planning scheme, and by the control of buildings, is not to secure fine architecture, but to grant an opportunity for its development, to prepare an adequate stage for its display, and to protect such fine architecture as may arise, and as I believe will arise, out of these better conditions from being spoiled by incongruous surroundings and the ugly freaks of eccentric fancy.

If by means of co-operation between the architectural profession and the municipal engineer a mutual understanding of this position can be secured, a very great step will have been taken towards the building up of more beautiful cities in this century than those which have resulted from the activities of the last.

Claridge's Asphalt has been specified for the damp-courses and the roofing at the new London and County and Westminster Bank premises, Pulborough.

The Civic Engineer's Who's Who, compiled by the editor of *THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER*, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

The Three-Axle Roller.—Messrs. Barford & Perkins, Limited, Queen-street Ironworks, Peterborough, write: "In reply to the query on page 955 of your issue of the 12th inst. as to what has become of the Barford & Perkins' three-axle road roller, we desire to say that the experimental roller which was shown at the exhibition last year in an incomplete state was used last year, and did some rolling at West Hill, Wandsworth, which was considered by Mr. Dodd, the borough surveyor, to compare very favourably with the ordinary rolling by steam roller. During the winter we have had it back in the works to alter it to run on paraffin, and to make an additional adjustment so that the driver could vary the weight on the rollers without moving from his seat. It has just been sent up to London, and has been used by the Trinidad Company at Cross Deep, Twickenham, and we are informed with highly satisfactory results. A second roller has been sent out to Calcutta, and others are now being constructed.

GLASGOW'S WATER SUPPLY.

OPENING OF LOCH ARKLET WORKS.

On the occasion of the annual inspection by the Glasgow Corporation on Friday last of the source of the city's water supply, opportunity was taken to open formally the new Loch Arklet works, which were begun in 1909. The following description of the works has been prepared by the chief of the city water department, Mr. John R. Sutherland:—

The natural flow from Loch Arklet is by the stream which discharges itself from the west end of the loch into Loch Lomond at Inversnaid. The direction of the main discharge from the loch is now reversed by means of a tunnel 12 ft. wide, 11 ft. high, and about $\frac{1}{2}$ mile long leading eastward to Loch Katrine. The difference in height between the raised level of Loch Arklet and Loch Katrine is 103 ft. The tunnel, which starts from an inlet basin at the east end of Loch Arklet, does not run all the way to the edge of Loch Katrine, but terminates in a measuring basin on the hillside on the west side of Loch Katrine. The measuring basin is about 200 yds. from the shore of the loch, and the water flows from the basin to the loch down a natural watercourse, which has been widened and improved with this object in view. Compensation water to the amount of 2 $\frac{1}{2}$ millions of gallons per day, discharged westward by suitable pipes and valves through the dam, will preserve a good flow in the original direction down the stream and over the falls at Inversnaid. The dam, which holds up the water of the loch to its new level, is constructed of concrete faced with masonry. The length is 1,050 ft., its greatest height above the original surface of the ground about 35 ft., and its width at top 11 ft. The greatest width at bottom was intended to have been about 34 ft., on foundations excavated a moderate distance into solid rock.

About half-way along the dam a bad fault crossed the foundation in a diagonal direction, terminating near the down-stream side of the dam in a large pocket of very soft material, quite unsuitable for giving support to the dam. This bad material had all to be cut out, with the result that for a length of about 50 ft. the bottom of the foundation is fully 100 ft. below the top of the dam, or 65 ft. below the original surface of the ground. The width of the structure at this part is proportionately increased, attaining for a short distance an extreme width of 80 ft. These difficulties gave rise to considerable anxiety in the winter of 1910-11, but they have been quite overcome. The inner face of the dam is built of artificial stone made in a blockyard near the site of the works, and the outer face is of red freestone brought from Annan. The imported material—chiefly Portland cement, freestone, and granite—was brought to the railway terminus at Balloch, Loch Lomond; thence it was conveyed in barges to a specially constructed landing-stage near Inversnaid, from which point it was taken up to the site of the works on a wire ropeway, about 1 $\frac{1}{4}$ miles in length. The landing-stage and ropeway were provided for in the specification of the works.

The area of Loch Arklet in its natural state is 207 acres. At its new top-water level—22 ft. higher than the present level—the area will be 551 acres. The loch originally measured about 1 mile long and rather less than $\frac{1}{2}$ mile wide. It is now fully 2 miles long, and of about the same average width as formerly.

The contract was let early in 1909 to Messrs. Charles Brand & Son, of Glasgow, who have carried on the work with great energy. In addition to providing the wire ropeway and other necessary plant, the contractors devised a scheme for using the water power, available from the stream discharging into Loch Lomond, for obtaining electric power by turbines and suitable generators situated close to the special landing-stage. The water was led to the turbines in a steel pipe, mostly 21 in. in diameter, and had a working head of 300 ft. This power provided the means for driving the ropeway, cranes, stone crushers, and other mechanical appliances on the contract, including air compressors for actuating the pneumatic rock drills. The current was taken to the points at which it was required by overhead copper wires. The contract sum was a little over £100,000, and the amount paid to date has been about £168,000. The additional work at the foundations for the dam was the chief cause of the increase on the total cost of the undertaking.

The contract for the gun-metal sluices of the dam and inlet basin, and for the ironwork required, amounting to £4,400, has been carried out by Messrs. Glenfield & Kennedy, Limited, of Kilmarnock.

A BOROUGH ENGINEER'S TRAVELS.

SUGGESTIVE DISCUSSION AT SCARBOROUGH TOWN COUNCIL.

At the meeting recently of the Scarborough Town Council there was a discussion as to the advisability of the borough engineer, Mr. H. Smith, paying professional visits to other towns for the purpose of information. Alderman Hastings Fowler having moved the adoption of the minutes of the Public Parks and Entertainments Committee,

Councillor Stephenson moved as an amendment that the minutes should be approved except that giving power to the borough engineer to visit other towns. He thought the borough engineer already knew sufficient, and that it was quite unnecessary for him to go and see other places. He hoped no one would think him niggardly in moving that amendment, but he would like first to see the slumdom of Scarborough done away with, and good houses provided for the people in general.

Councillor Hebden seconded the motion that that part of the minutes referring to the borough engineer's visits to other towns should be deleted.

Alderman Whittaker strongly opposed the amendment. He considered it would be very well spent money. They got the idea of the bather's bungalows which had been so great a success—from Bourne-mouth, and they got the idea of the floral hall—another big success—from Margate. Never had the borough engineer gone on a visit without bringing back something of interest. The future for Scarborough was full of promise, and they were on the eve of greater development. Every penny spent would be returned to them in pounds. They were doing much for the workers by their reproductive work.

The amendment was defeated, and the minutes, as printed, were adopted.

N.A.L.G.O. and Superannuation.—On Thursday morning next Mr. Herbert Samuel, President of the Local Government Board, will receive at the offices of that authority a deputation from the National Association of Local Government Officers on the subject of superannuation.

Law of Private Street Works.—It is surely a commentary on our system of legislation relating to what may be termed domestic matters that the owner of house property (to say nothing of the occupiers of his houses) has to thread his way through a maze of statutes and decisions to ascertain his rights and his liabilities in connection with questions which may arise every day. Such, however, being the case, text-books dealing with what on the face of them might be deemed to be simple matters have become an actual necessity, although the owner of property is lucky if the text-book suffices and he is not driven to consult a specialist. The work before us* deals with one of such subjects, private street works under the Public Health Acts and the Private Street Works Act, 1882, but not with the Metropolitan Management Acts; the statements in the text are supported by decided cases, with references printed in the text; there is also a table of cases and an index, and it should prove a useful hand-book. We find the recent decisions included, and the work seems to have been carefully prepared.—*The Builder.*

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. W. COCKRILL, M.INST.C.E., A.R.I.B.A., Borough Surveyor, Great Yarmouth.

ANNUAL GENERAL MEETING AND TOWN PLANNING, HOUSING AND ROAD CONFERENCES.

The forty-first annual general meeting of the institution will be held at the Town Hall, Cheltenham, on Wednesday, Thursday, Friday and Saturday of next week. Conferences will take place with delegates from the various corporations and local authorities of the United Kingdom, and repre-

* "Notes on the Law of Private Street Works under the Public Health Acts." By J. B. Reignier Conder, a Solicitor of the Supreme Court. 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.

sentatives of the different bodies interested in the subjects of town planning, housing and roads. An important exhibition of plans, maps and models of town planning and housing schemes has been arranged, and it is believed that the collection will be one of great educational and practical value. The exhibition will be open during the four days of the meeting. The programme of the meetings and conferences is as follows:—

Wednesday, June 24th.

9.30 a.m.—Meeting of subscribers to the Orphan Fund.
9.30 a.m.—Finance Committee meeting.

10 a.m.—Council meeting.

10.30 a.m.—Assemble in supper-room.

Members will be welcomed by the Mayor of Cheltenham, Mr. Alderman W. Nash Skillicorne, J.P., C.C.

ANNUAL GENERAL MEETING.

Chairman, the Outgoing President, Mr. J. W. Cockrill, M.INST.C.E., A.R.I.B.A.

Minutes of last annual general meeting.

Annual general meeting adjourned.

Annual report of the council (to be taken as read).

Annual general meeting, to be adjourned.

Special meeting Alterations in Articles of Association.

Annual general meeting resumed.

Alterations in by-laws.

Presentation of premiums.

Presidential address.

1 p.m.—Adjournment.

CONFERENCES.

TOWN PLANNING AND HOUSING.

(In Supper Room.)

Chairman: The President.

2.30. Opening Address by Mr. Thos. Adams (representative of the Local Government Board).

Mr. Adams will reply to questions arising from his remarks.

Discussion on Paper No. 1.

4 p.m.—Exhibition of town planning and housing schemes in Large Hall. Afternoon tea.

7 for 7.30 p.m.—Annual dinner in the Town Hall (delegates and visitors are invited to attend).

ROADS.

(In Drawing Room.)

Chairman:

Mr. H. T. Wakelam, M.INST.C.E. (vice-president).

2.30. Opening Address by the Chairman.

Discussion on papers Nos. 9 and 10.

Thursday, June 25th.

CONFERENCES.

TOWN PLANNING AND HOUSING.

(In Supper Room.)

Chairman: The President.

10.0. Discussion on Papers Nos. 2, 3 and 4.

ROADS.

(In Drawing Room.)

Chairman:

Mr. H. T. Wakelam, M.INST.C.E. (vice-president).

Discussion on Papers Nos. 13, 14 and 15.

1 p.m.—Luncheon in Large Hall given by the mayor to members, delegates and visitors.

2.30 p.m.—Visit to destructor, concrete slab factory and electricity works, and new sewage purification works.
Tea at sewage works by invitation of mayor.

8 p.m.—Exhibition of town planning and housing schemes in Large Hall.

Friday, June 26th.

CONFERENCES.

TOWN PLANNING AND HOUSING

(In Supper Room).

Chairman: The President.

10.0 to 1.0. Discussion on Papers Nos. 5 and 6.

2.30. Discussion on Papers Nos. 8, 9 and 10.

ROADS AND GENERAL SUBJECTS

(In Drawing Room).

Chairmen:

Mr. H. T. Wakelam, M.INST.C.E. (vice-president).

Mr. T. W. A. Hayward (vice-president).

Discussion on Papers Nos. 16, 17 and 18.

Discussion on Papers Nos. 19, 20 and 21.

4.30 p.m.—Votes of thanks to mayor and corporation,

authors of papers and exhibitors (in Supper-room).
8 p.m.—Open-air entertainment, Montpellier Gardens.

Saturday, June 27th.

10 a.m.—Assemble at the Town Hall. Visit to Cheltenham Corporation waterworks at Tewkesbury and Tewkesbury Abbey, returning to Cheltenham by 1 p.m.

EASTERN DISTRICT.

An Eastern District meeting will be held at Bedford to-morrow (Saturday), and one at Tilbury on July 25th.

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

EAST MIDLAND DISTRICT.

It is hoped that a District meeting will be held in South Leicestershire in the near future.

J. W. DUDLEY ROBINSON, B.S.C.(LOND.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

SOUTHERN DISTRICT MEETING.

A district meeting will be held at the offices of the institution on Wednesday, the 24th inst., at 7 o'clock p.m. prompt, for the discussion of Mr. Barralet's paper entitled "Temporary Buildings in Relation to By-laws."

It is hoped that a good number will be present, since the paper (which appears in the November, 1913, "Journal") is worthy of the fullest interest.

An additional copy of the paper may be had on application to the secretary, 39 Victoria-street, Westminster, S.W.

ARTHUR PALMER,
Hon. District Secretary.

Greenwich, S.E.

NORTHERN DISTRICT.

Meetings will be held in Cumberland this month, at Alnwick on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

NORTH-WESTERN DISTRICT MEETING.

(July 3 and 4, 1914.)

PROGRAMME.

Friday, July 3rd.

General council meeting, tea and social to be held at the Mitre Hotel, Manchester.

6 p.m.—Tea. (Tickets, 2s. per head.)

7 p.m.—Council meeting.

8 p.m.—Smoking Concert, for which a capital programme has been arranged.

Saturday, July 4th.

Visit to the Ashton-under-Lyne, Stalybridge and Dukinfield waterworks.

1.55 p.m.—Leave Manchester Exchange Station.

2.10 p.m.—Arrive at Stalybridge Station, whence conveyances depart for Brushes.

2.30 p.m.—Arrive at Brushes filters, where an inspection will be made of the general plant.

3 p.m.—Leave Brushes for Ashway Gap filters.

4 p.m.—Arrive at Ashway Gap, and inspect filters and waterworks.

4.45 p.m.—Tea at the Old Dining Hall, Ashway.

5.45 p.m.—Leave Ashway Gap for Greenfield Station.

6.21 p.m.—Leave Greenfield Station for Manchester.

6.52 p.m.—Arrive at Manchester Exchange Station.

Mr. F. J. Dixon, F.G.S., M.INST.C.E., has courteously placed his services at our disposal, and will conduct members over the waterworks. At Ashway Gap Mr. Dixon will entertain members to tea.

The cost of conveyance from Stalybridge to Greenfield will be 2s. per head.

R. J. MCKENN,
Hon. District Secretary.

Heywood.

EASTERN AND NORTH-EASTERN DISTRICTS.

A visit will be paid by these districts of the institution, on Saturday, June 27th, to the quarries of the Enderby and Stoney Stanton Granite Company, Narborough.

PROGRAMME.

12.45 p.m.—Assemble at Leicester (Midland) Railway Station, and proceed by conveyances (kindly placed at our disposal) on a visit of inspection to the Enderby and Stoney Stanton Granite quarries. Arrangements will be made for blasting operations to be seen. Refreshments will be kindly provided by Mr. H. J. Grace, managing director of the company.

6.45 p.m.—Arrive back at Leicester Station.

Members of the Western District are specially invited.

Members are specially requested to note the following: August 15th and 16th, week-end visit to Hunstanton (ladies and friends especially invited). September 26th, Newmarket.

G. BELSON CHILVERS,
Hon. District Secretary.

Council Offices,
Oundle.

B. WYAND,
Secretary.

39 Victoria-street, S.W.

ASSOCIATION OF MANAGERS OF SEWAGE DISPOSAL WORKS.

MEETING AT MANSFIELD SEWAGE DISPOSAL WORKS.

By kind permission of the Mansfield Town Council and the borough engineer, Mr. Thos. P. Collinge, Assoc.M. INST.C.E., a visit will be paid to the sewage disposal works on Saturday, June 20th. Objects of interest: Grit and screening chambers in duplicate, sedimentation tanks, percolating filters, storm-water tanks, storm-water filters, ram pump and sludge lagoons.

PROGRAMME.

2.30 p.m.—Meet at the town hall, when the visitors will be received by the Mayor, Mr. Alderman Taylor, and members of the Highways Committee.

2.50 p.m.—Proceed to the sewage disposal works, when the visitors will be conducted over the works by Mr. Collinge, the engineer, who has kindly promised to give a description of the works.

5 p.m.—The visitors will be entertained to tea by kind invitation of the town council.

ROBERT TYSON,
Hon. District Secretary.

VISIT TO BRENTWOOD, ESSEX.

By kind permission of the chairman and members of the Brentwood Urban and Billericay Rural Joint Sewage Disposal Works Committee, a visit will be paid to their works on Saturday, June 27th. Objects of interest: Modern sewage purification plant on gravitating systems, comprising silt and detritus chambers, continuous liquefying sedimentation tanks, tank effluent tanks on Dortmund principle with primary and secondary percolating filters followed by humus tank; also sludge treatment on prepared lagoons.

PROGRAMME.

1.33 p.m.—Train leaves Liverpool-street, G.E.R. (East side); arrives Brentwood 2.39 p.m.

2.45 p.m.—Conveyances leave railway station.

3.15 p.m.—Arrive at works, Nag's Head-lane, Brook-street, where a descriptive paper of past and present works will be read by Mr. A. James Meeson, surveyor, who afterwards, with the works manager, Mr. G. J. Quick (member), will conduct the party over the works.

5 p.m.—Tea at the town hall by the kind invitation of the chairman of the Joint Committee, Mr. J. J. Crowe, J.P.

J. FIELDHOUSE,
Hon. District Secretary.

ANNUAL SUMMER MEETING AT NORWICH.
(Saturday, July 4th.)

PROGRAMME.

- 10 a.m. Meeting of council (Committee Room).
 11.15 a.m.—Assemble in Council Chamber at Guildhall.
 11.20 p.m.—Lord Mayor, Mr. James A. Porter, welcomes the association.
 Read minutes, &c.
 Short paper by Mr. Arthur E. Collins, M.INST.C.E., city engineer, Norwich, on "The Sewage Pumping Plant, Travis Tanks, and Sludge Treatment Works of Norwich."
 12.30 p.m.—Luncheon at Criterion Restaurant, White Lion-street.
 1.50 p.m.—Embark at Foundry Bridge Wharf, near Thorpe Station, on board the "Doris," and proceed to the city's refuse tip at Whittingham Farm Marshes.
 2 p.m. Arrive at tip, where association will be welcomed by Mr. O. J. Horner, chairman of the Sewage Committee.
 Walk to sludge treatment works of Norwich.
 2.15 p.m.—Natural Manure Company.
 2.45 p.m.—Walk to Travis tanks.
 3.45 p.m.—Tea, at invitation of the city engineer, Mr. Arthur E. Collins, M.INST.C.E.
 4.15 p.m.—Embark on "Doris."
 4.35 p.m.—Reach Trowse sewage pumping station. Inspect old beam pumping engines, Tangye suction-gas plant (450-b.h.p.), roturbo pumps, automatic electric roturbo pump, special screening gear to suit awkward conditions, coal discharging and storage plant.
 5 or 6 p.m.—Leave Trowse and take electric tramcar to city.

CHARLES H. BALL,
Hon. Secretary.

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

COUNTY SANITARY INSPECTORS.—June 20th.—Lancashire County Council. £200, with £25 for expenses and railway fares.—County Medical Officer of Health, County Offices, Preston.

STREETS FOREMAN.—June 20th.—Corporation of Tiverton. £100 per annum.—Mr. J. Siddalls, borough surveyor, Town Hall.

CLERK OF WORKS.—June 20th.—Northamptonshire County Council, Standing Joint Committee.—Mr. C. S. Morris, county surveyor, County Hall, Northampton.

SEWAGE WORKS MANAGER.—June 22nd.—Haworth Urban District Council.—Mr. W. Robertshaw, clerk, North-street, Keighley.

SURVEYOR'S CLERK. — June 22nd. — Denton Urban District Council. 30s. per week.—Mr. W. Richards, clerk, Town Hall, Denton, near Manchester.

ASSISTANT ELECTRICAL ENGINEER. — June 23rd.—Kilmarnock Town Council. £150 per annum.—Mr. W. C. Bexton, Electricity Works.

CLERK OF WORKS.—June 24th.—Corporation of Hull. £3 10s. per week.—Mr. C. B. Newton, water and gas engineer, Guildhall.

CLERK OF WORKS.—June 24th.—Bourne Rural District Council. £3 3s. per week.—Mr. C. W. Bell, clerk.

TEMPORARY ASSISTANT.—June 25th.—Uckfield Rural District Council. £1 1s. per week.—Mr. E. W. Ray-Johnson, surveyor, Buxted, Sussex.

TEMPORARY ASSISTANT. — June 25th. — Corporation of South Shields. £3 10s. per week.—Mr. Leslie Roseveare, borough engineer.

SURVEYOR'S ASSISTANT.—June 27th.—Hexham Urban District Council. £70 per annum.—Mr. John A. Baty, clerk.

CLERK OF WORKS.—June 27th.—Downpatrick Rural District Council. £2 per week.—Mr. R. L. Morrow, clerk, Union Workhouse.

SURVEYOR.—June 27th.—Goole Urban District Council. £200 per annum.—Mr. Robert Tyson, clerk.

SURVEYOR'S ASSISTANT.—June 29th.—Abertillery Urban District Council. £80 per annum.—Mr. William Gait, clerk.

SURVEYOR'S ASSISTANT.—June 29th.—Corporation of Luton. £80 per annum.—Borough Surveyor.

JUNIOR ASSISTANT. — June 29th. — Somerset County Council. £80 per annum.—Mr. Edward Stead, county surveyor, Wells.

TEMPORARY SEWAGE WORKS ASSISTANT.—June 29th.—Corporation of Dewsbury. £2 2s. per week.—Mr. Henry Dearden, borough surveyor.

BOROUGH SURVEYOR'S ASSISTANT.—June 30th.—Corporation of Middleton. £90 per annum.—Mr. P. Entwistle, town clerk.

TEMPORARY SURVEYING ASSISTANT.—July 2nd.—Royton Urban District Council. £2 2s. per week.—Mr. Ellis Harrison, clerk.

CLERK OF WORKS.—July 6th.—Ruislip-Northwood Urban District Council. £3 3s. per week.—Mr. Edmund R. Abbott, clerk, Northwood, Middlesex.

CITY SURVEYOR. August 4th.—Municipal Council of Sydney, New South Wales. £1,000—£1,300 per annum.—Mr. Thomas H. Nesbitt, town clerk, Town Hall, Sydney.

COUNTY SURVEYOR'S TEMPORARY ASSISTANT. Pembrokeshire County Council.—Mr. Arthur H. Thomas, county surveyor, County Surveyor's Office, Haverfordwest.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

SUNDERLAND. June 23rd.—Designs for a secondary school, for the corporation. Premiums, £100, £50 and £25.—The Town Clerk.

SAMFORD. June 29th. Plans and designs for working-class cottages, for the rural district council.—Mr. A. J. Haward, clerk, 34 Princes-street, Ipswich.

MIDDLETON.—July 16th.—Designs for a town hall, the cost of which must not exceed £18,000. Premiums £100, £50, and £25.—Town Clerk.

REIGATE.—July 25th.—Designs for a police and fire station, for the Corporation of Reigate. Premiums 40, 20, and 10 guineas.—Mr. A. Smith, town clerk.

LONDON.—September 7th.—Designs for elementary schools, for the London County Council.—Education Officer, Education Offices, Victoria-embankment, W.C.

CHESTER.—Designs for working-class dwellings, for the Corporation of Chester. Premiums, £50, £25, and £10. Mr. Patrick Abercrombie, M.A., Liverpool University School of Civic Design, has been appointed assessor.—Mr. J. H. Dickson, town clerk.

GATESHEAD.—Designs for a school to accommodate 700 scholars, for the Education Committee.—Education Offices, Gateshead.

LIVERPOOL.—Designs for laying out a public park and recreation ground, for the Corporation of Liverpool. Premiums 100, 50, and 25 guineas.—Mr. E. R. Pickmere, town clerk.

WHITBY.—For the improvement of the theatre and grounds, for the Whitby Urban District Council.—Mr. T. K. Scott, surveyor.

BIGGLESWADE.—Plans for setting out land for proposed cottages. The Clerk.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

BRIDGWATER. —June 22nd.—For laying 6,890 yds., or thereabouts, of cast-iron pipes, 3 in. diameter, and other works appertaining thereto, for the rural district council.—Mr. W. A. Collins, 56a Eastover, Bridgwater.

CHELMSFORD.—June 22nd.—For the erection of an engine-house and cottage, for the corporation.—Borough Engineer.

EVESHAM.—June 22nd.—For the erection of twenty-four cottages, for the rural district council.—Mr. E. Holloway, surveyor.

ANDOVER.—June 22nd.—For repainting and repairing the municipal buildings, for the corporation.—The Borough Surveyor.

SOUTHAMPTON.—June 22nd.—For the erection of a refuse destructor, for the corporation.—Borough Engineer.

EXETER.—June 22nd.—For the erection of underground conveniences, for the corporation.—Mr. T. Moulding, city engineer.

CARDIFF.—June 22nd.—For the erection of weights and measures offices, for the corporation.—City Engineer.

FINCHLEY.—June 22nd.—For the erection of 100 houses, for the urban district council.—Mr. C. J. Jenkin, engineer and surveyor, Church-end, Finchley.

GLASGOW.—June 22nd.—For the erection of a fire station, for the corporation.—Mr. J. Lindsay, town clerk.

BLAENAVON.—June 23rd.—For the erection of fifty houses, for the urban district council.—Mr. E. W. Edwards, surveyor.

PORTSMOUTH.—June 23rd.—For the erection of a school, for the Education Committee.—Mr. C. G. Vernon-Inkpen, architect, 40 Commercial-road, Portsmouth.

LONDON.—June 23rd.—For the construction of an embankment wall in the Thames in front of the new county hall, for the county council. Chief Engineer, Spring-gardens, S.W.

WIGAN.—June 23rd.—For the erection of a school, for the Education Committee.—Messrs. W. A. Ralph & Son, architects, King-street.

GRANTHAM.—June 23rd.—For taking down and rebuilding the lining of the chimney at the refuse destructor, for the corporation.—Borough Surveyor.

IPSWICH.—June 23rd.—For the erection of a transformer sub-station, for the corporation.—Mr. J. R. Mead, borough engineer and surveyor.

MAIDSTONE.—June 23rd.—For the reconstruction on the Hennebique system of Bow bridge, Waterbury, for the rural district council.—Mr. R. H. Halls, engineer, High-street, Lewes.

MIDDLESBROUGH.—June 24th.—For alterations and additions to municipal offices, for the corporation.—Mr. S. E. Burgess, borough engineer.

CHAPEL-EN-LE-FRITH.—June 24th.—For laying cast-iron water mains, for the rural district council.—Messrs. Brady & Partington, engineers, Chapel-en-le-Frith.

BRISTOL.—June 26th.—For the erection of a sanatorium, for the Health Committee.—Mr. L. McKenzie, city engineer and surveyor.

CARMARTHEN.—June 27th.—July 15th.—For the erection of a laundry at the counties' asylum, for the Committee of Visitors.—Messrs. Morgan & Son, 24 King-street, Carmarthen.

HUDDERSFIELD.—June 27th.—For the erection of a garage, store shed, retaining wall, and other works, for the corporation.—Mr. K. F. Campbell, borough engineer and surveyor.

PEMBROKE.—June 27th.—For the erection of a new class-room, for the Education Committee.—Mr. K. McAlpin, architect, Pembroke Dock.

DEVON.—June 29th.—For repairs and alterations at certain schools, for the Education Committee.—The Architect, 1 Richmond-road, Exeter.

FINSBURY.—June 29th.—For structural alterations to the town hall, for the borough council.—Borough Surveyor.

HITCHIN.—June 29th.—For sinking a well, for the rural district council.—Messrs. W. R. and W. Phillips, engineers, Luton.

CAMBRIDGE.—June 29th.—For the erection of a school, for the corporation.—Mr. E. Jenkins, education secretary, Guildhall.

HINDLEY.—June 29th.—For the erection of a school, for the urban district council.—The Surveyor.

LONDON.—June 30th.—For the construction of two storage reservoirs in the Thames Valley, together with intake works on the banks of the Thames, and certain contingent works, for the Metropolitan Water Board.—Chief Engineer, Savoy-court, London, W.C.

SEAHAM HARBOUR.—June 30th.—For the erection of forty-five houses, for the urban district council.—Mr. W. R. Robinson, assistant surveyor.

HOUGHTON-LE-SPRING.—July 1st.—For widening a bridge, for the rural district council.—Mr. D.

Balfour, engineer, 3 St. Nicholas-buildings, Newcastle-on-Tyne.

HULL.—July 1st.—For extensions to a hospital, for the corporation.—Mr. J. H. Hirst, city architect.

ABERTILLERY.—July 1st.—For alterations and extensions of a school, for the urban district council.—Mr. W. H. Hiley, architect, Chapel-street, Abertillery.

LONDON.—July 3rd.—For the erection of a temporary building, for the Metropolitan Water Board.—The Surveyor, Savoy-court, Strand, W.C.

ESSEX.—July 4th.—For alterations and additions to a school, for the Education Committee.—County Architect, 73 Duke-street, Chelmsford.

WATFORD.—July 6th.—For the erection of a pumping station, including engine-house, basement, machine shop, boiler-house, filter-house, lime store, and softening tank, for the urban district council.—Mr. D. Waterhouse, engineer, Council Offices, High-street, Watford.

MERTHYR.—July 6th.—For school extension, for the Education Committee.—Mr. R. Elias, director of education.

WARBLINGTON.—July 6th.—For the erection of a cottage, for the urban district council.—Mr. A. J. Martin, 7 Victoria-street, Westminster.

TONBRIDGE.—July 7th.—For the erection of twenty-five pairs of cottages, for the rural district council.—Mr. Frank Harris, surveyor.

WINCANTON.—July 7th.—For the construction of a reservoir, for the rural district council.—Mr. E. A. Rankin, engineer, Bourton, Dorset.

CROYDON.—July 10th.—For the erection of a school, for the Education Committee.—Education Office, Katherine-street, Croydon.

BLACKWELL.—No date.—For the construction of a urinal and a small sewage disposal filter, for the rural district council.—Mr. H. Silcock, surveyor, 67 West-gate, Mansfield.

Iron and Steel.

STOCKHOLM.—July 3rd.—For the supply of 15,800 metres of wrought-iron piping, for the Stockholm waterworks. Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, London, E.C.

BLACKBURN.—For the supply of 750 tons of 24-in. and 12-in. cast-iron pipes, for the corporation.—Mr. W. Stubbs, borough and water engineer.

Roads.

LEEDS.—June 22nd.—For paving and flagging certain streets, for the corporation.—Town Clerk.

HECKMONDWIKE.—June 22nd.—For paving work, for the urban district council.—Mr. J. Saville, surveyor and engineer.

SOUTHAMPTON.—June 22nd.—For laying about 3,000 yds. of slab paving, for the corporation.—Borough Engineer.

EGREMONT.—June 22nd.—For the supply of 350 tons of tar-macadam, for the urban district council.—The Surveyor.

SWANSEA.—June 22nd.—For the execution of private street works, for the corporation.—Mr. G. Bell, borough surveyor.

WARMLEY.—June 23rd.—For making up a road, for the rural district council.—Mr. H. M. Bennett, surveyor, 36 Corn-street, Bristol.

BOOTLE.—June 23rd.—For the supply of granite paving materials, for the corporation.—Mr. B. J. Wolfenden, borough engineer.

FAILSWORTH.—June 23rd.—For works of private street improvement, for the urban district council.—The Surveyor.

MOUNTAIN ASH.—June 23rd.—For work of road construction, for the urban district council.—Mr. W. G. Thomas, surveyor.

STRATFORD-UPON-AVON.—June 23rd.—For the supply of broken and unbroken macadam, for the corporation.—Mr. Roden Dixon, borough surveyor.

DUNMOW.—June 23rd.—For the supply of broken granite to be delivered during July and August, for the rural district council.—Mr. A. E. Floyd, clerk.

LONDON.—June 23rd.—For tar-paving works at schools, for the county council.—The Architect, 19 Charing Cross-road, W.C. (Room 74).

LEWISHAM.—June 23rd.—For making up a road, for the borough council.—The Borough Surveyor.

PONTEFRAC.—June 23rd.—For works of paving and flagging, for the corporation.—Mr. J. E. Pickard, borough engineer and surveyor.

WHEATLEY.—June 23rd.—For the execution of private street works, for the urban district council.—Mr. J. Simmonds, surveyor.

ROMFORD.—June 23rd.—For fencing and road improvement, for the urban district council.—Mr. H. T. Ridge, surveyor.

ENFIELD.—June 24th.—For the supply of Hertfordshire or other approved gravel, for the urban district council.—The Surveyor.

WOOD GREEN.—June 24th.—For private street works, for the urban district council.—The Surveyor.

ROCHDALE.—June 24th.—For making up certain roads, for the corporation.—Borough Surveyor.

CASTLEFORD. June 24th.—For repaving tramway margins with granite setts, for the urban district council.—Mr. W. Green, surveyor.

ASHFORD.—June 24th.—For the supply of broken granite and granite chippings, for the urban district council.—Mr. W. Terrill, surveyor.

DUNMOW.—June 25th.—For the supply of broken granite, for the rural district council.—Mr. A. E. Floyd, clerk.

LLANTRISANT.—June 25th.—For road widening and surface-water drainage, for the rural district council.—Mr. T. Saunders, surveyor, School-street, Pontyclun, Glam.

LARNE.—June 25th.—For the construction of a new street, for the urban district council.—Mr. W. G. Younge, clerk.

MERTON.—June 26th. For the construction of concrete flag paving, for the urban district council.—Mr. G. Jerram, engineer and surveyor.

EAST SUSSEX.—June 26th.—For the hiring of steam rollers and scarifiers, for the county council.—Mr. Fred. J. Wood, county surveyor, County Hall, Lewes.

LYMINGTON.—June 27th.—For the supply of 600 tons of granite or basalt, for the corporation.—Mr. J. Barnes, borough surveyor.

HERTFORDSHIRE.—June 27th.—For the construction of kerbing, for the county council.—Mr. U. A. Smith, county surveyor, Hatfield.

SOUTHGATE.—June 27th.—For private street works, for the urban district council.—Mr. C. G. Lawson, surveyor.

BURNLEY.—June 29th.—For making up certain streets, for the rural district council.—Mr. H. Pritchard, surveyor.

ALTOFTS.—June 29th.—For the construction of new footpaths, for the urban district council.—The Surveyor.

RHYL.—June 29th.—For the construction of tarmacadam paving, for the urban district council.—Mr. A. A. Goodall, surveyor.

WOODFORD.—June 30th. For road construction with creosoted deal blocks, for the urban district council.—Mr. W. Farrington, surveyor.

BROMLEY (Kent).—June 30th.—For paving the carriage-way in the main London road, a portion of High-street, East-street and Market-square with creosoted wood blocks, including the necessary excavation and concrete foundation, approximately 21,100 yds. super., for the corporation.—Mr. Fred H. Norman, town clerk.

HUNSLET.—June 30th.—For making up private streets, for the rural district council.—Mr. W. B. Pindar, clerk.

BASINGSTOKE.—July 1st.—For steam rolling work, for the rural district council.—Mr. R. Forrester, surveyor.

HASLEMERE.—July 2nd.—For the supply of 600 tons of 1½-in. and 2-in. broken granite, for the urban district council.—Mr. Howard V. Snook, surveyor.

HARROW.—July 4th.—For the supply of broken granite, granite chippings, tarré granite, and tarré granite chippings, for the urban district council.—The Surveyor.

SUNBURY.—July 6th.—For the supply of Guernsey granite, for the urban district council.—Mr. H. F. Coales, surveyor, Sunbury-on-Thames.

SEAFORD.—July 6th.—For the supply of 1,000 tons of granite, for the urban district council.—The Surveyor.

BROMLEY (Kent).—July 6th.—For works of private street improvement in Somerset-road, Wiltshire-road

and St. John's-road, for the rural district council.—The Surveyor, Maulden House, Sidecup-hill, Sidecup.

LOUGHTON.—July 6th.—For the supply of granite and gravel, and hire of steam roller, for the urban district council.—Mr. H. White, surveyor.

LEWISHAM.—July 7th.—For supplying and laying wood paving, for the borough council.—The Borough Surveyor.

GODSTONE.—July 4th.—For the supply of tarmacadam and bituminous materials, kerbing, channeling, tools, oils and iron goods, and hire of steam rollers, for the rural district council.—Mr. Geo. Crowter, engineer and surveyor.

Sanitary.

ELGIN.—June 20th. For relaying a sewer, for the corporation.—Borough Surveyor.

MATLOCK.—June 22nd.—For the completion of the main sewerage, consisting of main outfall and subsidiary sewers of earthenware, steel and cast-iron pipes, with manholes, ventilation and flushing tanks, for the urban district council.—Messrs. J. Diggle & Son, engineers, 14 Victoria-street, Westminster, S.W.

BASFORD.—June 22nd.—For the construction of sewerage and sewage disposal works, for the rural district council.—Mr. S. Maylan, engineer and surveyor.

ROWLEY REGIS.—June 22nd.—For the construction of a sewer, for the urban district council.—Mr. D. Wright, clerk, Council House, Old Hill.

ASHTON - IN - MAKERFIELD.—June 22nd.—For work of sewer construction, for the urban district council.—Mr. T. Burgess, surveyor.

BEDWELLTY.—June 22nd.—For the construction of 750 yds. of 9-in. sewer with manholes, for the urban district council.—Mr. Dan H. Price, surveyor.

FINCHLEY.—June 22nd.—For the construction of four clinker sewage filters at the sewage farm, for the urban district council.—Mr. C. J. Jenkin, engineer.

ROCHDALE.—June 24th.—For sewerage work, for the corporation.—Borough Surveyor.

HUDDERSFIELD.—June 24th.—For the conversion of tub-closets to water-closets, for the corporation.—Town Clerk.

WESTBURY.—June 24th.—For the construction of stoneware pipe sewers, manholes, and flush chambers, for the urban district council.—Mr. W. H. Radford, engineer, Albion Chambers, Nottingham.

SLAITHWAITE.—June 26th.—For the construction of a main sewer, for the urban district council.—The Surveyor.

LYMM.—June 27th.—For the construction of stoneware pipe sewers and manholes, for the urban district council.—Mr. W. M. Beckett, 33 Brazennose-street, Manchester.

WHITSTABLE.—June 29th.—For the supply and erection upon the sewage disposal works at Swalecliffe of a sludge pump to deliver 1,000 gallons of sewage sludge per hour, and an oil engine to drive the same, together with accessories, for the urban district council. Messrs. Strachan & Weekes, 9 Victoria-street, Westminster, S.W.

NEWPORT (Mon.).—June 29th.—For the construction of a stoneware pipe sewer, for the corporation.—Borough Engineer.

ELY.—June 29th.—For sewerage works, for the urban district council.—The Surveyor.

MANCHESTER.—June 30th.—For work of re-draining, for the corporation. Mr. W. Moss, inspector, Town Hall, West Didsbury.

READING.—June 30th.—For sewer construction, for the corporation.—Mr. J. Bowen, engineer and surveyor.

WALMER.—July 1st.—For the construction of sewers and manholes, for the urban district council.—Mr. H. W. Barker, engineer and surveyor.

BIRMINGHAM.—July 1st.—For the construction of about 1,550 yds. of brick sewers, and 2 miles of stoneware pipe sewer, together with railway and canal crossing and cast-iron and stoneware pipe drains, for the corporation.—Mr. Henry E. Stilgøe, city engineer and surveyor.

LICHFIELD.—July 9th.—For the construction of sewage purification works, filters, and manholes, also for laying approximately 1,820 yds. of 15-in., 4,860 yds. of 9-in., and 2,000 yds. of 6-in. stoneware socket pipes, and erecting ventilating columns, for the rural district council.—Mr. C. O. Rawstron, engineer.

ASHFORD.—July 9th.—For the construction of an ejection station with pneumatic ejectors and air-compressing plant, 240 yds. of 6-in. rising main, and a set of sewage purification works, for the West London District School Managers.—Mr. Arthur Martin, 7 Victoria-street, Westminster, S.W.

BARROWFORD.—July 11th.—For the construction of sewage disposal works, for the urban district council.—Mr. F. Sutcliffe, surveyor.

BRADFORD.—July 20th.—For the construction of a circular outfall sewer in tunnel, for the corporation.—Mr. J. Watson, Town Hall.

RINGWOOD.—For the construction of sewage purification works, for the rural district council.—The Surveyor.

Stores.

LEEDS.—June 22nd.—For the supply of articles, for the Gas Committee.—Mr. W. B. Leach, general manager, Gas Offices, Market Hall, Leeds.

BIRMINGHAM.—June 23rd—30th.—For the supply of general and engineering stores, for the corporation.—Mr. R. A. Chattock, city electrical engineer, 14 Dale End.

ROTHERHAM.—July 8th.—For the supply of requisites, for the Electric Light and Tramways Committee.—Engineer and Manager.

Miscellaneous.

WALTHAMSTOW.—June 24th.—For the supply of four motor tractors and motor sweeper, for the urban district council.—Mr. E. Morley, surveyor.

RHONDDA.—June 26th.—For the construction of river bridge, masonry abutments, and road making, widening of Station-street, Treherbert, masonry abutments, river wall, about 15 tons steelwork in plate and lattice girders and troughing, about 46 tons of the same, and 200 suits of workmen's oilskins, for the urban district council.—Mr. E. Taylor, acting engineer and surveyor, Pentre, Rhondda.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of Surveyor readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance. ‡ Provisionally accepted.

ALDERSHOT.—The following tenders have been accepted by the urban district council:—
Granite.—Johnston Brothers, 43s. per ton.
Tar-paving.—Read & Son, 1½ in., 17s. 8d. ½ in., 18s. 8d. and grit, 9s. 4d. per ton.
Horse Hire.—W. North, 8s. per day.
Cement.—Wiggins & Co., 33s. 7d. per ton.
Gravel.—W. Norris, 4s. 11½d. per yard, town roads; and T. Lamport & Sons, 5s. 2d. per yard main roads.
Tarmac.—Divided between Tarmac, Limited, and J. Smart & Sons, 17s. 7d. per ton.
Workmen's Tools.—Stephens & Johnson, Limited, pick handles, 8s. 6d. per dozen; scavengers' brooms, 29s. 6d.; broom handles, 1s. 3d.; gully scoops, 30s. F. Bird & Co., navy shovels, 27s. 6d.; steel shovels, 15s. 6d.; picks, 23s. 6d. per cwt.; stone hammers, 4d. lb.; salvage buckets, 17s. 6d. per dozen; trenching forks, 25s.; mud scoops, 20s. 6d.

BASFORD.—For providing and laying stoneware pipe sewers with Hassall's joints and manholes, for the rural district council.—Mr. S. Maylan, engineer and surveyor:—
Moss & Sons, Loughborough .. £1,140
T. Smart, Nottingham .. 1,093
E. Somerfield, West Bridgford, Notts .. 1,053
A. & C. Rayner, West Bridgford, Notts .. 1,041
G. Belshaw, Nottingham .. 981
J. Lewin, Netherfield, Notts .. 980
A. Sykes, West Bridgford, Notts .. 978
T. H. Harper, Carlton, Notts * .. 880

BRADFORD.—Accepted for duplicating a pipe line in the Aire Valley in connection with the Nidd aqueduct, for the corporation.—Mr. James Watson, waterworks engineer, town hall:—
Pipe-laying.—Morrison & Mason, Limited, Glasgow, £25,097.
Cast-iron Pipes.—Stanton Ironworks Company, Nottingham, £31,212.

CHUCKFIELD.—For the erection of six cottages and other buildings, for the urban district council:—
T. White, Hayward's Heath, £1,285.

DURSLEY.—For the construction of sewerage and sewage disposal works at Wotton-under-Edge, for the rural district council.—Mr. G. P. Milnes, Stroud:—
Mereweather & Sons, Bristol .. £13,195
F. Wilkins, Bristol .. 12,872
Johnson Brothers, Gloucester .. 11,113
G. Pollard & Co., Limited, Taunton .. 10,947
Childs & Withers, Willenhall .. 10,163
J. Riley, Cheltenham .. 9,961
W. J. B. Halls, Gloucester .. 9,553
A. Hill & Co., Cheltenham .. 8,817
W. Morley & Sons, Keighley .. 8,394
N. Baxter & Sons, Lansdown, Stroud * .. 8,082

HIGHAM FERRERS.—For the construction of sewage disposal works, for the corporation.—Mr. A. E. Lloyd, borough surveyor:—
Smith & Son, Raunds, Northants .. £1,765
W. G. Willmott, Rusden, Northants * .. 1,632

HORNCASTLE.—For the erection of a bridge, for the rural district council:—
C. Hensman & Son, Horncastle .. £95
G. W. Horton, Horncastle .. 68
A. Sutton, Horncastle .. 68
W. & C. Steadman, Woodhall Spa * .. 86

HOVE.—For paving and other works, for the corporation.—Mr. H. H. Scott, borough surveyor:—
J. Parsons & Sons, Hove, £295.

HOVE.—For the construction of an underground lavatory, for the corporation.—Mr. H. H. Scott, borough surveyor:—
McKellar & Westerman, Hove, £763.

HOVE.—For providing and laying wood paving, for the corporation.—Mr. H. H. Scott, borough surveyor:—
Improved Wood Pavement Company, London, £941.

HOVE.—For providing and fitting up book shelving and cupboards in the special collection room at the public library:—
McKellar & Westerman, Hove, £284.

LANCHESTER.—For constructing sewers and manholes, for the rural district council.—Mr. J. R. Lupton, surveyor:—
G. T. Storey, Cornsay, Co. Durham, £98.

NEW FOREST.—For the erection of a bridge at Culverley, for the rural district council:—
Francis, Morton & Co., London .. £465
— Spriggings, Portsmouth .. 405
F. Osman & Co., Southampton .. 373
H. Holley, Lynhurst .. 371
Brading & Son, East Cowes .. 318
J. Douglas, Southampton .. 300
Bright & Son, Bartley * .. 244
Britten & Son, Brockenhurst .. 297

RICHMOND.—Accepted for the supply of Welsh steam coal, house coal, lime for precipitation, lime for sludge pressing, sulphate of alumina, green coppers, and filter press cloth, for the Main Sewerage Board.—Mr. William Fairley, engineer, Kew Gardens:—
Steam Coal.—J. D. Firmston & Co., Putney.
House Coal.—J. D. Firmston & Co., Putney.
Buxton Lime.—Buxton Lime Firms Company, Limited.
Grey Lime.—Wiggins & Co., Hammersmith.
Sulphate of Alumina.—F. W. Berk & Co., Limited, London.
Green Coppers.—Higginbottom & Co., Manchester.
Filter Press Cloth.—J. F. Enslie & Co., Dundee.

WEST SUSSEX.—For alterations and improvements to the Shoreham council school, for the Joint Education Committee.—Mr. Haydn P. Roberts, county education architect, Worthing:—
E. H. Curd, Shoreham-by-Sea .. £573
F. Sandell & Sons, Worthing .. 560
W. A. Gates & Sons, Shoreham-by-Sea .. 551
C. G. Cheesman, Shoreham-by-Sea .. 550
W. Willett, Shoreham-by-Sea .. 544
G. Gillam, Southwick * .. 537

WEST SUSSEX.—For alterations and additions to the Midhurst Grammar School, for the Joint Education Committee.—Mr. Haydn P. Roberts, county education architect, Worthing:—
G. Luff, Midhurst .. £2,142
F. J. Privett, Haslemere .. 1,987
Reeves & Port, Rudgwick .. 1,967
H. C. Deane & Sons, Midhurst .. 1,948
G. Potter, Horsham .. 1,896
Cronley Brothers, Limited, Epsom .. 1,894
A. Burrell & Standen, Littlehampton .. 1,865
Thomas & Edge, Woolwich .. 1,863
R. Cook & Sons, Crawley .. 1,850
A. Beskett & Co., Crawley .. 1,820
H. Baker & Son, Horsham .. 1,805
Rowland Brothers, Horsham .. 1,799
J. Longley & Co., Crawley .. 1,798
Crosby & Co., Limited, Farham .. 1,779
F. Sandell & Sons, Worthing * .. 1,700

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JUNE.

- 20.—Association of Managers of Sewage Disposal Works: Visit to Mansfield.
- 20.—Institution of Municipal and County Engineers: Eastern District Meeting at Bedford.
- 24.—Institute of Sanitary Engineers: Visit to Luton sewage farm. Train from St. Pancras, 2.50 p.m.
- 24-27.—Institution of Municipal and County Engineers: Annual Meeting and Town Planning, Housing and Road Conference at Cheltenham.
- 27.—Association of Managers of Sewage Disposal Works: Visit to Brentwood.

JULY.

- 2.—Institution of Civil Engineers: Conversazione, 8.30-11.30 p.m.
- 3.—Institution of Municipal Engineers: North-Western District Meeting at Manchester.
- 4.—Association of Managers of Sewage Disposal Works: Annual Summer Meeting at Norwich.
- 4-11.—Royal Sanitary Institute: Annual Congress and Exhibition at Blackpool.
- 6-10.—Institution of Mechanical Engineers: Summer Meeting in Paris.
- 25.—Institution of Municipal and County Engineers: Eastern District Meeting at Tilbury.

SEPTEMBER.

- 19.—Institution of Municipal and County Engineers: Meeting at Cleethorpes.
- 26.—Institution of Municipal and County Engineers: Meeting at Scarborough.



**FOR DAMP WALLS,
FLOODED CELLARS,
AND FLAT ROOFS.**

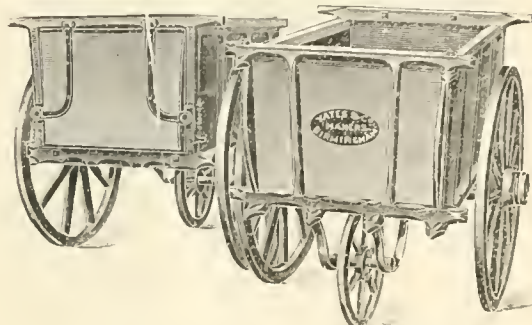
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Ann's Gate, King's Lynn.

JOHN YATES & CO. Ltd.

Aston Manor, BIRMINGHAM.

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**SUPERIOR QUALITY
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For Public Authorities
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Outputs up to 1,000 tons per day per machine.

Write for particulars, stating fully your requirements, to:—

**ELECTRO-METALS, LTD.,
UNION COURT, LONDON, E.C.**

Full particulars for Advertising
IN
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APPLY TO

Mr. C. S. MASON,
24 Bride Lane, Fleet Street, London, E.C.

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The QUALITY-WITH-ECONOMY Car.

The most successful compromise of
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upkeep ever yet achieved in Motor Car
manufacture.

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8 h.p. Model. Four Cylinder Engine 60 x 120 m.m. Three Speeds and
reverse. Hood, Screen, Hooter and 4 Wire Wheels. With 2-Seater
Body and Dickey Seat, as illustrated £237

BAYARD CARS LIMITED,

Sole Concessionaires for
A. Clement-Bayard, of Levallois, Paris,
155-7 GT. PORTLAND ST., W.

Without Dickey Seat £232
With 3-Seater 'Sport'
Body & full equipment £245
With Coupe Body ... £265



TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

THE URBAN DISTRICT COUNCIL OF HASLEMERE.**TENDERS FOR GRANITE.**

The Urban District Council of Haslemere invite Tenders for the supply and delivery of six hundred tons, more or less, of 1½-in. and 2-in. Broken Granite, to be supplied before 25th March next.

Forms of Tender may be obtained from the undersigned upon receipt of a stamped and addressed envelope.

Tenders, endorsed "Tender for Granite," must reach me not later than noon on Thursday, the 2nd July, 1914.

The Council do not bind themselves to accept the lowest or any Tender, and reserve the right to allot the Contract as they think fit.

HOWARD V. SNOOK,
Surveyor to the Council.

Council Offices,
Haslemere.

June 17, 1914.

(1,719)

(Continued on p. xxiv.)

EX-PUPILS AND JUNIOR ASSISTANTS.

ASSISTANT (22), Cert. R. San. I., A.M.I. Mun. E., desires change. Experience in Town and Rural Surveying, Levelling, Building Construction, Sewerage and Sewage Works, Waterworks, Highways, &c. Neat draughtsman; good credentials. Box 1,434, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C.

(1,711)

APPOINTMENTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

ASSISTANT. The Highway Surveyor to the Uckfield Rural District Council invites applications for a Temporary Assistant for a period of 12 months. Applicants must have had previous experience in a Surveyor's Office, be a good book-keeper, neat draughtsman, and have a knowledge of Surveying. Wages, £1 1s. per week. Applications, with testimonials, to be forwarded to the undersigned by the 25th inst.

E. W. RAY-JOHNSON,
Surveyor, Buxted, Sussex.

RUISLIP-NORTHWOOD URBAN DISTRICT COUNCIL.**CLERK OF WORKS.**

The above Council invite applications for the position of Clerk of Works to supervise the execution of Private Street Works in Kewferry-road, Northwood.

The salary offered is £3 3s. per week.

Applications, accompanied by three recent testimonials—which will not be returned—must be delivered to the undersigned not later than 12 noon on Saturday, the 4th July next.

Each application must be endorsed "Clerk of Works," and any not so endorsed will not be considered.

The applicants selected for interview will be notified not later than Wednesday, the 6th July. No intimation will be given to unsuccessful candidates.

EDMUND R. ABBOTT,
Clerk to the Council.

Council Offices,
Northwood, Middlesex.
June 16, 1914.

(1,715)

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**ROAD MANHOLES, GULLIES,
COCK CASES, VALVES.**

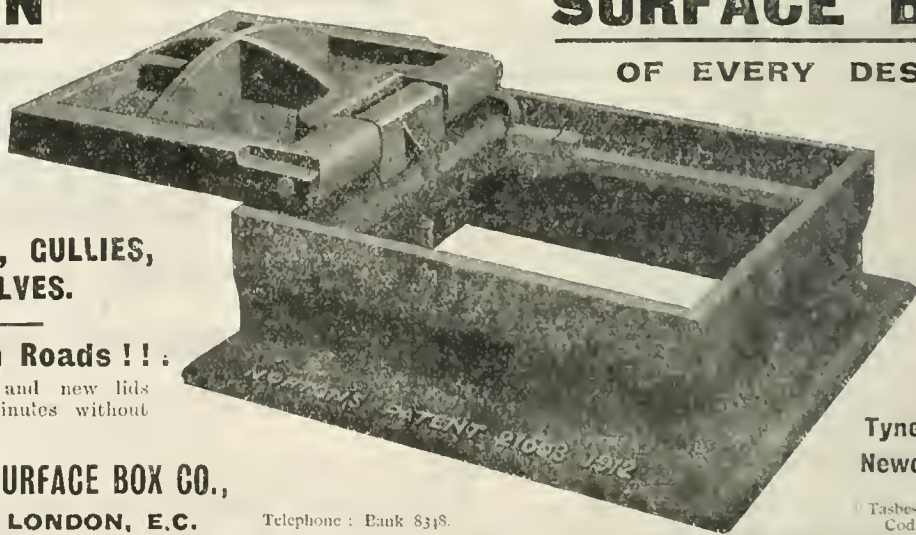
No More Broken Roads !!

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**SURFACE BOXES**

OF EVERY DESCRIPTION.

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Works—

**Tyneside Foundry,
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Cables:
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Patent WATERPROOFING and FLOORING PROCESSES

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Managers: S. THORNELY MOTT & VINES, Ltd.
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MR. J. S. PICKERING, M.INST.C.E.,

Borough Surveyor and Water Engineer, Cheltenham,

President of the Institution of Municipal and County Engineers, 1914-15.

The Surveyor

And Municipal and County Engineer.

Vol. XLV.

JUNE 26, 1914.

No. 1,171.

Minutes of Proceedings.

The Cheltenham Meeting.

By the time this issue is in the hands of our readers the forty-first annual meeting of the Institution of Municipal and County Engineers will have made good progress. The programme is an ambitious one, and it has been found necessary to extend the time of the meeting in order to provide an adequate opportunity for the discussion of the papers which are to be read. It is, of course, impossible for us to comment this week upon the individual papers, but we may offer some observations upon the annual report of the council. In the first place an increase of 126 is recorded in the membership, which now stands at the satisfactory figure of 1,709. Suggestions are made in the report for further alterations in the articles and by-laws in order to secure that a certain number of past-presidents and two associate-members shall become members of the council. These proposed alterations are not so controversial as those which have occupied the attention of the institution in the past, and their principle will probably be agreed upon. Another matter mentioned in the report is an informal interview with the President of the Local Government Board, at which the views of the institution were put forward in regard to the protection of municipal and county engineers in the execution of their duty. At the request of the board information as to cases of hardship to individual members has been forwarded from time to time, and it is to be hoped that some remedy may now be found for a long-standing grievance. The report contains references to several other matters, which show that the council have been watchful of the interests of the members in a variety of ways. Altogether the institution and the retiring president may be congratulated upon a year's very satisfactory work.

The meeting of subscribers to the Orphan Fund has been a feature of the annual meetings of the institution for many years past. On Wednesday the committee were able to report an increased revenue, and a corresponding increase in the benefits awarded to the several grantees. The addition of forty-two annual subscribers is so far satisfactory. If, however, the fund is to be

really worthy of the institution and of the profession, its income ought to be of a much more representative character. It is not so much large subscriptions that are required, although of course these are always welcome. A large number of small subscriptions, showing that the fund has a place in the affections of the general body of members, would be specially welcome to those who are responsible for its administration. The grants made by the committee during the year have benefited in varying degrees twenty-two children, while one child remains at the British Orphan Asylum until the year 1916 by reason of the purchase of a presentation in 1909. The annual expenditure is not a very large one, but the committee believe that the payments made have in all cases proved of timely assistance.

The address delivered by Mr. Pickering on assuming the office of president of the institution consisted in the main of an able *résumé* of the principal matters which ordinarily come within the scope of the duties of a municipal engineer. Some observations in regard to drainage and sewage disposal were followed by a reference to questions connected with water engineering. Dealing with the subject of the allocation of available sources of supply, Mr. Pickering pointed out the urgent need for the creation of a central authority empowered to deal with matters affecting the conservation and disposal of water supplies generally. The question is one upon which we have already expressed our opinion, and we have now only to say that we are in cordial agreement with Mr. Pickering's remarks. The new president had something to say in regard to the technical training of the highway engineer, and pointed to the difficulty of raising the standard of roads in districts where the authorities fail to recognise the necessity of this. A reference to the work of the institution and to the important subject of superannuation concluded an address which may fairly be described as a model of its kind. Mr. Pickering's many friends will cordially wish that his year of office may not only be a conspicuous success, but that it may also witness a continued development in the useful activities of the institution.

Electricity Supply.

The convention of the Incorporated Municipal Electrical Association held at Birmingham last week attained the high-water mark of success in every respect, and was fully worthy of the very energetic association by which it was organised, as well of the great city which gave it hospitality. We briefly summarised the presidential address in our last issue; three papers were also read, which afforded abundant scope for discussion. The first was written by Mr. W. A. Vignoles, chief electrical engineer, Grimsby, who dealt with the "Commercial Development of Electricity Supply in Moderated Towns" in an exceptionally thorough and inspiring manner. In addition to effective advertising the author advocated co-operation with contractors, and explained the system of hiring-out apparatus in force at Grimsby, where the electricity department maintains friendly relations with the contractors, and does no wiring work. He also emphasises the importance of a progressive policy in laying mains to reach new consumers without waiting till a remunerative demand is certain. Referring to the temporary set-back experienced by some undertakings when the highly-efficient metallic-filament lamp was introduced, he pointed out that the present prosperous condition of electric lighting undertakings was entirely founded on the tungsten lamp, thus justifying the view which we repeatedly expressed at the time, that the new lamp should be welcomed and not feared. Moreover, he said, the tungsten lamp had made it possible for electricity to compete with gas for street lighting on favourable terms. For dealing with small consumers Mr. Vignoles found the slot meter advantageous. At 1d. a unit a considerable revenue was derived from heating and cooking in Grimsby, and with the new tariff—15 per cent on the rateable value, and $\frac{1}{2}$ d. per unit—it was expected that a very large development would take place in this branch. In the second part of his paper Mr. Vignoles dealt very fully with the financial management of the undertaking, into which we have not space to follow him, but we note with approval that he strongly condemned the pernicious policy of bleeding the undertaking by annexing the profits for the relief of the rates, instead of placing the business in a sound financial position. Still another section was devoted to the cost of supply, and the whole paper was full of information useful to the manager of such an undertaking.

Mr. S. E. Fedden, chief electrical engineer and manager to the Corporation of Sheffield, discussed the subject of boiler-house plant from a technical standpoint, and described the arrangement of his new station at Neepsend, which possesses many unusual features. The third paper was by Mr. J. H. Bowden, chief electrical engineer to the Corporation of Poplar, and related to the standardisation of tariffs. The author lamented the chaotic state of opinion regarding contributions to the rates, the proper period of loans, and so forth, which resulted in the present diversity of systems of charging for electrical energy. Equal justice to every class of consumer was his ideal, and he held that future practice would tend towards the assessment of a fixed annual charge, irrespective of the purpose for which the supply was used, plus a small charge per unit for energy consumed. Eventually, he thought, by the recovery of by-products, it might become possible to dispense with the secondary charge altogether. The "Norwich" system of basing the fixed charge on the rateable value of a house he describes as most pernicious, bearing unequally upon consumers and not at all in proportion to their consumption; he preferred to take into account "the conditions of each class of supply

in each individual area upon its own merits," as affording a basis for the assessment, and discussed the question in detail. Like Mr. Vignoles, he foresaw an immense development in the demand for electric heating and cooking in the near future which must be provided for by supply managers.

Requirements for Mechanical Filters.

Mechanical filtration is a process which includes the full treatment of water as distinguished from merely passing it through a layer of sand. It includes various processes which may or may not be used according to the requirements of the case. The water consumer has but to state his requirements and obtain a water of any degree of purity, and possessing, in addition, whatever special qualities may be necessary. Waters differ not only in quality at different places, but they also differ in quality from time to time at the same place, and thus need different degrees of treatment. The requirements of one case are not necessarily those of another; for instance, absolute bacterial purity, softness, hardness, plumbo-solvency, acidity, and so forth, are matters which have special bearing upon special cases. Thus there is far more difficulty in making out a list of essential requirements in connection with a filtration plant than is generally supposed, and to prepare a list applicable generally is still more difficult.

That the effects of treatment by means of coagulants and mechanical filters have not been fully understood in the past is demonstrated by Professor Sheridan Delépine in his paper on "The Characters of Mechanically Filtered Water," read before the Institution of Water Engineers and reproduced elsewhere in these pages. In discussing the conditions of guarantee which are sometimes suggested by manufacturers of filters, or which are sometimes imposed on them, it is shown that there are certain requirements which are generally not fulfilled, which are valueless from a hygienic point of view or which cannot be realised. The author's remarks as to the differences in the deposit on the surfaces of mains caused by untreated moorland water and by treated water show that the requirement as to the removal of suspended matters is one which offers certain difficulties; for the suspended matter in the treated water is of an entirely different character to that in the raw water. Again, the percentage reduction requirement for bacteria is such that it is possible for a very pure water to be condemned, for, though an impure water will show a great percentage reduction, a very pure water may actually show an increase after treatment, such increase being quite immaterial. It is also shown that when dealing with hard water it may be convenient to indicate in terms of percentage how much the hardness shall be reduced, but in the case of a soft water, when increase of hardness has for its object the prevention of action on lead, it is clearly useless to demand a percentage increase, because such increase may yet leave the water plumbo-solvent if the water is very soft to start with. The author gives a list of essential conditions for treated water, but he certainly leaves one with the strong impression that the engineer must in the future work with the chemist in water purification and treatment more than has been the case in the past if the best and most economical results are to be obtained. It is clearly impossible to say exactly what treatment is required by any water till its character in the raw state is known and the exact purposes for which it is to be used and the conditions under which it is to be delivered are known. When these are known the chemist and the engineer may co-operate in deciding upon the exact requirements applicable to the case.

**A Dorchester
Outbreak.**

Owing to the number of cases of diphtheria which had been notified in the Borough of Dorchester during the months of September and October, 1913, the Local Government Board, after consideration of a report on the subject by the medical officer of health, and a request from certain residents that an inquiry should be made, instructed Dr. M. B. Arnold, one of their medical inspectors, to make a local investigation of the circumstances of the outbreak. The result of his inquiry, as indicated in the report on the matter which has just been issued by the board, is to show that the outbreak cannot be attributed to any glaring sanitary defect. The recommendations are therefore entirely of an administrative character, and some very pertinent remarks are made as to the possibility of a medical officer, holding other public appointments, and carrying on a large general practice, being able to devote sufficient time to the duties of his office. A proposal to join with the Rural District Council of Dorchester in the appointment of a whole-time medical officer of health was recently debated by the council and rejected. As Dr. Arnold points out, however, there can be no doubt that some association of districts in the appointment of a whole-time medical officer of health will in time be found to present the best prospect of maintaining administrative efficiency. Meanwhile, however, the debate may be taken as evidence that the council desire to continue the services of the medical officer of health as a part-time officer, and it must be admitted, first, that the duties are not such as for the town alone would require the whole time of one medical officer, and, secondly, that Dr. Day's knowledge and experience should enable him to carry out the work satisfactorily if he were in a position to give sufficient time to it. The question is one which is constantly cropping up in different places, and in our view all-round efficiency is only to be gained on the lines indicated in the report.

* * *

**Security
of Tenure.**

A scheme which has been put forward by "Official Security, Limited," for insuring officials against loss of office otherwise than for misconduct, and for providing indemnity for loss by litigation, will doubtless arouse considerable interest among municipal engineers. The council of the institution are recommending the scheme to their members, and, having regard to the peculiar liability of the conscientious engineer or surveyor coming into conflict with the private interests of individual members of his authority, there can be no doubt that the matter is worthy of the most careful consideration. It will be remembered that not long ago a proposal was on foot for forming a voluntary mutual defence fund, but the measure of support that it received was not such as to justify the promoters in proceeding with the matter. The scheme of "Official Security, Limited," is on commercial lines, and is already on a fairly broad basis, having been approved by the Tax Collectors' Associations of London, Liverpool, and Manchester, and by the Rate Collectors' and Sanitary Inspectors' Associations. The company has been formed specially by officials, and, having no share capital, all the profits will be available either for the extension of benefits or the reduction of premiums. A further attractive feature of the scheme is the intention of the management to devote any surplus profits to benevolent purposes. In the circular issued by the institution it is stated that the trustees appear to be taking every precaution to keep down the working expenses, and that, as there were no costs of promotion beyond the

actual charges for printing and registration, the company may rightly claim the hearty support of municipal officers.

* * *

**Lymington
Town Council
and
Street Watering.**

The vagaries of municipal mis-handling, in all probability having their origin in the spurious form of economy which is so dear to many councillors, would appear to have reached a climax in connection with the street watering of Lymington. The work has been let to a contractor, and, judged by the chorus of criticism at a recent meeting of the town council, the system pursued is about as primitive as it is possible to be. One councillor who undertook the office of amateur investigator found that while certain streets were flooded the main thoroughfare got no water; and in reply to a question the borough surveyor, Mr. J. Barnes, said there was no reason why only one standpipe should be made use of while a second was available. There was, no doubt, Mr. Barnes stated, that both the street watering and the scavenging were "most unsatisfactory." The why and wherefore of this were probably explained by the fact that the work of street watering was entrusted to two boys! The mayor, Alderman Shrubbs, was constrained to bear testimony to the "serious state of things that had been disclosed," and added that the "town clerk could not be too emphatic" in the letter of complaint which he was instructed to write to the contractor. In the circumstances it was not surprising to find the mayor and councillors in agreement with the suggestion that the council should take into consideration the question of doing the scavenging and street watering with their own staff. The pity of it is that the town council did not in the first instance give due consideration to this form of management and control of what should be essentially their own affair.

* * *

**A Scottish
Appointment.**

Few would be found to quarrel with the principle that long and efficient service in the office of a local authority should be rewarded by promotion when suitable opportunities occur. When, however, it is intended to adopt this course in making an appointment it is evidently to the advantage of everybody concerned that all the circumstances should be such as will obviate the least suspicion of impropriety or favouritism. Moreover, if the man on the spot is good enough, we have always held the view that he should be appointed outright and without placing him in competition with other candidates. The latter course is irritating in the extreme to those who have been put to the trouble and expense of replying to an advertisement, and inevitably leads to a suspicion that the rules of fair play and impartiality have not been followed. We are led to repeat these observations, which in substance we have often made before, because of a complaint which has reached us in regard to the appointment of road surveyor to the Highland District Committee of Perthshire. In reply to an advertisement, 101 applications for this appointment were received, and the choice of the committee ultimately fell upon a gentleman who had been acting as principal road assistant to the previous holder of the office for a period of eight years. We are not complaining of the propriety of the appointment, as we have no reason to believe that the new surveyor is not perfectly qualified to fill the post. We do say, however, that in adopting the procedure they did the committee have at least acted thoughtlessly towards the other 100 applicants.

New Workmen's Cottages for Southwold.

Some ten years ago the Southwold, Suffolk, Town Council erected sixteen cottages for the accommodation of working-class people, and last year, shortly after his appointment, Mr. James S. Hurst, the borough surveyor, was instructed to prepare a scheme for the provision of a further twelve dwellings.

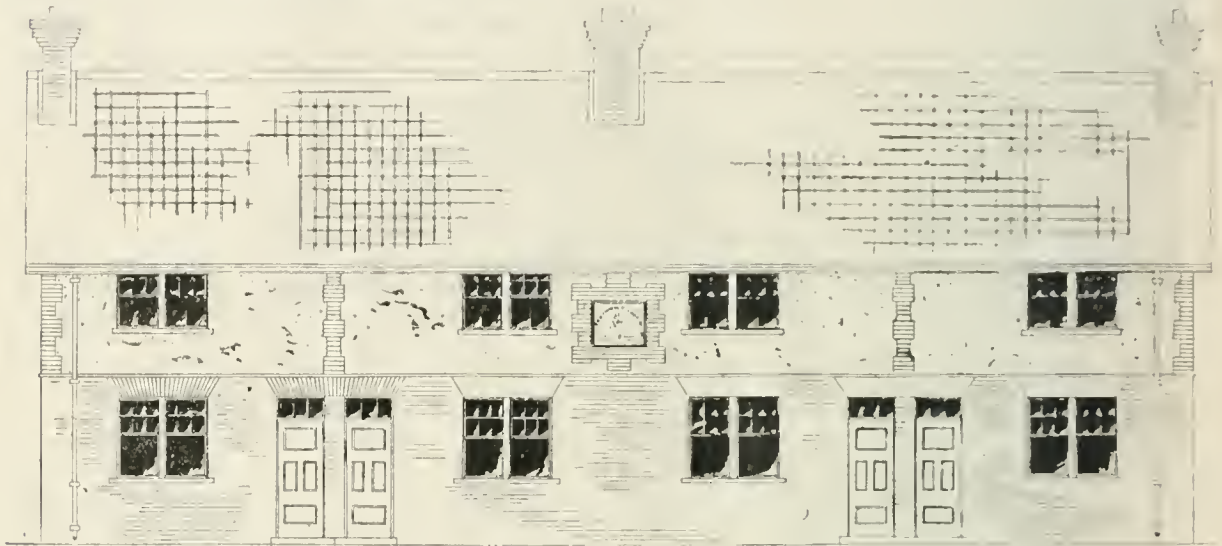
The new cottages, which are built in sets of four, have just been completed, and they were formally opened on the 8th inst.

Each cottage has a small garden in front 10 ft. deep, and at the rear there is an average length of

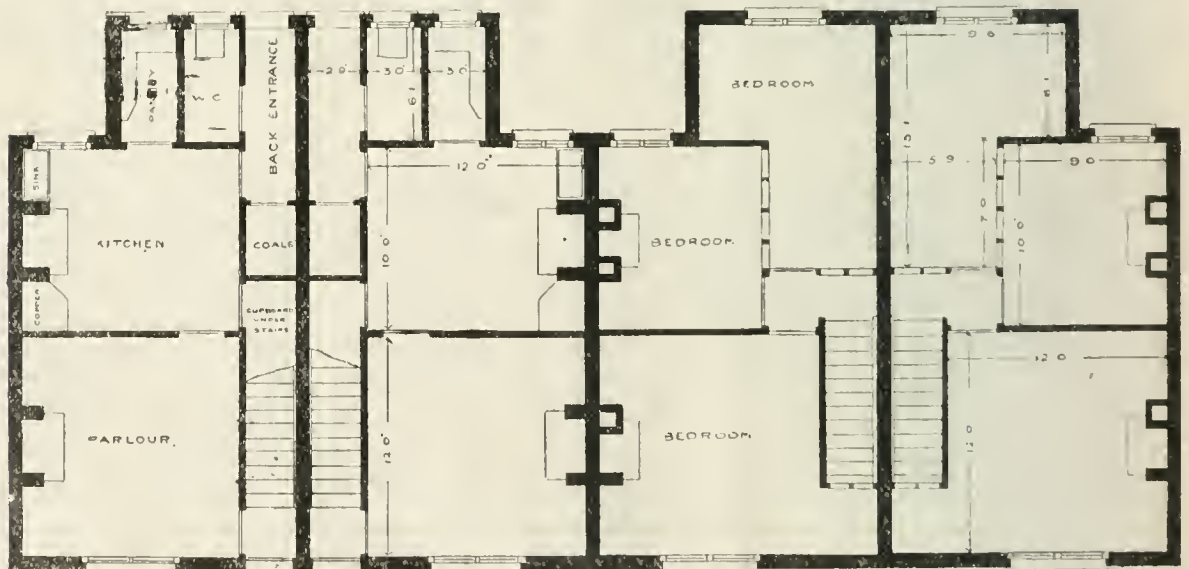
130 ft. The cottages are faced with Peterborough stock bricks. The gardens will be enclosed with ornamental chestnut fencing.

The contractor for the cottages was Mr. H. Thompson, brother of the late Alderman Thompson, the well-known housing reformer. His tender for the work was £2,155 10s., which, apart from the land, works out at an average of £179 12s. 6d. per cottage.

The cottages will be let at a rental of 4s. 6d. per week, which it is estimated will easily clear all liabilities. The cottages erected ten years ago are rented at 1s. a week, and during the time they have



Front Elevation.



Plan.

SOUTHWOLD WORKMEN'S COTTAGES.

(Mr. James S. Hurst, Borough Surveyor, Architect.)

garden of 130 ft. On the ground floor there is a parlour 12 ft. square, fitted with a tiled register stove with tiled hearth, and a kitchen 12 ft. by 10 ft., fitted with a cooking range, open and closed fire and side boiler, with a copper and sink. A commodious cupboard is arranged under the stairs, and there is also a large pantry, a coal-house, and water-closet, the out-offices all being approached under cover. The staircase leads up directly from the front door, and upstairs there are three bedrooms, 12 ft. square, 10 ft. by 9 ft. (these being fitted with fireplaces), and 13 ft. by an average of 7 ft. 6 in. The cottages are faced with local red bricks at the front to the first story, and rough-cast above, with raised brick quoins, while the roofs—slated—overhang 9 in., both at the back and the front. The backs of the houses are

been occupied they have shown a working surplus of £200. There are the usual restrictions placed on the tenants.

Fast Traffic, its Effect on Roads, and the Remedy.—

A further instalment of "Contributor's" article will appear next week.

Glasgow Municipal Buildings Extension Scheme.—

The estimated cost of this scheme is £168,228, being £137,728 for the new buildings and £30,500 for altering the existing buildings. The architects are Messrs. Watson & Salmond, F.F.R.I.B.A., 242 West George-street. The scheme was adopted by the corporation in September last, and operations are in progress for beginning the new buildings in John-street, the foundation stone of which will be laid by the King on July 7th.

Town Planning from a Lawyer's Point of View.*

By JOHN L. JACK, Town Clerk of the City and Royal Burgh of Dunfermline.

It is a trite saying that no Act of Parliament has ever yet been passed which did not contain loopholes big enough to allow of a horse and cart being driven through it by astute lawyers whose clients desired to avoid its restrictive or other provisions. Doubtless the Housing, Town Planning, &c., Act, 1909, will prove no exception to the rule, but until some town planning scheme is approved and being enforced there will be little, if any, opportunities of testing in the law courts the points of difference which must inevitably arise between responsible authorities and parties interested as to the effect of the town planning provisions of the Act. Already some of us who are engaged in preparing town planning schemes are daily having points raised, some of which might almost be termed fantastic in conception, others, however, being points of real difficulty, calling for serious attention and sometimes prolonged consideration.

The Act of 1909 is remarkable in many respects, but specially so, I think, from a lawyer's point of view, in respect of the provision therein authorising the Local Government Board to prescribe general provisions for carrying out the general objects of town planning schemes with reference to a great many matters, including the modification and adaptation of statutory enactments, and, most important of all, for supplementing the provisions of the Act of 1909 for enforcing schemes. The great latitude of that provision seems to my mind to open up a field for litigation which might well prove costly to responsible authorities, if lucrative to the lawyers; but of that more anon.

Meantime, however, let me put before you in some kind of logical sequence the points which I propose to submit for your consideration.

To begin with, therefore, let us first consider to what extent the town planning part of the Act of 1909 extended or amended the existing law. First, and most important of all, it conferred upon local authorities the right to town plan lands not only in their own area, but also in the area of other local authorities, provided always, of course, that these lands were likely to be used for building purposes.

THE RIGHT TO TOWN PLAN.

The right to town plan is one of the most valuable powers which have yet been entrusted to local authorities, and, conversely, it is one of the greatest restrictions which have been imposed upon landowners in dealing with their properties. Consequently, in the administration of the Act, its provisions must be subject to the very strictest interpretation, and any deviation therefrom, however small, in dealing with a town planning scheme might prove disastrous. I might make my meaning clearer by suggesting this to you, that if, for any reason after a town planning scheme has been completed it were to be found as the result of an appeal to the courts, that the provisions of the Act had been neglected or exceeded in any way, the whole scheme might be declared to be ineffectual. The time involved in the rectification, by the promotion of another scheme, or otherwise, during which a large area of land might be sterilised for building purposes, might entail a considerable financial loss on the local authority and landowners interested. In addition, such a situation would undoubtedly give rise to the question of whether landowners are entitled to compensation for such a delay. I incline to the view that they would be entitled to compensation where the delay is occasioned by the fault or neglect of the local authority.

One other point with regard to the right to town plan that should be borne in mind is that that right is not quite an absolute one in respect that local authorities promoting schemes are directed to endeavour by means of conferences, or otherwise, to secure the co-operation of owners, parties interested, and local authorities in the lands affected by any scheme. That obviously means that where a landowner has views with regard to the laying out of his own lands, a local authority is bound to give these every consideration.

It is my opinion that if in a town planning

* Paper read at the meeting of the Institution of Municipal and County Engineers, held at Dunfermline on June 5th and 6th.

scheme a landowner has already initiated a scheme of development, and partly carried out same, local authorities would be well advised to accept that development, if the objects of the scheme were not interfered with thereby, in preference to entering upon a lengthy controversy with the view of forcing the scheme of development differing from that proposed by the landowner in unimportant engineering details.

LANDS OUTWITH THE AREA OF LOCAL AUTHORITY PROMOTING SCHEME.

With regard to the right of a local authority to town plan lands which are outwith their own jurisdiction, it may interest you to know that in connection with the Dunfermline town planning scheme the corporation have included in that scheme an area of land immediately adjoining the city, which lies within the jurisdiction of the Dunfermline District Committee of the County Council of Fife. One peculiarity about the inclusion of this land is that in the year 1911 the Corporation of Dunfermline promoted in Parliament a Bill for the extension of the city boundary, which, *inter alia*, included this area, now included in their town planning scheme. The Bill was passed without alteration by the House of Commons, but the House of Lords' Committee struck out from the area proposed to be annexed to the city the area to which I am now referring. It is an area presently unbuilt upon, and the buildings in the city are built close up to the boundary thereof. The corporation felt that the development of this area must be made to harmonise with the lay-out of the existing city immediately adjoining, and accordingly, in promoting their town planning scheme, they asked the Local Government Board to include it therein. The proposal was opposed by the County Council of Fife, who appeared before the Local Government Board Commissioners, and stated that while they agreed that the area in question, if it were developed, should be planned in conformity with the city development, they were of opinion that it was rural in character. The Local Government Board, however, took the view of the corporation that it was land likely to be used for building purposes, and allowed its inclusion in the city scheme. Perhaps their decision was influenced to some extent by the corporation stating at the inquiry they had no objection to constituting the county authority the responsible authority for the administration of the scheme, so far as within their jurisdiction, after it had been completed. Be that as it may, I am convinced that the case I have put to you is just such a one as the Legislature had in contemplation when they gave local authorities power to include in a town planning scheme lands in the area of another authority.

Before a local authority can successfully include in a town planning scheme land in the area of another authority they must be in a position to show that it is necessary in the interests of the amenity and convenience of a scheme being prepared by them, or of their existing town, that they should have control of the development therein.

I have heard the view expressed by members of some burghal authorities that it would be well for a burgh, in anticipation of a future extension of boundaries, to ask for authority to town plan county areas in the immediate neighbourhood of the burgh. I am of opinion that any application for a town planning scheme of that nature would be foredoomed to failure. I feel sure that the Local Government Board would be inclined to resent rather than encourage anything which might look like putting them in the position of supporting one local authority against another. At the same time I do not believe that the fact that a county authority has initiated and carried through a town planning scheme for land in the immediate neighbourhood of a burgh will prevent any burghal authority from obtaining an extension of boundaries, although it may entail payment of a larger amount of compensation. The preparation of a town planning scheme does not in the slightest impair the powers of burghal authorities to apply for extension by any of the recognised methods.

I ought to say, in passing, that the County Council of Lanark are promoting a scheme for an area of land

which includes an area within the burgh of Motherwell.

LAND LIKELY TO BE USED FOR BUILDING PURPOSES.

I now come to another point which was discussed at the Local Government Board inquiry into the Dunfermline scheme *viz.*, that land proposed to be included in a scheme is likely to be used for building purposes, or is so situated with respect to land likely to be used for building purposes that it ought to be included in a scheme.

At the Dunfermline inquiry an agent for one of the landowners appeared and objected to the inclusion of certain lands within the city on the extreme eastern boundary thereof. It was urged on behalf of the landowner that this was land which would not in all likelihood be built upon for the next twenty or thirty years, or perhaps fifty years. The answer on behalf of the local authority was that the words "likely to be used for building purposes" did not necessarily mean that it was likely to be so used within the next year or two, and, further, that these very lands had only a few months previously been included by Parliament within the city, thus showing that Parliament had considered the land to be burghal in character; that if lands were burghal in character, it must necessarily follow that they were liable at any moment to be feued or leased for building purposes; and that while it might be quite true that no feuing or leasing for building purposes might take place for even fifty years, the local authority could not very well run the risk of leaving these lands out, because they would undoubtedly form a danger zone to any town planning scheme for the remainder of the city area, in respect that they would be absolutely free of all the restrictions of the town planning scheme designed for the preservation of the amenity and health of the district, and would become an attraction for the speculative builder. In this case, also, the Local Government Board took the view of the corporation, and included the lands objected to. That decision is eminently reasonable, and does not confer any hardship on the landowner. If his lands are not likely to be built upon in the near future, the mere fact of their being planned does not necessarily entail upon him any disadvantage.

Suppose that lands are presently in use for agricultural or any other purpose, there is nothing, in my view, to prevent the Local Government Board making provision in a town planning scheme that additional buildings necessary for the proper working of the farm, and which will be occupied by persons employed in connection therewith, shall be put up, even if these do not harmonise with the proposals of the scheme. Such a condition is eminently reasonable. In fact it is only fair to landowners that until actual development takes place they should be in a position to continue to erect such buildings as are necessary for the proper working of their estates. I think that if, as the result of a town planning scheme, landowners were prevented from erecting such necessary buildings as I have referred to they would undoubtedly have a good claim for compensation in respect of any loss incurred by them thereby. If, however, the landowner desires to erect new buildings for purposes other than those to which his lands are put at the time a town planning scheme is initiated, that goes to show that his lands are likely to be used for building purposes, and he is no worse off than his neighbours who are nearer the heart of the city in being compelled to have these buildings erected in conformity with the town planning scheme.

The conclusion to be drawn from what I have just said is that local authorities are not compelled to take too narrow a view of what is land likely to be used for building purposes, but are entitled to take a broad view thereof, even to the extent of including lands which may not be built upon for generations, so long as the interests of the landowner and his tenants are properly safeguarded. It is not sufficient for a landowner to show that to the best of his knowledge it is unlikely that his land shall be built upon in the near future. If, owing to its proximity to a populous centre, it is doubtful when any particular area of land might be built upon, I think local authorities should have no hesitation in including such an area in a town planning scheme.

MINERAL DEVELOPMENT.

Since the preparation of the Dunfermline town plan intimation has been made, on behalf of one of the landowners in the town planning area, that a trial lease has been granted for the working of certain

minerals which will involve the sinking of shafts within the town planning area at a place which has been laid out for housing purposes. The question has been asked, first, whether a town planning scheme would effectually prevent the working of minerals if that is desired by a proprietor after the scheme is in course of preparation or is actually in operation; and, second, what provision, if any, could be made to meet such a case as I have indicated, where it is problematical whether there are or are not minerals workable to profit within the town planning area. I am distinctly of opinion that it was never intended that the Town Planning Act should interfere with the development and recovery of valuable minerals in any estate, and if, after a town planning scheme has been in operation, minerals should be recovered in any part of the area affected by the scheme, I should say that such a discovery would be a very good and sufficient reason for the revocation of any scheme as regards the area affected, and the substitution of new provisions which, while safeguarding the amenity of existing buildings, would allow of the minerals being developed and recovered. It might be that that could only be done by sinking shafts in the immediate vicinity of houses already erected under the town planning scheme, in which case it would necessarily follow that the party desiring to work the minerals should relieve the responsible authority of any compensation which might be payable to the owners of property injuriously affected by such working.

Coming next to the case which confronts us at Dunfermline, where it is doubtful whether there are minerals workable to profit in a portion of the town planning area, and, if not, where it is desired to utilise the area affected for housing purposes, the question which has been put to me is, what can be done to meet such a situation? I have very carefully considered the matter, and have come to the conclusion that there is nothing in the Act to prevent the town planning scheme making provision to meet such a case. One way, of course, would be to delimit an area within which minerals could be wrought in the original scheme, and if, after a time, it was found that there were no minerals, or that they were not workable to profit, an application could be made for a variation of the scheme, and new provisions could be inserted for the area affected, which would enable it to be planned out for housing purposes. I am of opinion that that would be a costly and cumbersome method of dealing with the situation looking to the procedure that would require to be gone through, and the delay that would be required to be involved thereby. A better method of dealing with the situation would, in my view, be that the proprietor affected should mark off the area within which he desired to work minerals; that the town planning scheme should contain alternative provisions for the area affected, which should come into effect according as mineral development took place or not, and which should permit of houses being erected in the area affected, if no mineral development took place, or after all risk of subsidence had ceased, and the ground been restored, if mineral development did take place. I can find nothing in the Act to prohibit such a course being followed, and I think that the wide powers conferred on the Local Government Board would enable them to insert such alternative provisions in a scheme.

VARIATION OF A SCHEME.

By sec. 54, subsec. 6, of the Act, provision is made for the variation or revocation of a scheme by a subsequent scheme prepared and approved in the same way as the original scheme. Such a provision must inevitably act as a great deterrent on town planners in regard to detail planning, for I think you will agree that the intention is that, whatever appears on the town plan will be in the scheme, and will only be revocable as provided for in the Act. At the commencement of this paper I called attention to the great latitude of the powers of the Local Government Board in the way of suspending existing statutes and supplementing the provision of the Act of 1909 itself, and the point I desire to raise here is whether these powers confer on the board the right of varying the express provisions of the Town Planning Act itself. The nearest analogy is that of a Statute which authorises local authorities to prepare by-laws. It is well-settled law that such by-laws must not exceed or conflict with the powers of the Statute itself. That would lead us to the conclusion that the regulations of the Local Government Board must not conflict with the provisions of the Act of 1909, and that, consequently, no regulation which they may

make can provide for the variation of a scheme by any other method than that provided in the Act.

In the preparation of a large scheme such as the Dunfermline scheme, where development will come in a rush, and where no one can say precisely where that development will commence, detail planning over a wide area becomes absolutely necessary in order to save time and to show to intending builders the lines on which the development is intended to proceed. With development on such a large scale going on, there must arise circumstances in which it will become necessary to make alterations on the lay-out of roads shown on the plan. So far as these alterations are confined to such minor matters as the deviation laterally, to a small extent, of any road shown on the plan, I think there is no difficulty; but the trouble begins when it is desired to eliminate altogether certain of the roads shown on the town plan, and the question comes to be, can this be provided for without following out the provisions of sec. 51, subsec. (6), of the Act? The desirability, if not the actual necessity, of being able to do so must be patent to all, and while certain main features of each scheme must be unalterably fixed except by the means provided in the Act, I think it is permissible to show in a distinctive manner on the town plan detail development which may be altered or abandoned without having recourse to a subsequent scheme so long as the original scheme contained provision for safeguarding the interests of parties concerned. It may be felt that I am drawing a very fine distinction, but the provision for variation as suggested by me would become part of the scheme itself, and not a variation thereof, and everyone would have notice from the beginning that the detail planning referred to would be subject to alteration. Whether the Local Government Board will take the same view remains to be seen.

DELEGATION OF POWERS OF RESPONSIBLE AUTHORITY TO A COMMITTEE.

In framing the Dunfermline scheme I have inserted a provision authorising the responsible authority to delegate all or any of their powers to a committee with power of revocation of such delegation at any time. There is nothing in the Act permitting or forbidding such delegation, but the desirability thereof cannot be questioned. Close scrutiny will require to be taken of all plans for building in a town planning area, and it seems absurd to have to call a whole town council together every time a plan has to be passed. I am of opinion that it is quite within the powers of the Local Government Board to allow delegation to a committee.

COMPENSATION.

I should now like to deal with another point which arose in connection with the Dunfermline scheme. Under sec. 58 (2) of the Act of 1909, it is provided that no compensation shall be payable on account of any building erected on, or contract made, or other thing done, with respect to land included in a town planning scheme after the time at which the application for authority to prepare the scheme is made, or after such other time as the Local Government Board may fix for the purpose.

Some time before the Dunfermline Corporation resolved to make application for permission to prepare a town planning scheme, a building syndicate acquired an area of ground in the vicinity of Rosyth Naval Base, practically in the heart of the area proposed to be included in the town planning scheme. They lodged plans in the Dean of Guild Court for the erection of a number of three-story tenements on that area, having a density of about sixty houses per acre. This was considered by the corporation to be objectionable, but, owing to the period of two months which requires to elapse between the date of notice of intention to make an application and the actual making of the application, there was abundance of time to enable the syndicate to complete their contracts for the erection of the houses, and, in fact, to have the actual erection begun to some extent before the time at which the application for authority to prepare the scheme could be made. I advised the corporation that, according to my reading of the Act, although they had not actually made their application to the Local Government Board, there was nothing to prevent the board from fixing a date anterior to the date of making application. They accordingly authorised me to make application to the Local Government Board to fix the date of their first advertisement of intention to apply for authority to prepare a scheme as the date after which no compensation should be payable on account of any

building erected on or contract made or other thing done with respect to the land proposed to be included in the corporation's town planning scheme. I was heard by the board in support of the application. From what passed I gathered that the board were in some dubiety as to whether they were justified in fixing a date anterior to an application being made to them, and I was asked what guarantee the board had that there should be any town planning scheme put forward at all. My answer was that as a guarantee of the corporation's good faith they had already advertised their intention to apply, and that if they failed to apply within a reasonable time the board had ample power, under sec. 61 of the Act of 1909, to compel the corporation to proceed with their scheme. It was suggested that perhaps the proper course was to wait until such time as the application had been actually made to the board, who might then issue an order making the date after which no compensation would be payable retrospective as far back as the date of the first advertisement. Against that view I contended that such a course would be a distinct hardship, and was one which would be unlikely to be upheld in a court of law, in respect that any person erecting buildings within the town planning area up till the date of the application to the board were quite within their legal rights even if the buildings being erected did not harmonise with the proposed scheme, and that I held the view that the board had not the power to make an order retrospective in such circumstances, the effect of which might ultimately be to confiscate the property which was quite legally brought into existence. As a result of the application and discussion, the board issued an Order fixing the date of publication of the first notice of the corporation's intention to apply for authority to prepare a scheme as the date after which a person should not be entitled to compensation, under sec. 58, on account of any building erected on or contract made or other thing done with respect to land included in the corporation's town planning scheme conditionally upon the corporation making application to the board within a period of two months and three days after the date of publication of the notice referred to. This all goes to show that, once a local authority have resolved to proceed with a town planning scheme, they are in a position to effectually protect the amenity of the area proposed to be included therein pending the decision of the Local Government Board on their application.

It is true that there is no direct prohibition against the erection of buildings in the prescribed area, and anyone who cares to take the risk can build in that area if they choose; but I fancy there are few who are willing to take the risk if the local authority indicate that there is a likelihood of the building being disconform to the proposals of the town planning scheme then in preparation.

In Dunfermline houses have been erected within the town planning area since the town council made application to the Local Government Board, but in granting warrant for their erection the Dean of Guild Court have invariably inserted therein a notice to the effect that the proposed buildings are within the town planning area, and at the hearing in court applicants have invariably been informed of the risk which they incur if the buildings referred to should eventually turn out to be disconform to the town planning scheme.

BETTERMENT.

There is, perhaps, no provision in the Act which will give rise to greater difficulties than that which entitles the local authority to claim betterment from landowners. In Dunfermline the corporation have pursued a policy of "give and take" in this matter. There can be little doubt that where a town planning scheme makes provision for the construction of some special feature, such as a park or a main thoroughfare of some considerable width, it must naturally follow that the ground abutting thereon will become specially valuable for building purposes. Consequently, the landowner can obtain a very much greater rent or feu-duty than he would have done if this special feature were not constructed on his estate. If the local authority were themselves to undertake the construction or provision of this special feature, as has been done in some of the large cities in England, obviously they would be entitled to lodge a claim for betterment against the landowner. Against that, however, the landowner would be entitled to set off his claim for land taken for the construction of the roadway, if not to the whole extent, at least to the extent to which the roadway exceeds the width of road which must be provided under existing by-laws or statutes. In Dun-

fermine the corporation have been successful in arranging with landowners through whose estates specially wide thoroughfares are to be constructed, that, in consideration of the landowners giving off the land necessary for the construction of the roadways and contributing towards the cost thereof the expense of the construction of an ordinary statutory road, they should not lodge a claim for betterment, and that the landowner should not lodge any claim for compensation. That is a policy which will doubtless be pursued successfully in connection with most town planning schemes. But it is conceivable that cases may arise where local authorities will be compelled to make claims for betterment, and the point which I wish to make with regard thereto is one which was recently put to me—viz., that, as a result of the Finance Act of 1909, the Government valuers are in course of making valuations of all estates; that, with respect to land in the immediate vicinity of large centres, these are treated as lands which are immediately available for building purposes, and the valuations are consequently fixed at a very full price, the result of which will be that there is very little room, if any, for any claim for betterment. I, personally, know of lands at present included in a town planning scheme which are let for agricultural purposes at a rate of from £2 to £3 per acre. These very lands have been quite recently valued by the Government valuers at £20 and upwards per acre.

It will therefore be seen that, if a local authority were to construct any special feature through lands of this description, the betterment which they could recover would be bound to be of small amount, and the onus of proving it would be entirely on them. On the other hand, you have the landowner in a strong position, he being armed with no less authority than that of the Government as to the present value of his land. I mention this point in order to put before you the necessity of making inquiry as to the valuations which have recently been put upon lands, so that if any of you are anticipating substantial claims for betterment in connection with town planning schemes you may be led to inquire more carefully into them before incurring expenditure which you would hesitate to incur were it not for the expectation of being recouped to some extent by means of a claim for betterment.

WIDTH OF ROADS.

There is one other small matter which I must mention before closing this paper, and that is as to the powers of local authorities with regard to roads. It is undoubted, I think, that a local authority may plan roads of a much greater width than those which are authorised by Statute, but the cost of doing so, in so far as the road exceeds the present statutory requirements, must be borne by the local authority. Under the General Police Acts in Scotland local authorities cannot demand a road of greater width than 60 ft. between building lines, 40 ft. of which is devoted to carriageways and footpaths. This makes it necessary that buildings must at least be 10 ft. back from the inner line of the footways. If, however, a local authority desire that the buildings shall be further apart than the width prescribed by the General Acts, I am of opinion that they can secure this under the Act of 1909 without incurring any claim for compensation. In this way, under the Act of 1909, sec. 59, no compensation will be payable on account of any provisions in a town planning scheme which prescribe the space about buildings or limit the number of buildings to be erected. My view of that provision is that local authorities can, in Scotland at least, insist on a much wider space than 10 ft. being left between the inner line of the footway of an ordinary statutory road and the building line, and by this means they can secure wider streets without compensation so long as they do not demand a carriageway and footpaths of greater width than 40 ft.

In what I have written above I have endeavoured to confine myself to a few points which are likely to crop up in most town planning schemes, and I hope that the views expressed by me will give rise to some discussion, as I think everyone will agree that the valuable part of any conference is the discussion which usually follows the various papers submitted.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

THINGS ONE WOULD LIKE TO KNOW.

(Contributed.)

Has the Humphrey pump yet been installed in any pumping station near a dwelling-house or houses, and what has been the effect caused by noise or vibration? Have any figures yet been produced as to the efficiency and economy of this pump as compared with pumps of ordinary type?

Why is it that people will keep dogs in towns? Is it not an unnatural life for the dog, and is it not thoughtless selfishness that imposes such a dreary life on a pet animal? Is it not a fact that dogs are responsible for the filthy condition of some of our footpaths? And would it not have been a good plan to impose a tax of ten guineas a year on people who own dogs in any town of more than 20,000 inhabitants?

Why is it that so many private motor cars in London are allowed to belch forth black and obnoxious fumes from their exhausts? Why do not the police interfere and summon the drivers for creating this terrible nuisance? And why is it that this defect seems to be almost non-existent with commercial motors and omnibuses?

Why is it that tar-grouting succeeds in some cases and is a dismal failure in others? Is it because the materials are wrong, or too little filling is used, or the metal is not sufficiently dry? Is it not a fact that some very successful and economical roads have been constructed in this manner?

Why does it seem impossible for some inventive genius to design a simple machine for breaking up the concrete foundation in our streets? Does it not seem to be a rather crude operation to drive wedges into the material with so much expenditure of labour and with so little result comparable with the labour involved?

What is the reason that at the present time so many Eurasians and natives of India are entering for the examination of "Sanitary Science" held by the Royal Sanitary Institute in this country? Is it a fact that the Government of India are sending these men to England on the understanding that if they pass the examination the Government will pay all their expenses? Or is this a mere rumour without any foundation?

Why is it that municipal engineering is so attractive a profession? Is it because the emoluments are so large and the work so light, or is it because the "weekly wage" is secure, however small, and that men prefer to bear the ills they have rather than to fly to others that they know not of? What is the average per 1,000 of population of a surveyor's salary throughout the country?

What is the reason that so little progress has been made in the scientific and sanitary collection and temporary storage of house refuse, whereas such great strides have been made in its ultimate disposal? Is it because the question is beneath the attention of those capable of dealing with it, or is it that habit and custom have made us callous?

Has anyone in this country tried the following Belgian method of road making? A concrete is made of 10 parts, by measure, of pulverised slag, 2 parts of slaked lime, 1 part of slow-setting cement, mixed with the right proportion of water to make it "pasty." The road is excavated to the required depth and contour, and a layer of broken stone 2½ in. gauge laid thereon and rolled to a moderate amount of consolidation. The concrete is then laid on this to a depth of about 1 in., and the final coat of 1½ in. macadam laid thereon and well rolled. The concrete is thus forced both downwards and upwards into the "metal," and is said to form a good and cheap road.

What do surveyors and road experts think of Mr. Boulnois' recently published "Glossary of Road Terms," and will not a number of people entirely disagree with a number of his definitions? Is it not evident from a perusal of this glossary that in our language there are often too many terms employed to designate the same thing?

Institution of Municipal Engineers.

SOUTH-WESTERN DISTRICT MEETING AT TISBURY.

(Conclusion.)

At the recent meeting of the Institution of Municipal Engineers held at Tisbury, a paper entitled "Wiltshire Roads, Past and Present" was submitted by Mr. E. Plummer Davies, the engineer and surveyor to the Tisbury Rural District Council. The paper was reproduced in our issue of last week, with the first instalment of this report.

The CHAIRMAN, Mr. Henry C. Adams (vice-president), in moving a formal vote of thanks to Mr. Plummer Davies, said he had been wondering where all the information came from. Mr. Plummer Davies had told them there were no records kept. He (Mr. Adams) thought the records were kept in minute-books and report-books, but the trouble was that these old books were not indexed and tabulated, and they were of no practical use to anybody, because one could not find information when it was wanted. One of the rules every engineer ought to adhere to was to index and tabulate all his information, so that at a moment's notice he could find anything he wanted. The construction and maintenance of roads was becoming one of the most important branches of engineering. In the old days anything was good enough as long as it was possible to drive over a road, but now roads were wanted in a high state of perfection, and, unfortunately, money was wanted to construct them. As engineers they were always coming into contact with different classes of the public, and it was interesting to note the different ideas they had. He had a conversation with a casual acquaintance in the train, who said councils made mistakes when they advertised for a man used to making roads, and added that what they wanted was an engineer, because an engineer was capable of doing anything. He (Mr. Adams) would not like to contradict that, because engineers could do most things; but, after all, this was an age of speculation. He could make a road, but he would be sorry to set himself up as an expert in road construction. If a good road was wanted they should get a man who was a road engineer. At the present time there was enough to learn in road making to occupy an engineer the best part of a lifetime, and it was the same in every other branch of the profession. From roads they passed on to bridges. Mr. Plummer Davies was a very bold man to have erected a reinforced concrete bridge with local labour. An engineer was running a very great risk in constructing a reinforced concrete bridge with anything but labour of the highest skill. [Mr. Plummer Davies: Concrete and steel—not reinforced construction.] It was not desirable perhaps to go direct to the manufacturers and accept the lowest tender, because there was a natural tendency to cut it as fine as they could. They wanted an engineer to prepare the design, but the construction should be left in the hands of a specialising firm, so that they could rely upon a good result.

Mr. E. H. KNAPMAN (Wincanton) seconded the vote of thanks, and said they all appreciated the paper, and also Mr. Plummer Davies' remarks.

Mr. G. H. GIBSON (Radstock) said he had pleasure in supporting the motion. He had had the pleasure of meeting Mr. Plummer Davies in connection with the Sanitary Inspectors' Association, and knew that he had done excellent work for that organisation. Mr. Davies was always ready to promote the best interests of the profession. His paper on roads was of historical interest, and in adjacent counties they would be able to profit by it.

Mr. R. D. D. MASSY (Lymington), speaking as chairman of a Hampshire district council, said he appreciated an opportunity of taking part in the discussion, not being a member of the institution, although incidentally he happened to be a member of their profession. For the last forty years highways had been of great interest to him. He remembered cycling very close to the Tisbury district when travelling from Salisbury to Warminster on an old-fashioned machine many years ago, and he had been cycling more or less ever since. An old cyclist could speak with some authority about the old roads. They remembered the roads when there were no signposts and no road maps, but they found their way about for a very long time. In recent times he (Mr.

Massy) had been connected with highway work for twenty years. Of course, they could all see that a tremendous strain had lately been thrown upon the ratepayers. What was to be the final outcome of it was very hard to predict, but it might be that the time would come when the Government would have to take over the roads, especially as they were now getting an enormous amount of commercial traffic that used to be borne on railways constructed and maintained by proprietary companies. The road expenditure under the direction of the rural district council of which he was chairman, and to which Mr. Crittall was a most able surveyor, had increased during the past eleven years from something like £900 a year to over £4,000, and the latter figure was about £1,000 too little. They had done a great deal during the period named. When they took hold of the thing they had very narrow roads, a good many of them only 12 ft. wide. The first thing they did was to make an 18-ft. standard, and by gradually pushing and widening they now had all the main roads with an 18-ft. minimum surface. Another question was that of bridges. When he took hold of that, about two years after Mr. Crittall's appointment, they had thirteen streams which required bridging. To-day there were only three. They had adopted a standard of an 18-ton traction engine for these bridges, and they were built of ferro-concrete. The question whether one ought to go to an expert or not was purely one whether the person who had to make the calculations was competent to do so, and whether the council felt, as they did at Lymington, that they had an engineer able to carry out the thing in an efficient manner. He thought many districts had made mistakes in accepting the cheapest tenders for ferro-concrete bridges, because there was a tendency to cut prices. He thought it was a far better plan to make a design and ask for tenders for building a bridge to the specification, and then accept the lowest or not, according to experience.

Mr. E. H. KNAPMAN (Wincanton) asked whether the Tisbury roads were repaired under contract or under the direct maintenance system.

Mr. A. CARTER (Droxford) inquired whether separate gangs were kept for the main roads, or whether the same gangs worked on district as well as main roads. He also asked as to the mileage each man was expected to look after. He presumed that the figures given in the paper only applied to the main roads.

Mr. PLUMMER DAVIES said that, working one road with another, the district roads cost £12 10s. per mile.

Mr. A. J. REDFERN (Honiton) said he found very great difficulty in making any criticism of the paper. He was inclined to think that some of the 160 miles of district roads did not get done very often if Mr. Plummer Davies managed to spend only £12 10s. per mile. There was no doubt that Mr. Davies had brought out one very strong point, which was not sufficiently prominent in these days when people were grumbling so much about the increased cost of the roads—viz., that there had been considerable saving to owners of vehicles and horses in the way of less wear and tear due to the improvements in the roads. It was generally thought that the improvements were solely for the benefit of motorists, but, as a matter of fact, the improved roads were a benefit to all users of the highways, even down to the pedestrian, who saved his shoe leather. He agreed with Mr. Plummer Davies' remarks with reference to the use of flints. They had a lot of crying out for the use of local material, but, as Mr. Plummer Davies had stated, it was not always sound economy to use it.

The CHAIRMAN having put the vote to the meeting, when it was adopted unanimously, said he would like to know whether Mr. Davies had any trouble from unequal wear by using Mendip limestone with local flints.

Mr. PLUMMER DAVIES, in replying, said he could best answer the chairman's query by asking him to go over the roads where they were mixing flints and Mendip limestone. In this matter, as in the case of the main roads, it was an instance of the advantages of local control. The man on the spot knew the needs of the road, and the wear and tear upon it, and

knew how to differentiate between one road and another. In a district like that at Tisbury, where they had the most magnificent flocks of sheep the country possessed travelling over the roads, the roads needed a great deal of attention in order to keep the surface firm. He always made it a point to execute the repairs early in the autumn, so that the roads would settle down before the spring came. If a man was worth twopence in his business he tried to give a good account for money expended. That was the effort they made in Tisbury, and that was why they were able to get such good roads for £12 10s. a mile. There were not 10 miles out of the 160 that were not steam rolled. He could not give particulars of the material used per mile, because they gave each road the quantity it was crying for. They had been steadily improving the roads and bringing them up to a certain pitch, and if he lived there another ten years he hoped to strengthen the roads with material that had up to now been used for widening and improving their shape. As an old cyclist he was very glad that that section of the travelling community were now enjoying a far larger portion of the road surface than was formerly the case. With regard to bridge building, the chairman had referred to bridges of reinforced concrete. The bridge he (Mr. Davies) referred to was of concrete and steel, and the labour employed was skilled local labour. The council gave him a free hand, knowing that that was the only way to get good material. The bridge would bear a 30-ton strain without any difficulty. Mr. Davies went on to condemn the contract system for road making, remarking that unless the surveyor had direct control he became a nonentity. In the Tisbury district the men worked the main and district roads together under eleven road foremen. He had had as many as five steam rollers working at the same time. There had been no trouble with the workmen. The council had very readily increased their day wages 1s. per week recently, and the average roadman earned from 18s. to 22s. per week, according to the character and age of the man.

The members and visitors were hospitably entertained at lunch. Dr. Ensor, presiding, gave the toast of "The Institution of Municipal Engineers," to which Mr. Adams, Mr. W. J. Potter and Mr. B. Wyand responded, the last-named remarking that their thanks were heartily due to Mr. Plummer Davies, who had made the local arrangements for a successful meeting. The toast of "Tisbury Rural District Council" was also honoured, and Mr. E. E. Hibberd, Dr. Ensor and Mr. Plummer Davies responded.

Motor cars afterwards conveyed the party to the Tisbury waterworks reservoir and pumping station, and subsequently they were shown over Fonthill House and inspected the mansion at Little Ridge, to which additions are being made by Mr. Hugh Morrison at a cost of £60,000. The great tithe barn at Place Farm was an object of interest on the homeward journey across the charming Wiltshire Downs, and Mrs. Plummer Davies had tea in readiness prior to a hasty scramble for trains.

A Surveyor's Will.—The late Mr. John Bainbridge, surveyor and building inspector to the North Riding of Yorkshire County Education Committee, left property of a value of £4,013.

Coast Sand Dunes, Sand Spits and Sand Wastes. By Gerald O. Case. 5s. nett. London: St. Bride's Press, 24 Bride-lane, E.C.—This work is a treatise on the advantages of the proper utilisation of inblown sand, so as to turn it into a protection against coast erosion, instead of being, as too often at present, an active agent in such erosion and in the laying waste of fertile land. The author draws many of his examples from Scotland. He points out the work that has been done on the Continent in turning sand wastes into pine forests. The book gives an able and systematic treatment of its subject. *Scotsman.*

Seventeenth Century Municipal Engineers.—Mr. Roger Thornton has contributed to the *Newcastle Municipal Officer* an article entitled "The Town Surveyors of Newcastle." The first to fill the position referred to was Henry Moore, appointed in the year 1666 at a salary of £200, with a gratuity of £50. Ten years later, John Pig took up the work, acting also as county surveyor. John Pig, Mr. Thornton states, was a very eccentric person, and would never ride when going a long distance, walking being his great hobby. When tired of outside life he would live in a prison cell. He died in a pigstye a very peculiar coincidence, remarks the writer of the article.

CORRESPONDENCE.

*Sir, though I would persuade, I'll not constrain;
Each man's opinion freely is his own
Concerning anything, or anybody.*

—MANSINGER: "The Fatal Dowry," Act ii., 2.

WATER ENGINEERS AT STOCKPORT.

To the Editor of THE SURVEYOR.

SIR,—In your report of the meeting at Stockport I regret to find that the list of members elected and transferred since the last meeting contained two errors, which I must ask you to correct. The name "George F. Anderson," of the Fylde Water Board, should have been "George F. Atkinson," and the transfer of Mr. Waddington, of Grimsby, to the class of members should not have appeared. It is only fair to state that these errors were due to a secretarial oversight, and not to any failure on the part of your journal. Will you therefore kindly publish my apology to the gentlemen concerned, as well as to any of your readers who may have been misled.—Yours, &c.,

PERCY GRIFFITH.

20 Victoria-street, S.W.

June 20, 1914.

ROYAL SANITARY INSTITUTE CONGRESS AT BLACKPOOL.

Delegates to the congress of the Royal Sanitary Institute, which opens at Blackpool on Monday, July 6th, under the presidency of the Earl of Derby, have been appointed by over 200 authorities, and as the institute's membership numbers over 4,500, a large and influential meeting is expected.

A reception of the members and delegates by the Mayor of Blackpool will take place in the Hotel Metropole, and following a public luncheon the inaugural meeting of the congress will be held in the Grand Theatre.

The usual conference of engineers and surveyors, which will be presided over by Mr. John S. Brodie, the borough engineer and surveyor, is fixed for Tuesday, July 7th, while the engineering and architecture section will meet on Thursday and Friday, July 9th and 10th.

On the last-mentioned date the congress dinner will take place at the Hotel Metropole.

The Health Exhibition arranged in connection with the congress will be opened on the Saturday preceding the actual congress week.

Sheffield Street Improvements.—The Local Legislation Committee of the House of Commons, over which Mr. Middlebrook presides, on Tuesday further considered the Sheffield Corporation Bill. The committee proceeded to deal with the unopposed clauses of the Bill relating to street improvements. Mr. C. F. Wike, the city engineer and surveyor, said the proposed works would cost £163,248. The corporation expected to recoup themselves to the extent of £90,000 by the resale of land. The committee approved the street improvement clauses, but amended the clause specifying the period in which the work must be completed by reducing the time allowed for improvement. No. 1 (the widening of Waingate, Exchange-street, Furnival-road, and Blonk-street) was reduced from seven years to five years, and seven years were allowed for the other works.

The Museum of Practical Geology.—A second edition of the "Short Guide to the Museum of Practical Geology, Jermyn-street, London, S.W.," has been issued, and is obtainable at the price of 1d. The first edition of this guide was issued in 1909. In it the various departments of the museum were described by the officers directly responsible for their maintenance, but the arrangement and editing of the book were carried out by Mr. Howe, the curator. The new edition, also edited by Mr. Howe, differs from the first only in such alterations as have been necessitated by the rearrangement of some of the old exhibits and by the addition of new exhibits. Among the latter may be mentioned geological models of Ingleborough and district, and of the Thames Valley near Goring and Reading, examples of photographs taken by the Geological Survey, a collection of micas lent by Messrs. Wiggins & Sons, and some rock specimens from Cornwall.

Institution of Municipal and County Engineers.

ANNUAL MEETING AND HOUSING AND TOWN PLANNING AND ROADS CONFERENCES AT CHELTENHAM.

Mr. J. S. Pickering, who on Wednesday succeeded Mr. J. W. Cockrill, the borough engineer of Great Yarmouth, as president of the Institution of Municipal and County Engineers, is not without experience of the responsible and arduous duties attaching to such an office. It is only two years ago since his installation as president of the Institution of Water Engineers took place in the beautiful Gloucestershire town in which he is engaged as borough surveyor and water engineer, and it is no exaggeration to say that he proved himself an ideal occupant of the position. One of its keenest supporters during the long period with which he has been connected with it, and probably one of its best known and most popular members, it may be anticipated with every confidence that his year as president of the "Municipal and Counties" will be attended with unqualified success, and that the institution will continue to prosper under his able guidance. A pupil of the late Mr. J. T. Eayrs, one of his predecessors in the chair, Mr. Pickering commenced his career as assistant to the late Mr. John Anstie, of Westminster, under whom he was engaged in the general practice of a civil engineer. Subsequently he took up the position of engineer and manager of the East Warwickshire Waterworks Company, afterwards going to Nuneaton as engineer and surveyor to the local authority. He was appointed to Cheltenham eleven years ago, and has since carried out several important engineering works, including new sewage disposal works, the re-sewering of a large portion of the borough, and extensions of the water undertaking.

As is customary, meetings of the council and of subscribers to the Orphan Fund took place before the commencement of the annual meeting, which opened with a cordial welcome to the members from the Mayor of Cheltenham. The reading of the presidential address and the discussion of certain suggested alterations in the articles of association, the presentation of premiums, and other matters occupied the attention of the gathering very fully up to the adjournment for lunch. Conferences on housing and town planning and roads opened simultaneously in the afternoon under the chairmanship of the president and Mr. H. T. Wakelam, county engineer of Middlesex, respectively, and in the evening the annual dinner of the institution was held in the town hall. The conferences were resumed yesterday morning, and on adjourning the members and delegates were entertained to luncheon by the mayor, visits to a number of the municipal works of the town following in the afternoon. Appended is the list of acceptances for the meeting—some 400 in all: Sir James Lemon (Southampton), Messrs. A. E. Abbot (Stratford and Wolverton), G. Alves (Glastonbury), J. A. Angell (Beckenham), S. C. Baggott (Macclesfield), W. E. Ballard (Birmingham), W. Banks (Rochester), A. Barlow (Ripon), E. M. Bate (Frinton-on-Sea), J. E. W. Birch (East Ham), L. C. Blackburn (Bristol), W. N. Blair (St. Pancras), R. Blanchard (Cannock), H. Bottomley (Bingley), H. Percy Boulnois (Westminster), T. Bowes (Hatfield), A. G. Bradshaw (Lancaster), J. A. Brodie (Liverpool), J. S. Brodie (Blackpool), A. Bromly (Croydon), J. Bryce (Glasgow), W. Burn (Sutton-in-Ashfield), T. Burrows (Lathom), A. Burton (Stoke-on-Trent), T. Caink (Worcester), A. W. Callaway (Nails-worth), A. H. Campbell (Edinburgh), E. R. Capon (Epsom), W. L. Carr (Ruislip-Northwood), E. W. A. Carter (Gloucester), H. T. Chapman (Kent), W. A. Chapman (Lanarkshire), W. H. Clarry (Sutton Coldfield), A. H. Claypoole (Bristol), H. Clegg (Felixstowe), W. A. Clegg (Dorking), C. A. Clews (Derby), H. Cliffe (Mexborough), H. G. Coales (Market Harborough), J. W. Cockrill (Great Yarmouth), F. C. Cook (Nuneaton), H. J. Coleby (Atherstone), T. P. Collinge (Mansfield), R. Collins (Enfield), A. E. Collins (Norwich), T. Cole (consulting secretary, Westminster), A. P. I. Cotterell (Westminster), G. Cowan (Portsmouth), J. S. Crawshaw (Weybridge), R. Croome (Cromer), J. W. Croxford (Brentford), E. H. Crump (Hinckley), A. E. Currall (Solihull), H. Clegg (Felixstowe), C. F. Dawson (Barking), H. Dearden (Dewsbury), J. F. Delany (Cork), A. J. Dickinson (Redditch), R. Dixon (Stratford-on-Avon), J. R. Dixon (Woolwich), J. H. Drew (Wath-upon-Deane), W. Dryack (Aberdeen),

Sholto Douglas (Kenilworth), N. F. Dennis (West Hartlepool), G. Eaton-Shore (Crewe), J. Edey (St. Neots), D. Edwards (Taunton), W. H. Elce (Bacup), E. J. Elford (Southend-on-Sea), J. England (Wrexham), T. E. Fellows (Willenhall), J. R. Findlay (Leith), M. E. W. FitzGerald (Warmley), R. Fletcher (Broms-grove), W. Fowlds (Keighley), T. P. Frank (Newark-on-Trent), J. Gammage (Dudley), C. F. Gettings (Worcester), H. A. Giles (assistant secretary, Westminster), C. A. Gill (Peterborough), W. J. Goodwin (Salisbury), A. T. Gooseman (Wigan), F. T. Grant (Gravesend), A. D. Greatorex (West Bromwich), G. Green (Wolver-hampton), J. S. Green (Haslingden), W. Gregory (Royston), W. H. Grieves (Sutton, Surrey), H. F. Gullan (Belfast), R. G. Gurney (Ledbury), W. J. Had-field (Sheffield), C. Hall (Droylsden), H. L. Hall (Bat-ley), C. L. Hamby (Beccles), H. Hamer (Accrington), C. C. Hancock (Warminster), H. W. Harding (Bristol), J. E. Hargreaves (Farnborough), J. L. Harpur (Brierley Hill), W. Harpur (Cardiff), F. Harris (Tunbridge Wells), P. T. Harrison (Chelmsford), E. Y. Harrison (Wellingborough), G. A. Hart (Leeds), G. B. Hartree (Alton), H. S. Harvey (Evesham), T. W. A. Hayward (Battersea), S. S. Haywood (Brighouse), J. A. Heap (Todmorden), F. Hewitt (Kiveton Park), E. Holloway (Evesham), H. Holmes (Ossett), R. L. Honey (Chatham), E. P. Hooley (Notts), A. Hosken (Smeth-wick), W. Howard-Smith (Westminster), H. H. Howell (Bristol), J. C. Hunt (Bristol), S. Hutton (Exmouth), R. H. Jeffes (Malden), D. M. Jenkins (Neath), R. J. Jenkins (Portsmouth), J. Johnson (Rawtenstall), F. E. Jones (Tyldesley), F. W. Jones (Frome), W. Jones, J. Julian (Cambridge), A. M. Ker (Warrington), W. H. G. Kieser (Bristol), P. G. Killick (Finsbury), F. O. Kirby (Doncaster), G. W. Lacey (Oswestry), F. W. Lacey (Bournemouth), W. T. Lancashire (Leeds), C. H. Lawton (Warminster), M. Lea (Karachi, India), H. W. Longdin (Penge), G. T. Lynam (Burton-on-Trent), C. Lund (Cleckheaton), G. W. Manning (Staines), C. W. Marks (Wokingham), E. B. Martin (Rotherham), F. Massie (Wakefield), E. G. Mawbey (Leicester), W. H. Maxwell (Tunbridge Wells), L. S. McKenzie (Bristol), J. C. Midgley (Newcastle-on-Tyne), J. Moncur (Stafford), J. H. Montgomery (Llanely), S. H. Morgan (Prestwich), P. Morris (Doncaster), A. Murray-Smith (Cheltenham), T. Nisbet (Glasgow), J. B. Nuttall (Heywood), R. Oakden (Newark), P. H. Palmer (Hastings), F. Parr (Bridgwater), J. Paton (Plymouth), F. W. Pearce (Twickenham), G. A. Phillips (Cardiff), F. R. Phipps (Basingstoke), T. S. Picton (Eccles), W. Plant (Stafford), S. S. Platt (Rochdale), D. H. Price (Bedwelty), W. H. Price (Leeds), A. J. Price (Lytham), W. B. Purser (Grantham), J. J. Quirk (Bryn-mawr), A. Race (Barrow-in-Furness), W. S. Raine (Hunger-ford), W. Ransom, (Worcester), R. Read (Gloucester), J. L. Redfern (Gillingham), W. Ridler (Tewkesbury), C. E. Rivers (Harrogate), J. W. D. Robinson (secretary, Westminster), O. C. Robson (Willesden), L. Rose-veare (South Shields), A. Rothera (Liversedge), T. J. Rushbrooke (High Wycombe), F. R. Ryman (Stam-ford), Norman Scorgie (Hackney), J. A. Settle (Bury), H. Shaw (Ilford), G. J. Shepherd (Kidder-minster), T. H. Shipton (Oldbury), Edward S. Sinnott (Gloucester), J. F. Smillie (Tynemouth), J. Walker Smith (Edinburgh), J. P. Spencer (North Shields), W. J. Steele (Newcastle-on-Tyne), A. Steven-son (Ayr), E. A. Stickland (Windsor), H. E. Stilgoe (Birmingham), W. Strickland (Ramsbury), J. Sutcliffe (Deptford), D. S. Sutherland (Southgate), M. H. Sykes (Coventry), E. J. Silcock (Westminster), R. J. Thomas (Bucks), W. Thompson (Burton-on-Trent), G. W. Thompson (Hipperholme), J. Thomson (Dundee), H. Tillstone (Brighton), W. H. Travers (Wallasey), H. Tremelling (Newport, Mon.), S. G. Turner (London), E. W. Turner (Sheffield), F. C. Uren (Aldershot), C. Vawser (Hatfield), T. Waddingham (Hebden Bridge), J. P. Wakeford (Wakefield), H. T. Wakelam (West-minster), A. H. Walker (Loughborough), A. W. Ward (Stockport), J. Ward (Derby), G. W. Warr (Southwick), P. A. Watford (Newark-on-Trent), J. D. Watson (Birm-ingham), E. T. Watts (Bishops Cleeve), T. N. W. Watts (Marlow), H. G. Whyatt (Great Grimby), J. A. Webb (Great Stanmore), F. Weeber (Horncastle), W. Welburn (Middleton), C. F. Wike (Sheffield), F. Wil-kinson (Prestatyn), J. E. Willcox (Birmingham), E.

Willis (Chiswick), H. B. Williams (Workington), O. E. Winter (Hampstead), R. H. Winterbottom (Irlam), F. Wilson (Bristol), B. J. Wolfenden (Bootle), W. S. Woodcock (Oakham), F. Woodward (Stourbridge), E. Worrall (Old Trafford), J. A. Wright (Bristol), T. H. Yabbicom (Bristol), F. S. Yates (Waterloo) and J. Young (Ayr), members, associate-members and students; T. Adams (Local Government Board), Prof. Adshad, H. R. Aldridge, Councillor W. Allon, H. N. Alves, L. P. Appleton, Councillor Ashworth, Alderman Bainbridge, J. H. Barlow, E. J. Beddington, H. C. Bell, C. J. A. Benyon, F. H. Berryman, E. Betham, Dr. Bibby, Councillor J. Booth, J. Bowen, Dr. J. Buchanan, Buish, Councillor Berry, Alderman J. Bester, Conke, Alderman W. Caldicutt, Councillor Cartwright, F. Child, J. Cole, W. E. Collier, Councillor H. W. Cooper, H. Craske, F. H. Crawford, E. T. Culpin, H. M. Ll. Davies, R. Davison, G. S. Doncaster, Councillor H. A. Dowsett, E. Eays, Councillor Eaton, Councillor W. L. Edwards, Councillor A. Frith, Councillor Fielding, A. J. Gainsforth, Councillor J. W. Garland, W. Garner, G. F. Garter, J. Gourlay, D. Graham, W. H. Grant, Alderman T. Greenwood, T. S. Griffin, A. F. Haines, C. W. Hall, Alderman Hardy, G. Harris, Councillor T. Harrison, G. Henson, A. R. V. Hickley, L. M. Hill, J. V. Hodgson, Councillor Hudson, G. Hughes, R. R. Humphrey, Councillor W. Hutchinson, Alderman G. Jackson, J. W. Jackson, Councillor L. M. Jacobs, Alderman Jenkinson, F. A. Jenkins, P. Johns, E. W. Jones, T. J. Jones, F. W. Kellway, O. J. Kirby, Councillor W. Latham, D. Lamb, Councillor C. Lawley, J. Leigh (Chiswick), E. R. Lightwood, S. Liley, Alderman Lloyd, T. A. Lloyd, Councillor J. Longmore, G. Madge, J. M. Martin, Councillor J. Malton, Councillor Martin, G. F. B. Maxengarb, G. Melvin, H. M. Miller, E. H. Morgan, Alderman Mullins, Alderman Marlor, Mawson, R. A. Reay Nadin, B. Nation, H. F. Nichols, Alderman Northfield, J. S. Nowill, T. Overbury, W. Pardon-Howse, A. A. Pattison, H. D. Pearsall, Councillor E. Pennington, T. Picken, Alderman Pinkham, Alderman C. P. Plant, F. E. H. Powell, J. G. Powell, Pratley, J. J. Quaid, A. J. Redfern, W. E. Riche, Alderman W. Roberts, T. F. Ryan, Councillor G. Smith, E. J. Stead, Stewart, J. E. Swindlehurst, T. Lee Syms, D. J. P. Thomson, Alderman W. Tougher, Councillor Turner, T. Turnbull, W. Vincent, P. H. Wakefield, J. Ward, H. M. Webb, S. Williams, Alderman R. Wilson, J. R. Wilson, F. Wood, Councillor J. Wood, T. Woodcock, Woodward, E. Wooldridge, and Councillor A. P. Young, visitors. The following ladies were also present: Mrs. Alves, Mrs. Bate, Mrs. Cockrill, Mrs. Cole, Miss Cole, Mrs. F. C. Cook, Mrs. Child, Mrs. Gettings, Mrs. Hall, Mrs. Hayward, Mrs. Montgomery, Miss Mountford, Mrs. Picton, Mrs. Ridler, Miss Ridler, Mrs. Tillstone, Miss Tillstone, Mrs. Tremelling and Mrs. Walker.

At the opening proceedings Mr. J. W. Cockrill, the retiring president, occupied the chair, supported by Mr. J. S. Pickering, the president-elect.

The MAYOR (Alderman W. Nash Skillicorne), in his speech of welcome, observed that Cheltenham was noted as the garden town of England, and he thought they would say the place had not been misnamed. They were there on important business. The times moved very rapidly, and it was the duty of engineers to keep up with the times. At the present moment there were many improvements of great importance requiring attention. For instance, there was road making, which required all the brains of engineers to keep the roads up to the high standard required by fast motor traffic. Then they had the great question of town planning. He thought that Cheltenham could claim that the town had been laid out on modern lines. He did not say that those who had laid out the town had made much out of it, because even in those times when labour was cheap it was very difficult to make estates pay. They ought to be grateful to the people who had laid out Cheltenham, and at the present time they were reaping the benefit. As they walked round the town they would see how it had been kept up to date in every way, thanks to the engineers of the present and the past. Referring to Mr. Pickering, he was glad that they were honouring him that day by making him president of the institution. It was felt in Cheltenham that he deserved it, for Mr. Pickering was one of the best engineers they had had, and whatever he did he did well. He would also like to bear testimony to the work of Mr. Sinnott, the county surveyor of Gloucestershire, who was a man of great ability. He had great pleasure in welcoming the institution.

The PRESIDENT thanked the mayor for the very hearty reception which he had given to the members of the institution. Cheltenham had been a great draw, for they had the largest and best town planning exhibition which had ever been held. They had also the largest meeting in the history of the institution, upwards of 400 members and delegates having signified their intention of being present.

Mr. T. COLE read the minutes of the annual meeting at Great Yarmouth, which, on the motion of the president, seconded by Mr. J. S. Brodie (Blackpool), were adopted.

THE RETIREMENT OF MR. COLE: APPRECIATION OF HIS SERVICES.

The PRESIDENT said he could not allow the occasion to pass without calling attention to the fact that Mr. Cole, their secretary for so many years, had retired. He had to move "that the members do place on record their high and grateful appreciation of the useful and striking services rendered by Mr. Cole during his term of office as secretary of the institution, covering the period of thirty-two years; and while regretting his retirement from office it is earnestly hoped that the future may have in store for him every happiness and prosperity." He had known Mr. Cole practically during the whole period of his secretaryship, and he had always found him what a secretary of an institution such as this should be. (Cheers.) He had great pleasure in moving the resolution.

Sir JAMES LEMON (Southampton) said he had much pleasure in seconding the resolution. He with others was responsible for the appointment of their friend Mr. Cole. He did not remember whether he proposed him or not, but what he did know was that he had looked upon his career with pleasure. No institution ever had a better secretary than Mr. Cole. The least they could do was to pass the resolution of appreciation of his long and eminent services.

Mr. H. PERCY BOULNOIS (Westminster) said he had the greatest pleasure in adding his testimony to the worth of Mr. Cole. It seemed to him a very short thirty-two years he had been in office, but time passed quickly. He could remember when he was president—he was fortunate enough to hold the position for two years—Mr. Cole was invaluable to him. What he should have done without him he could not say. Mr. Cole's popularity was wonderful. Whence arose this popularity? In Mr. Cole's case it had been his urbanity, his courtesy, his love of his work, and his love of the institution. It was no use painting the lily or adorning the rose. He had been an ideal secretary, and he felt he was parting with a link with the past in the retirement of Mr. Cole.

Mr. E. G. MAWNEY (Leicester) said they all appreciated Mr. Cole's real good-heartedness and his geniality. These qualities had a good deal to do with Mr. Cole's popularity, and the success of the institution. They did know this, that the institution had grown and prospered as probably no other institution had done. He, like Mr. Boulnois, when president experienced the splendid help and guidance which Mr. Cole had extended to all the presidents.

Mr. G. W. LACEY (Oswestry) as a representative of the rank and file of the institution, said every word which had been spoken by past-presidents could be substantiated by those he claimed to represent. He had known Mr. Cole for 22 years, and one could not help but be struck by his courtesy and kindness to every member of the institution. One always venerated his memory because he had become venerable in his long service to the institution.

Mr. W. HARPUR (Cardiff) said he would like to add his meed of praise of Mr. Cole. He would not like the occasion to pass without saying how much he appreciated Mr. Cole's services to the institution. He had been the backbone to the institution, and his services had been invaluable as he hoped they would continue to be invaluable for many years to come. The fact that the institution had reached its present status was largely owing to Mr. Cole. Without a secretary such as Mr. Cole they would not have attained to the position they had.

Mr. J. A. BRODIE (Liverpool) said he had not known Mr. Cole as long as the older members of the institution, but he had conceived a very great liking for him. He had looked upon him as a friend, a wise counsellor, and one to whom the younger members of the institution could go at any time for wise advice and help. He thought possibly he was young himself once. Young men were all very anxious to push on full speed ahead. He thought if they looked back on the work which Mr. Cole had done in push-

ing along the institution from very small beginnings to its present position, even the young fellows must admit that he had done his duty on splendid lines. He thought he had been an exceedingly wise secretary to the institution, and his knowledge of Government ways and departments had been of very great advantage to them. He would like while on his feet to welcome the new secretary. He could assure him there was plenty of need for hard work. From what he had seen of him he was likely to do well for the institution, and if he did as well relatively for the institution as Mr. Cole had done, then at the end of his period of service he would be worthy of a very hearty vote of thanks, and possibly a good deal more.

Mr. T. W. A. HAYWARD (Battersea) said he would like to add his word of appreciation. They had all come to love their secretary, and that was saying a good deal. They had looked upon him as a friend, and had never been treated as a servant of the institution. They were not losing him; Mr. Cole was remaining with them as their consulting secretary. He would always be at their meetings, giving them the advice he had given in the past; but they did feel that as years were passing he deserved to have a little more rest and be relieved of responsibility. He was glad to say that the new secretary and the old secretary were working amicably together, like father and son. Personally he would like to thank Mr. Cole for his kindness to him.

The vote of thanks having been passed by acclamation.

Mr. T. COLE, in reply, said: Mr. President and gentlemen, please forgive me, because I feel I can hardly get words out; but I should like to express my thanks, my very grateful thanks, for all that has been said to-day, and for as much of it as I am entitled to I thank you from the bottom of my heart. I have seen this institution grow from small things. In 1881, when I was appointed, there were 180 members; now there are 1,720. In that time I have seen no fewer than thirty-four presidents. Those presidents were some of the finest men that had ever lived in this country. Many of them have gone from us, and it is difficult to mention names. Angell, Morant, Laws and Till have enriched and ennobled the traditions of this institution. (Hear, hear.) For that alone I am very proud of my connection with the institution. I am not going to detain you now. There are lots of things that crowd into my mind with regard to many of the occurrences that have passed in my history; but I can only say that I have given my best life's work to the institution, and on the other hand, I gratefully acknowledge that the institution has done all it possibly could for me. I am therefore very grateful that the institution I have so much loved has in its goodness elected me as consulting secretary, and therefore I shall be with you as long as I live. Gentlemen, I thank you very much. It has been such a pleasure to me to listen to the words of past presidents—men with whom I have served—and it is music to me to hear that my work has been appreciated.

ALTERATIONS IN ARTICLES OF ASSOCIATION.

The business was then suspended for the holding of a special general meeting for the purpose of considering and, if approved of, adopting alterations in the articles of association.

Mr. H. GILBERT WHYATT (Grimsby) pointed out that Article 27 stated that the council shall consist of members only, and Article 14 was to be altered so that the council shall consist of twelve names, of which two shall be those of associate-members. He should like to know which the council intended; one or the other must be wrong.

The PRESIDENT replied that the technical meaning of the word member included members, associate-members, and students also.

Mr. WHYATT presumed that he would have to take the president's definition of the meaning.

The PRESIDENT: At the council meetings it has been generally assumed to be so.

Mr. WHYATT was willing to accept the president's ruling, but when they provided for nominations they had differentiated between the two classes. He was not going to fight the question, though he maintained that it was contradictory. The only other point was the pulling in of the ex-presidents ex-officio as members of the council. The first meeting he attended was at Leicester, in 1901, and it had been the custom up to then for the ex-presidents to be members of the council. That was rescinded from 1901. It seemed that the members who came on the council then were the men who wanted to have the ex-presidents on

again. He was not going to oppose it, but called attention to it to show that the pendulum swung both ways, and in another thirteen years they would be wanting the ex-presidents off again.

Mr. E. WILLIS (Chiswick) pointed out that by not altering the rule they would be preventing the younger men going forward.

The articles as proposed were agreed to by 60 votes to 3.

The proceedings of the annual general meeting were then resumed.

The annual report of the council was presented.

ANNUAL REPORT OF COUNCIL.

The council have pleasure in presenting the forty-first annual report recording the work of the year 1913-1914.

THE NEW COUNCIL.

The scrutineers, having examined the ballot lists, report the following members elected as the council for the year 1914-1915:—

President—J. S. Pickering.

Vice-Presidents—T. W. A. Hayward, H. T. Wakelam, P. H. Palmer.

Ordinary Members of Council—J. Patten Barber, W. Nisbet Blair, John A. Brodie, J. S. Brodie, G. F. Carter, A. E. Collins, W. Harpur, W. T. Lancashire, H. E. Stilgoe and C. F. Wike.

Past-Presidents (ex-officio Members of Council)—A. D. Greatorex, R. J. Thomas and J. W. Cockrill.

General Hon. Secretary—Vacant.

Hon. Treasurer—Sir James Lemon.

Serving upon the council, in addition to the above, are the district vice-presidents and the district representatives reported by the scrutineers as having been elected for the year 1914-1915:—

DISTRICT OFFICERS.

Vice-President for Scotland—A. Stevenson.

Vice-President for Ireland—W. E. L. Duffin.

DISTRICT REPRESENTATIVES.

Scottish District—T. Nisbet.

Irish District—R. H. Dorman.

North-Eastern District—E. B. Martin and F. Massie.

North-Western District—C. Brownridge and W. Stubbs.

Eastern District—E. J. Elford and W. H. Prescott.

Metropolitan District—N. Scorgie and O. E. Winter.

South-Western District—T. Moulding.

West-Midland District—F. C. Cook.

Southern District—L. S. McKenzie.

East-Midland District—E. P. Hooley.

South-Eastern District—Frank Harris.

North Wales District—W. Jones.

South Wales District—G. A. Phillips.

ABBREVIATION OF TITLE.

The council draw attention to By-law 22: "The following, and no other, abbreviations may be used to denote connection with the institution: Hon. Mem. Inst. M. & Cy. E., M. Inst. M. & Cy. E., A. M. Inst. M. & Cy. E., Stud. Inst. M. & Cy. E." As this by-law forms an agreement entered into by the council on behalf of the institution, the council trust that members will assist them by using the exact form of abbreviation as shown.

[A record is here given of the various institution and district meetings—eight of the former and twenty-two of the latter—held during the year.]

THE ROLL OF THE INSTITUTION.

During the financial year ending April 30th last, 169 new members, consisting of sixty-six ordinary members, fifty-three associate-members, forty-eight students and two affiliated members, have been elected. Twelve members, one associate-member and one student have resigned. Ten members, five associate-members, and four affiliated members have been written off. Four members and one associate-member have rejoined.

The council record with regret the deaths of R. S. Anderson, T. T. Bains, H. F. Bull, W. F. Curry, C. T. Garratt, A. Hale, R. Hara, G. W. Hewes, C. Jones, W. J. Jones, E. Rushton, J. P. Wilkinson and P. R. A. Willoughby (members), and R. Kerr (associate-member).

The roll now stands: Hon. members, 13; members, 1,197; associate-members, 332; students, 112; affiliated members, 55; total, 1,709 [a nett increase of 126 for the year].

Four students have been transferred to the class of associate-member, and ten associate-members to the class of member.

THE FINANCES.

The accounts which accompany this report for the financial year ending April 30, 1914, have been duly audited by the official auditors, Messrs. Wood, Drew & Co. It will be seen from the figures that the institution is in a satisfactory financial position. The only item showing a substantial increase on the year ending April, 1913, is printing, lithography and stationery, which is due to the inclusion of the cost of the conference volume, and extra expenses incurred owing to the increased activity of the district committees. It is satisfactory to note that, in spite of the increased membership and the increased activity in various directions, the figure is practically the same as the year ending April, 1912.

In addition to the cost of printing the "Proceedings" during the year, the cost of printing the *Journal* which replaces them has had to be met, which may be regarded as printing a double set of "Proceedings" in one year. This introduces the abnormal item of £500 for the cost of the *Journal*, and it is very satisfactory to see that this item has been to a large extent met by the amount of £326 6s. 7d., which would have remained as a surplus if only one set of printing had been paid for. It should also be stated that the sum of £500 represents the approximate cost of the *Journal* up to April 30th. As the *Journal* year finishes with the last number of Vol. 40, the accounts will be made up so as to include the whole of Vol. 40, and will then be audited and presented to the members. The auditors report that the total cost for Vol. 40, including the premiums (£93 9s.), will, in all probability, be within £700.

The appeal issued by the council last year for prompt payment of members' subscriptions has met with a ready response, as is shown by the large decrease in the amount of arrears reported. It is hoped that members will continue to assist in producing this satisfactory result.

THE "JOURNAL."

Fifteen numbers of the *Journal* will have been issued before the members assemble for the annual meeting, comprising 850 to 900 pages, or 34,000 sq. in. of matter, as against 16,000 sq. in. in Vol. xxxix. In addition, the increase in the membership roll has caused a corresponding increase in the number of copies printed and in the cost of postage.

The council are therefore glad to be able to report that, in spite of the large increase in gross cost, it appears from the figures available for Nos. 1-9 that the nett cost of the *Journal*—Vol. xl., Nos. 1-15 may be estimated as follows:—

Cost of printing, binding cases, postage, &c.	£1,110		
Less revenue	600		
Nett cost of printing, &c.	£510	0	0
Premiums	93	9	0
Contingencies	96	11	0
Total nett cost	£700	0	0

It is therefore evident that, although the amount of matter published has been doubled, and despite the normal additional cost due to the increase in membership, the publication of the "Proceedings" in *Journal* form will for the first year cost practically the same amount as Vol. xxxix., while in the future it is anticipated that it will be less.

Out of the sum of £700, £93 9s. will be returned as premiums to members. This fact should not be lost sight of.

It is also evident from a scrutiny of the accounts that a deficit of £173 13s. 5d. has arisen during the year owing to the publication of two volumes (xxxix. and xl.) of the "Proceedings" during the year instead of one. In this connection it must not be forgotten that there have also been (1) the publication of the special conference volume, (2) the publication of the index relating to "Proceedings," vols. xxxi. to xxxvii., and (3) the increased printing connected with district meetings.

The council, in submitting the above report, desire to add that they have the greatest confidence in stating that, in their opinion, a substantial balance will appear in the annual statements of accounts of future years in favour of the institution owing to the publication of the *Journal*.

ALTERATIONS IN ARTICLES AND BY-LAWS.

The council have from time to time given careful attention to the situation arising by reason of past-presidents being returned as ordinary members of

council to the exclusion of other members of the institution, and have resolved to place before the members suggestions for the alteration of the articles and by-laws to provide for past-presidents becoming ex-officio members of the council.

The council have given attention to the desirability of alterations in the articles and by-laws in respect of the provision for the election of two associate members as ordinary members of council, and proposals for the amendment of the articles and by-laws accordingly have been drafted.

The provisions of the articles and by-laws have been amended to provide that the institution *Journal* shall not be sent to members whose subscriptions shall remain unpaid six months after the same becoming due.

Owing to the inconvenience arising from the nomination for election of members who are unwilling to take office, the by-laws are being altered to provide that the consent of members should be required to accompany such nominations.

Attention has also been given to a suggestion for the division of Africa into two districts, and the secretary has been instructed to make further inquiries and to report.

The council are giving attention to a proposal for the formation of a Canadian District of the Institution.

TESTAMUR.

It is satisfactory to note that of those who have gained the testamur, the greater majority have joined the institution.

The application form to be filled by candidates for permission to sit for examination has been amended by a clause requiring the candidate to state his intention of joining the institution if successful.

The council have received further suggestions as to the recognition of the testamur and have taken steps to secure full recognition thereof.

COLONIAL SERVICE PENSIONS.

Attention has been given to a suggestion that the Colonial Office should be approached with a view to obtaining the same favourable consideration on retirement to pension for members of this institution engaged in Colonial service, as is granted to members of the institution of civil engineers.

AMENDMENT TO TOWN PLANNING ACT, 1909.

The council have also given attention to the Bill proposed to be introduced in Parliament amending the Town Planning Act, 1909.

Suggestions for the amendment of the Procedure Regulations under the Town Planning Act were laid before the Local Government Board and secured a sympathetic reception.

UNFAIR TREATMENT OF MEMBERS.

An informal interview with the President of the Local Government Board was sought and obtained, and the views of the institution as to the desirability of inserting a clause in the said Bill affording protection to municipal and county engineers in the execution of their duty were placed before him. At the request of the Local Government Board, information as to cases of hardship to members has been forwarded. It is reported with satisfaction that intervention by the institution on behalf of certain members receiving unfair treatment at the hands of their councils has been exercised with favourable results.

COUNCIL MEETINGS IN PROVINCES.

Representations received as to the holding of council meetings in the provinces have been considered, and the secretary has been instructed to obtain further information from the district secretaries who have not yet conveyed the views of their districts upon this subject.

REGISTRATION OF ARCHITECTS.

The council have given consideration to the Bill promoted by the Society of Architects in reference to registration, and have endeavoured to obtain the insertion of a clause protecting the interests of municipal and county engineers.

EXPENSES OF MEMBERS ATTENDING CONFERENCES.

The council have requested Mr. J. Patten Barber to represent the institution at a conference of kindred societies to be summoned under the auspices of the Royal Sanitary Institute, in reference to the amendment of the Conference Act, with a view to providing for the payment of the expenses of engineers and surveyors in attending conferences.

MUTUAL DEFENCE AND SECURITY OF TENURE.

The council regret that no great measure of support has been received to the proposals of the council in reference to the Mutual Defence Fund, and the attention of members has therefore been directed to additional means of securing protection.

The support of the institution has been given to the Superannuation Bill promoted by the National Association of Local Government Officers.

AWARD OF PREMIUMS.

The council have awarded the prizes offered in the Premium Scheme for 1913-14 as follows:—

STUDENTS' PRIZES.

Section (a)—For measured drawings of existing buildings.

The council awarded a prize of £3 3s. to S. J. Hellier, student, engineer's office, Church End, Finchley.

Section (b)—For a design for a steel bridge.

A prize of £3 3s. was awarded to H. Cliffe, student, surveyor's assistant, Mexborough Urban District Council.

MEMBERS' AND ASSOCIATE-MEMBERS' PRIZES.

Section (c)—For an essay.

The first prize of £8 8s. was awarded to S. S. Davson, member, engineer to the Tazini Department, Ministry of Public Works, Cairo, for his paper on "The Dry-weather Flow of Sewage, and its Relation to the Design of Sewers and Arrangements for Pumping."

Section (d)—For a design for a park and recreation ground.

The first prize of £12 12s. was awarded to Messrs. W. H. Price, associate-member, resident engineer's office, Knostrop sewage works, Leeds, and A. J. Price, associate-member, borough engineer's office, Eccles, both holding the testamur of the institution.

The second prize of £6 6s. was awarded to G. Cowan, member, chief assistant to borough engineer, Portsmouth; holds the institution testamur.

A third prize of £3 3s. was awarded to W. Thompson, member, deputy borough engineer, Burton-on-Trent; holds the institution's testamur.

PRIZES FOR PAPERS OR ESSAYS APPEARING IN THE "JOURNAL."

Section (e)—Illustrative papers.

The first prize of £8 8s. was awarded to W. J. Hadfield, member, surveyor of highways, Sheffield, for his paper on "Road Construction."

The second prize of £4 4s. was awarded to P. T. Harrison, member—holds the institution testamur—borough surveyor, Chelmsford, for his paper on "Recent Public Work at Chelmsford."

Section (f)—Essays on special subjects.

The first prize of £8 8s. was awarded to L. Leeper, associate-member, assistant engineer to borough surveyor, Great Yarmouth, for his papers on "Moment in Mechanics" and "Elastic Theorem."

The second prize of £4 4s. was awarded to Reg. Brown, member—holds the institution's testamur—surveyor to the Southall-Norwood Urban District Council, for his papers, "Students' Section."

Section (g)—Essays by students.

The first prize of £4 4s. was awarded to S. J. Hellier, student, engineer's office, Urban District Council, Church End, Finchley.

Section (h)—Designs for artizan's dwellings.

The first prize of £15 15s. was awarded to M. B. Bennett, associate-member—holds institution's testamur—Town hall, Hove.

The second prize of £7 7s. was awarded to P. Morris, associate-member, town planning assistant to the Doncaster Rural District Council.

A third prize of £4 4s. was awarded to A. H. Elliott, associate-member—holds the institution testamur—engineering assistant to city engineer, Nottingham.

REVISION OF SYLLABUS AND REGULATIONS FOR EXAMINATIONS.

The Board of Examiners have given careful attention to the revision both of the procedure of the examinations and the syllabus, and have appointed a sub-committee to consider the matter fully. Subject (4)—Sanitary Science—of the examination has been added to by a new section dealing with the improvement of insanitary areas.

SPECIAL EXAMINATIONS.

It has also been decided to institute special examinations in (a) county and highway engineering and surveying, and (b) town planning. A communication has been addressed to the Road Board informing them of the intention of this institution to hold a special examination in county highway engineering and surveying. Careful attention is being given to the preparation of the syllabus in these examinations, and it is hoped to hold the first special examinations in conjunction with the ordinary examination in October next. The board have also given attention to a suggestion received for the addition of gas engineering to the syllabus of the examination, but considered that at present this subject was not of importance to so many municipal engineers as to warrant its inclusion as a special subject.

TRAMWAY RAILS.

The Tramways Committee report that there have been no meetings of the Rails Standardisation Committee since May, 1913. At the last meeting of that committee it was agreed to recommend the retention of Secs. Nos. 2, 3, 4 and 5 of Tramway Rails (with the exception of the reduction of the flanges from 7 in. to 6½ in.). To suit the views of the different members it was agreed to have a meeting to consider other suggested modifications. A Panel Committee has been appointed by the Sectional Committee to give effect to the recommendations and suggestions; Mr. Elford has been appointed on the Panel Committee to watch the interests of the institution. Data to form the basis of a draft specification for points and crossings is being prepared by a sub-committee, and this matter will probably be dealt with by the Sectional Committee during the coming year.

RAIL CORRUGATION.

The Tramways Committee have, during the year, been carefully watching several important questions relating to tramway practice. Among them was that of "Rail Corrugation," upon which two interesting papers have been recently read at a meeting of the Institution of Civil Engineers. Members of our institution interested in the subject will be well advised to read carefully the papers when they are officially published. The committee were represented at the meeting by Mr. Wakelam, who took part in the discussion.

SALT-GLAZED SEWER AND DRAIN PIPES.

The Standardisation Committee have had under consideration from time to time during the year the proposed specification for salt-glazed sewer and drain pipes. Instructions have been given to the institution's representatives on the Sectional Standardisation Committee upon various important points relating to the specification. This specification has now been practically completed and will be published shortly. This committee have under consideration other matters requiring standardisation, and hope to issue further specifications during the ensuing year.

SPECIFICATION FOR CONCRETE FLAGS.

The sale of the second edition of the Institution's Standard Specification for Concrete Flags is proceeding steadily.

SPECIFICATION FOR BROKEN STONES AND CHIPPINGS.

The Roads Committee have drawn attention to the British standard specification for broken stones and have recommended the members to adopt same, subject to a modification in the maximum length of stones.

ARTERIAL ROADS IN GREATER LONDON.

At the suggestion of the Northern Section of the Conference on Arterial Roads in Greater London, and with the approval of the Local Government Board, the council have decided to convene meetings of the engineers to the various authorities concerned. Both the Local Government Board and the Board of Trade have consented to send representatives to such conferences. A Central Committee will be formed to receive the reports and to prepare the final report for submission to the authorities concerned.

WEIGHTS UPON AXLES OF HEAVY MOTORS.

The question of weights upon axles of heavy motors and of their excessive speed has received the careful attention of the committee, and representations have been made to the Local Government Board on the subject.

TAXES ON MECHANICALLY PROPELLED VEHICLES.

Attention has been given to representations made by a member in reference to the taxation of surveyor's means of locomotion, and the views of the institution have been laid before the Chancellor of the Exchequer.

THE DEATH OF THE HON. SECRETARY.

The council have to record with great regret the irreparable loss sustained in the death of Mr. Charles Jones, and have placed on record their deepest sympathy with the surviving relatives in their great sorrow, and also their high appreciation of his distinguished public talents, and of the useful and ungrudging service he rendered to the Municipal Engineering Profession during his forty years' membership of the institution. The council resolved

Mr. J. Patten Barber was appointed delegate to the Sanitary Inspectors Examination Board.

Mr. J. S. Pickering has been appointed delegate to the Victoria League.

Mr. T. W. A. Hayward was appointed delegate to the Summer School of Town Planning.

Mr. W. H. Prescott has been appointed delegate to the Garden Cities and Town Planning Association.

TOWN PLANNING.

The council referred to the Town Planning Committee the suggestions sent up by last year's conference at Great Yarmouth in reference to the various matters concerning Town Planning, and the Public Works Loan Commissioners have been requested by the council to advance loans for Housing Schemes at the lowest possible rate of interest. The

Dr. INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDING 30th APRIL, 1914. Cr.

EXPENDITURE.		INCOME.	
	£ s. d.		£ s. d.
To Reports of meetings	66 0 0	By Subscriptions	2,358 6 0
„ Examiners' fees and expenses	105 6 6	„ Entrance fees	142 14 0
„ Printing, lithography, stationery (including postage)	1,134 13 0	„ Examination fees	287 14 0
(Proceedings, Vol. 39, £515 9s. 2d.; Conference Vol., £224 9s. 7d.; Index Vols. 31-37, £378s.; General, including districts, £311 7s. 9d.)		„ Sale of Proceedings	55 2 10
„ Expenses of meetings	83 16 6	„ Sale of copies of Journal	3 3 0
„ Rent of office, rates, coals, &c.	234 6 8	„ International Roads Congress, part of donation of £105 returned	25 5 0
„ Backers' charges	1 5 6	„ Interest on investments and on Deposit	88 6 1
„ Telegraphic address and telephone	19 16 0		£2,960 10 11
„ Expenses of delegates and affiliation	6 19 8	„ Deficit for year transferred from Accumulated Fund	173 13 5
„ Premiums	19 7 0		
„ Law reports and Parliamentary papers	8 18 0		
„ Salaries	635 12 3		
„ „ Typist and temporary assistants	114 8 4		
„ Office expenses	52 11 2		
„ Petty cash—			
Postage	62 14 11		
General	5 18 9		
„ Legal charges	9 14 2		
„ Audit fees	15 15 0		
„ Amounts written off—			
Subscriptions	21 9 6		
Investments	4 6 7		
Office furniture	31 4 4		
	2,634 4 4		
„ Provision on account of cost of Journal for the year 1913-1914	500 0 0		
	£3,134 4 4		£3,134 4 4

Dr. BALANCE-SHEET ON APRIL 30, 1914. Cr.

LIABILITIES.		ASSETS.	
	£ s. d.		£ s. d.
To Sundry creditors	466 13 0	By Cash—	
„ Premiums in respect of Volume xxxix.	15 0 0	at bank	255 3 3
„ Subscriptions in advance	45 16 0	in hand	9 16 5
„ Accumulated fund—		„ Investments—	264 19 8
Balance at April 30, 1913	2,740 11 5	£150 Southampton Corporation 3½ per cent Stock at 91	172 18 0
Less deficit for year ending April 30, 1914	173 13 5	£553 2s. 9d. India 2½ per cent Stock at 63	348 9 6
	2,567 1 0	£650 0s. 3d. London County 2½ per cent stock at 67	435 10 0
		£220 Metropolitan 2½ per cent Consolidated Stock at 77	154 0 0
		£107 11s. 9d. New South Wales 3½ per cent Stock at 92	374 19 7
		£600 India 3½ per cent Stock at 88½	529 10 0
		„ Subscriptions in arrear	298 14 6
		Less reserve	150 0 0
			148 14 6
		„ Amount due for sale of Proceedings, &c.	36 7 6
		„ Stock of Proceedings—estimated value	100 0 0
		„ Office furniture	280 19 8
		„ Suspense account, Journal, 1913-14	188 1 7
	£3,034 10 0		£3,034 10 0

to raise a fund to perpetuate the memory of Mr. Charles Jones, and have issued an appeal to members.

DEATH OF MR. A. M. FOWLER.

The council also record with great regret the death on the 2nd of June of Mr. A. M. Fowler, who was president during the year 1894-5, and a member of the institution from its foundation.

APPOINTMENT OF DELEGATES.

Mr E. J. Eloff has been nominated as a delegate to the Engineering Standards Committee (Panel Committee) on Tramway Rails.

Messrs. T. W. A. Hayward, W. H. Prescott, and H. T. Wakelam were appointed delegates to the Arterial Roads Conferences convened by the Local Government Board.

Messrs. J. S. Brodie, J. S. Pickering, and A. E. Collins were appointed delegates to the Royal Sanitary Institute Congress at Blackpool.

committee were unable to recommend the taking of any action in reference to the resolution referring to the assistance to be granted to local authorities in the erection of workmen's dwellings.

Representations have been addressed to the Council of the Town Planning institute in reference to the admission of members of this institution with satisfactory results.

The council are considering suggestions for the formation of a Town Planning loan library.

TRACKLESS TROLLEY SYSTEMS.

The Parliamentary Committee have given careful consideration to Bills presented to both Houses of Parliament. Particular attention has been paid to the clauses in the Bills dealing with Trackless Trolley Systems in relation to maintenance and widenings, and the chairman of the committee, together with the secretary were requested to tabulate such clauses. The tabulation has been published

in the *Journal* of the institution for the general use of members.

BUILDING BY-LAWS.

The council have appointed a committee to prepare and give evidence before the Departmental Committee of the Local Government Board appointed to inquire into the working of the Building By-laws, and also to consider the Public Health (Building By-laws) Amendment Bill.

JOINT COMMITTEE ON REINFORCED CONCRETE.

Report from Mr. A. E. Collins: "During the past year the Joint Committee has had before it the proposed by-laws of the London County Council, under the London County Council General Powers Act, 1909, the Act requiring that copies of the regulations be submitted to the Royal Institute of British Architects, who referred them to the Joint Committee. This Joint Committee had previously considered them in 1913. Reconsideration was necessary by reason of alterations proposed by other institutions to whom they had to be referred. We were able to arrive at a working agreement with these other institutions, and with the London County Council. With respect to the Engineering Standards Committee on Tramway Tyres and Axles, to which I was appointed a delegate by the council of the Institution of Municipal and County Engineers, we have had several meetings, the last of which was on the 22nd ult. I think we have now arrived at an agreement as to what form the standard specification for tramway tyres and axles shall take, and I hope to report the conclusion of the work of this committee in time for the annual report of 1915."

The PRESIDENT moved the adoption of the report.

Mr. E. WILLIS (Chiswick), who seconded, congratulated the members of the council on the report which they had placed before them.

Mr. H. GILBERT WHYATT (Grimsby) raised a question as to the contributions of the Road Board to county boroughs. He suggested at Yarmouth that the council should take some action to induce the Road Board to deal more liberally with county boroughs than they had done. They dealt very liberally with counties and small rural authorities. The only two authorities which could have any influence were the Association of Municipal Corporations and their institution, and something ought to be done to influence the Road Board in this matter.

The report was adopted.

The PRESIDENT then presented certificates to the prize-winners whose names appear in the report.

The auditors and scrutineers were re-elected.

INSTALLATION OF PRESIDENT.

The incoming president, Mr. J. S. Pickering, was then installed in office, and invested with the presidential chain by the retiring president.

THANKS TO THE RETIRING PRESIDENT.

Mr. J. S. BRODIE (Blackpool) moved that the best thanks of this meeting be given to the retiring president for his conduct of the affairs of the institution during the past year. Mr. Cockrill, he said, had had a most strenuous year. He had inaugurated the prize system, and got it carried through the council off his own bat. He wished to associate Mrs. Cockrill in the resolution.

Mr. E. WILLIS (Chiswick) seconded. He said they had had a most successful year. He should like to add his thanks to Mrs. Cockrill for the help she had given to the president during his year of office.

The vote of thanks was accorded by acclamation.

Mr. COCKRILL said he was extremely obliged to them for the vote of thanks. He wished to acknowledge the help which his wife had given to him.

Mr. PICKERING then rose and delivered the following

PRESIDENTIAL ADDRESS.

A history of the progress of civilisation and all that has made for the welfare of humanity could not be written without reference to the enormous advantages that have accrued from the accomplishments of the engineer, and it is with a feeling of justifiable pride that the municipal engineer—I use the term in its broadest sense—claims to have taken no small share in promoting the health, happiness and convenience of mankind.

With the demand, by a more educated and enlightened community, for a higher standard of sanitation and a greater degree of comfort, the responsibilities of engineers and surveyors to local authorities

have increased. The provision of a suitable system of sewers and drains is now a recognised necessity for the smallest village as well as for the largest city; the prevention of the pollution of rivers and streams has brought about a desire for efficient schemes of sewage purification; the demand for a wholesome and adequate public supply of water has become general; the collection and sanitary disposal of house and trade refuse are matters that have assumed the greatest importance; in the construction, maintenance and administration of public roads there has been nothing short of a revolution; the passing of the horse and steam tram has necessitated the construction and equipment of suitable permanent ways for electric and cable trams; most towns of importance have provided public baths, abattoirs, markets, fire stations, infectious diseases hospitals, and other public buildings; housing schemes of considerable magnitude have been promoted and carried out, and during the last few years a new departure has been made in the preparation of schemes for the systematic planning of towns. These are all matters for which the municipal engineer is mainly responsible, but they only embrace a portion of his duties. Apart from his technical knowledge he is required to have a sound commercial training, to understand the value of labour and materials, and to possess a keen power of organisation; while by no means the least of his qualifications lies in his aptitude to accommodate his energies in the interests of the community to the trying and difficult position he occupies as a public official.

DRAINAGE.

Dealing with the subject of drainage, much progress has been made of late years in the scientific design and construction of both public sewers and house drains. Where the best construction is not always met with is in the case of sewers laid by private individuals for the drainage of speculative building estates, efficiency generally being looked upon as secondary to financial considerations. Even with the most careful supervision it is obvious that the same standard of work cannot be obtained as in the case of sewers over which the engineer has direct control, and a local authority has frequently to take over and afterwards maintain sewers which, although not sufficiently defective to condemn, do not meet all the requirements of first-class construction. It seems to me quite a reasonable suggestion that sewers which are to become public property should be laid only by the local authority, the property owner being charged the actual cost.

After somewhat fruitless discussions extending over a period of something like half a century, the question of sewer ventilation and the use of the intercepting trap has now been dealt with in a valuable report prepared by a Departmental Committee of the Local Government Board. The questions involved are of so complex a character that it was scarcely to be expected that the committee would arrive at their conclusions without making many qualifying safeguards; but there is no mistaking their opinion that it is desirable, except in very special cases, to dispense with the use of the intercepting trap, and to ventilate the public sewers through private house drains. These conclusions, although confirming the opinions frequently expressed by a large section of municipal engineers and other sanitarians, are opposed to the practice still in operation under the "Model" Code of By-laws issued by the Local Government Board in 1877, and it is therefore unlikely that there will be a ready acquiescence in adopting the findings of the committee. But the scientific evidence and the practical observations on which the report is based cannot be lightly set aside on the mere assumption that the practice which has hitherto prevailed is the correct one, and, unless rebutting evidence of an equally weighty description is forthcoming, exception can only be taken to the report on the ground that the inquiries and investigations of the committee have not been sufficiently exhaustive to justify the conclusions arrived at. A careful reading of the report will, however, convince any unprejudiced mind of the care and thoroughness with which it has been compiled, and the information it contains cannot but be useful in arriving at a solution of the difficult problems involved.

SEWAGE TREATMENT.

The remarkable progress of late years in many of the branches of sanitary science has been brought about mainly through the co-operation of the bacteriologist, the chemist, the medical officer and the engineer. Up to a comparatively recent time there had

been little or no combination in the research work which had been carried out, and progress had necessarily been slow; but in proportion as each profession has realised the futility of working independently of the other, so has sanitary science advanced. Not only have the combined efforts of scientists brought about a better knowledge of subjects connected with sewers and drains, but they have gone a long way towards a solution of the equally vexed questions relating to the disposal of sewage.

While, however, it is now possible to produce an effluent of any reasonable standard of purity for preventing the pollution of streams, the means adopted for doing so have in many cases created a new difficulty in the pollution of the atmosphere surrounding the works of sewage purification. Where sewage is allowed to become septic, and is distributed over the modern filter-bed, either in the form of sprays or otherwise, there must be an objectionable odour produced, the intensity of which will depend chiefly upon the quantity and character of the sewage. To obviate this it is now becoming the practice to abandon the septic tank as a means of partially dissolving the sludge, and to distribute the sewage on the filter-bed in as fresh a condition as possible, and this appears to be a desirable course. The next advance should, it appears to me, be in the direction of dispensing with the usual form of precipitation tank altogether and substituting a combined tank and disintegrating filter in order to retain only mineral solids, and thus allow the organic matter to be discharged in a suitable condition for treatment through the aerating filter. This course has been adopted at the new sewage works for Worcester, and there is every probability of the system proving a success.

Another feature of sewage treatment, in which greater economy and improved results may be looked forward to, is in the aëration of the sewage before its application to the filter. It has already been proved that the rate at which sewage may be filtered is considerably increased when an additional quantity of oxygen is added to the tank effluent, and there appears to be no reason why this should not be applied in a practical and economical manner. Opinion is still somewhat divided upon the size of the media for percolation filters. Broadly speaking, it may be said that the finer the media the better the filtrate, but the more the tendency of the filter to become choked. Local conditions will, of course, affect each particular case; but as a rule it appears to me desirable to use a fairly coarse material (say from $\frac{1}{2}$ -in. to 1-in. gauge), and to deal with the humus escaping from the filter either by means of deep tanks, secondary filters, or land treatment. Coarse filtering media and subsequent treatment of the effluent will, I think, become more general as the necessity for dispensing with the usual objectionable form of precipitation tank becomes more recognised.

WATER SUPPLY.

Probably no branch of the municipal service in which members of the institution are actively engaged has attained so high a standard of proficiency as that of water engineering, and it may safely be stated that comparatively few centres of population in the kingdom are still unprovided with a supply of wholesome water. From an engineering standpoint there is no difficulty in satisfying the increasing demands made by the growth of population, though it is a matter of some concern with many authorities that they are compelled to resort to sources of supply far removed from their own districts, and to incur an expenditure which can only be met by an excessive charge to the consumer, or by a special rate in aid of the undertaking. But for the sound practice which prevails for the prevention of waste, the disadvantages alluded to would be yet greater.

Year by year the difficulty of obtaining an ample supply within reasonable distance of rapidly growing towns must increase, but under existing conditions a still greater difficulty presents itself in the acquisition of a supply where several authorities have decided upon the same source. The unsatisfactory conditions which prevail are exemplified in the Parliamentary struggle a few years ago between the corporations of Derby, Leicester, Nottingham and Sheffield, and other local authorities for securing the upper waters of the Derbyshire Derwent. Separate Bills were promoted by three of these corporations, and separate engineers were engaged to design different works for the same source of supply, and this complicated and costly procedure, after the waste of much valuable time, ended in the division of the

supply between the several authorities interested. There is urgent need for the creation of a new organisation to deal with matters affecting the conservation and disposal of water supplies generally. Suggested details for carrying this into effect have been clearly set out by the Institution of Water Engineers, and legislation in the direction indicated is very necessary in order to efficiently and economically deal with the future needs of the country.

ROADS.

The skill and energy of the engineer have of late been put to the test by the necessity that has arisen for the adaptation of the highways of the country to meet the new and destructive types of vehicular traffic, and it may be said without hesitation that he has not been wanting in ability to deal with the emergency to the best advantage, having regard to the means at his disposal. In the short space of half-a-dozen years or so enormous improvements have taken place in highway engineering, long-established types of construction having been superseded by improved methods based upon a more scientific knowledge and a full realisation of the requirements due to altered circumstances. The road question has been recognised as of national importance by the creation of the Road Board and by the raising and distribution of funds to meet the more pressing needs of the reconstruction and improvement of arterial roads. But as the grants made have generally been conditional upon the authorities receiving them providing a large proportion of the cost, the work undertaken has added appreciably to the burden of local rates without conferring a compensating advantage on those who have been called upon to contribute, and this has had the effect of curtailing necessary expenditure in other directions to the disadvantage of the towns and districts affected. Increased rates for education and other national purposes have also had the same result. Happily, provision has now been made for some relief to be given to local rates by new grants from the Exchequer towards matters which are of a national rather than a local character, and it is to be hoped that the assistance ultimately to be given will be sufficient to enable local authorities to deal with the many pressing matters affecting the health and convenience of the public which are now deferred or ineffectually performed for lack of the requisite funds.

Together with financial considerations the demand for a better type of road has raised the general question of administration. There are too many authorities having the control of highways, and it cannot be denied that many of them, either from want of funds or indifference to modern requirements, are doing little or nothing to bring the roads under their charge into a condition suitable for the traffic they have to carry. A glance at the list of salaries paid by the greater number of minor road authorities to officials having a considerable mileage of the roads of the country under their supervision should in itself be sufficient to prove the case for change in administration. It is not likely that the standard of roads will be raised in districts where the authorities fail to recognise the technical training required in the official responsible for their construction, and it will be to the advantage of the road engineer, as well as to the benefit of the road user and the ratepayer, when all officials having the supervision of roads are required to possess such qualifications as may be approved by a central road authority.

In a report to the Departmental Committee on Local Taxation, the chairman of the Road Board points out the necessity of securing men of good education and technical knowledge as county surveyors; and in order to minimise the risk of waste in any attempt to reduce the salaries and number of their staff below what is essential to secure efficient administration and supervision, it is suggested that one-half the salaries of county surveyors and one-fourth the salaries of their staff should be paid by the State, subject to a central authority being satisfied as to their qualifications, duties and tenure of office. Although these recommendations are apparently not endorsed by the Departmental Committee, it is something to be grateful for that a Government Department intimately acquainted with the work of highway engineering thus recognises that efficient and economical results are more likely to be obtained where the responsible officials are adequately remunerated for their services. The observations of the chairman of the Road Board can be applied with equal force to the work of every engineer and surveyor occupying a public appointment.

HOUSING AND TOWN PLANNING.

Among the more important questions of the day affecting the welfare of the community as a whole a foremost place must be given to the subjects of education and the housing of the poorer classes, and systematic town planning may be added as being inseparable from the housing question and entirely dependent for its success on education and culture. If this country is to maintain the power and prestige which its glorious achievements of the past have won for it, every possible provision must be made for its citizens to attain the educational standard and the physical fitness and stamina requisite to enable them successfully to cope with the growing competition of other nations. However brilliant and enviable the past history of a nation may have been, its influence must wane and finally decay unless it realises to the full the progressive spirit of civilisation in all that tends to elevate the mind and promote the well-being of the human race. The continued prosperity of our country depends in a great measure upon the healthy housing of the labouring classes, and upon the amplitude of facilities afforded for the play of ennobling aspiration. The growth of our cities and towns, particularly in industrial centres, has brought with it a responsibility involving problems of so complex a character that a solution can only be found in the strong and determined resolution of the nation.

What would be said of the man who proceeded to build his house without a plan or design, and without any preconceived idea of his requirements, or of a company, say, that built a theatre without any thought as to the means of ingress and egress, and regardless of the convenience and accommodation of the public? If such acts on the part of the individual or a company would be looked upon as a wasteful folly, what is to be said of the lack of design and arrangement of our cities and towns, and of the overcrowded and insanitary areas characteristic of nearly all large centres of population in the country? The comparatively few towns that have resolved themselves into desirable places of residence owe their present position mainly to the foresight and enterprise of the private individual. The landowner in these cases has, on his own initiative, laid out his estate, not within the narrow limits of the local by-laws, which would have produced nothing but a network of monotonous and narrow streets and overcrowded dwellings, but on the broad and comprehensive principle of what is now understood as systematic town planning.

Notwithstanding these exceptional cases, however, I think it will be agreed that the lay-out of a town should not depend upon the will of the individual, whose chief interest, after all, is generally to secure a pecuniary advantage for himself. The powers of local authorities to govern the extension and development of their towns under the general Acts are so inadequate that it is impossible to prevent the formation of thoroughfares unsuited to the needs of the district and the building of houses which come under the category of the opprobrious term of slums. The large majority of authorities are limited to the provision of the Public Health Act, 1875, under which by-laws may be made governing the "level, width and construction" of new streets. There is no authority to require a new street to follow any particular direction or to communicate with an existing street, and in most towns the by-laws only provide for one standard width, usually 36 ft.

The development of building areas under these conditions, particularly in industrial towns, has resulted in the formation of a perfect maze of narrow streets following a direction to suit the varying shapes of the land and crowded with houses as closely as they can be built to comply with the letter of the by-laws. The Public Health Acts Amendment Act, 1907 (an adoptive Act), among other useful provisions, contains a section giving power to local authorities to lay down the direction of any new street by paying compensation to any owner of land prejudicially affected. This is a step in advance of the provisions of the 1875 Act, but the additional powers are obviously insufficient to check the improper development of building areas.

It is somewhat startling to the uninitiated to learn that there is no general Act giving local authorities power to require a minimum height for habitable rooms. The Public Health Acts Amendment Act, 1890, provides for this, but as the Act contains other provisions not always acceptable to local authorities, it has not been generally adopted. It is also not generally known that local authorities have no power to require a minimum floor space for a bedroom in con-

nection with a new building. Few local authorities have any control over the height and elevations of new buildings, and fewer still can deal with buildings as affecting the amenities of the district.

One or two of the larger municipalities have anticipated many of the provisions of the new Town Planning Act, and have either obtained Parliamentary powers to carry these into effect or have adopted extensive schemes in co-operation with landowners and others interested in the development of building areas. In 1908 the Liverpool Corporation obtained powers to require the submission and approval of general building estate plans before the commencement of any work, the provision of roads up to a width of 80 ft., the limitation of the length of a street without cross-roads to 150 yds., the adjustment and alteration of irregular boundaries, and to accept reduced street works in the case of open spaces given up beyond by-law requirements. Most of the provisions that Liverpool, after years of costly experience to the city, has found it so necessary to acquire under a private Act, and many other important powers which at the time the corporation was unable to secure, may now be embodied by any local authority in a town planning scheme under the new Act.

As an instance of what may take place in any town extension under the limited powers of the general Acts, a typical case may be mentioned of plans being deposited with the city of Liverpool for the housing of a population of about 10,000 on an estate of 53 acres with no street wider than the minimum by-law requirement of 36 ft. In this particular case the operation of a private Act, and the good sense of the owner, resulted in an amendment to the scheme whereby a street 60 ft wide and 600 yds long was made, and the buildings were set back 36 ft. from the centre of the road. In the vast majority of towns, however, there would have been, with an obstinate landowner, no power to reject so undesirable a scheme.

To give an example of the economy of laying out and constructing the main thoroughfares in advance of the development of a town, Liverpool may again be quoted. The fine avenues which have been made during the last few years, and which vary in width from 80 to 114 ft., have cost the corporation an average of about £7,000 per mile, whereas street widenings near the city boundary to a width of only 60 ft. have cost at the rate of £70,000 per mile, and approaching within a mile or so of the centre of the city the cost of widening to 66 ft. has averaged over £350,000 per mile.

There is probably not a town of importance in the country in which costly improvements might have been avoided had a suitable town planning scheme been in operation during the period of development. And what is true in this respect of past experience applies with equal force to existing conditions. No one knows better than the municipal engineer that developments which are taking place at the present time in compliance with so-called "model" by-laws will sooner or later require to be amended and improved at the expense of the public in order to meet the most ordinary conditions of traffic and to comply with the most elementary principles of hygiene.

A study of the history and of the sociological aspect of town planning is as engrossing as it is essential for formulating the true principles on which the towns of the future should be designed. As a nation we have an inherent dislike to copying the examples of other countries, and while this characteristic of temperament may be generally commendable, it has in some respects recoiled upon us to our disadvantage. We have much to learn from other countries on the subject of town planning, and there is no reason why we should not profit by their experience, and, as far as possible, avoid the errors and failures which have naturally followed the attempts made to deal with so complicated and difficult a problem. The task is an international one, and every nation has something to learn as well as something to teach.

Town planning and housing must necessarily proceed simultaneously, and what must be guarded against and overcome at any cost is the retrograde system which has prevailed in some countries of beautifying the towns without regard to the convenient and healthy accommodation of the working-class population. The high and overcrowded "tenement barrack" buildings which prevail in most Continental cities are, happily, not likely to find favour in this country. Yet it is by no means an easy matter to secure for a town a full complement of broad and convenient streets, an adequate number of open spaces, and an ample area of pleasure grounds, and

at the same time to provide a sufficiency of convenient and healthy dwellings of the cottage or small tenement type. These are, however, essential principles which should govern any town planning scheme, notwithstanding what at present appear to be the insuperable difficulties of carrying them into effect.

Circumstances have arisen which make the building of the workman's dwelling as a source of profit an impossibility in many parts of the country, and it is not unreasonable to ask whether this difficulty is likely to be increased or diminished by the application of a systematic plan of town extension. If a convincing reply could be given that town planning would be a direct solution of the housing problem, few authorities would hesitate to take advantage of the Town Planning Act. But, while it is obvious that in many districts the remedy lies beyond the application of town planning, it may safely be stated that there are numerous instances where a properly-devised scheme would materially assist in the housing problem, and there are few, if any, cases where town planning would actually increase the present difficulties. Private enterprise frequently succeeds where a public authority would fail, but in the erection of workmen's dwellings the builder whose aim has been to obtain a profit on his work, or to secure a reasonable return on his capital, has succumbed to the many adverse conditions which have been entirely beyond his control, and, as a consequence, the ever-increasing demand for houses has not been adequately supplied.

In planning the extension of a town under the new Act local authorities are able to deal with the undeveloped areas as a whole, and in a great measure to allocate the building sites to the purposes for which they are the most suitable in the interests of the community. They are able to modify the building and street by-laws, to arrange for sewerage, water, and lighting, to provide means of transit, and to carry out many other matters advantageous to the development of land which would be difficult, if not impossible, for the individual wholly to accomplish. In thus providing, under a town extension scheme, better facilities for building operations, private enterprise will be greatly assisted, and the desirability of municipal housing schemes lessened. There is, however, an immediate demand for houses which cannot be met by private enterprise, and which local authorities cannot supply, in most cases, except at a charge on the rates which they are not prepared to incur.

In a recent report of the Land Inquiry Committee, dealing more particularly with urban districts, it is recommended that it should be the statutory duty of all local authorities to see that adequate and sanitary accommodation is available for the working-class population employed, or reasonably likely to be permanently resident within their area. Where there is a deficiency of such houses, and sites suitable for their erection are not available at reasonable prices, local authorities, it is recommended, should be required to promote transit schemes to render accessible a sufficient area of suitable building land, and each authority should make a complete survey of housing conditions in its area, and prepare within a stipulated period a scheme of proposed action under the Housing Acts.

If these delightfully simple recommendations could be brought into effect, they would go a long way to solve the housing difficulty. Unfortunately, however, financial considerations have been entirely overlooked, and no such measures are likely to be carried out where the loss incurred would entail an additional heavy charge on local rates. Municipalities being unwilling, and individual enterprise unable, to meet the difficulty, there is no alternative but to look to the Legislature for a remedy, and all who are acquainted with the present deplorable housing conditions will anxiously await the "great housing legislation" promised by the Government, in the hope that some measure may be forthcoming to relieve the present deadlock.

THE INSTITUTION'S WORK.

Referring briefly to the work of our institution, the past year has been one of activity, and the report of the council shows that substantial progress has been made in the promotion of objects affecting the welfare of members and the interests of the profession to which they belong. A new departure has been made during the year in recording the transactions of the institution in the form of a monthly and bi-monthly

journal in lieu of an annual volume, and although this change has not been received with unanimous approval, I have no hesitation in expressing the opinion that it will prove to be one of the most beneficial steps taken in the annals of the institution. Much as each member must have valued the old form of "Proceedings," there can be no doubt as to the greater advantage to a large majority of the members in receiving official copies of papers, and a report of the discussions within a few weeks of the different meetings held, and it must not be overlooked by those members who prefer the old form that they may adorn their libraries with a handsome and much more serviceable annual volume by the simple process of binding the sectional parts in the specially designed cover to be supplied year after year. One of the main features of the journal is the simple and convenient means it affords for keeping each individual member in touch with the work of the institution. The regular publication of a summary of the council meetings, reports of district and executive committee meetings, announcements of future meetings, and of the numerous matters of professional and personal interest which arise from time to time must be far more appreciated when contained in an official journal rather than having to be sifted from the columns of the public Press. Then, again, the pages of the journal are at the disposal of members for correspondence and suggestions, and for contributions on subjects of professional interest, and no doubt these facilities will be taken advantage of by many who would hesitate to discuss the affairs of the institution, and to express their opinions except through an official organ. The introduction of the journal is by no means due to any dissatisfaction at the manner in which the affairs of the institution have been dealt with in the technical Press. On the other hand, there is a general feeling of appreciation and gratitude for the services which have always been rendered in this direction, and which cannot be overestimated. The new journal is the natural outcome of the growth and increasing influence of the institution, and it is bound to extend its usefulness and power.

The council recognise the growing importance of town planning and highway engineering, and have decided to hold separate examinations for candidates in each of these subjects. The municipal engineer must necessarily take a leading part in matters connected with town planning, and it is particularly desired that the younger members should make a special study of the subject in order to qualify by examination for important positions likely to be created under the new Town Planning Act. The examination in highway engineering is intended chiefly for candidates who may wish to qualify for engineering positions under county and other road authorities; but it will be open to others, and many who have received the testamur under the present examination will find it to their advantage to submit themselves to a further test of their knowledge on the special subject of highway engineering.

It is only a few years ago that membership was limited to engineers and surveyors occupying chief appointments; but there can be no doubt that the institution has been greatly strengthened by extending its privileges to those who are entering upon their professional career, and it is a gratifying feature in connection with the increased membership that the number comprises so large a proportion of students and assistants. It is the wish of the council to give every possible encouragement to junior members, and it is earnestly to be hoped that full advantage will be taken of the facilities afforded for their advancement.

Though the subject of superannuation makes but slow progress, there is some hope that when the present political strife is sufficiently abated to allow of a calm deliberation on the Bill that has been prepared, the Legislature will recognise the just claim of the local government official to a scheme of superannuation towards which he is willing to make generous contribution. Members of the institution can best forward this object by giving their whole-hearted support to the National Association of Local Government Officers, which has been entrusted with the drafting of the Bill.

The institution has done a great deal to raise the status of officials who are engaged in public work as engineers and surveyors. No opportunity has been lost in impressing upon both the central and local authorities the importance of their work as affecting the health and convenience of the community, and in pointing out the desirability, in the public interest, of

engaging men properly trained by education and experience for their work. Notwithstanding all that has been accomplished by the institution, much remains to be done to bring about a full recognition and appreciation of the services of its members, and this can only be attained by a determination on the part of each individual member to discharge the duties which devolve upon him with integrity and zeal, and with a conviction that, in proportion to the devotion and energy he displays in his own particular work, will

he assist in promoting the welfare of the profession to which he belongs.

Mr. A. D. GREATOREX (West Bromwich) moved a vote of thanks to Mr. Pickering for his address, and paid a high tribute to his work for the institution.

Mr. T. W. A. HAYWARD (Battersea) seconded, and it was carried by acclamation.

The meeting then adjourned for luncheon.

THE ROADS CONFERENCE: CHAIRMAN'S OPENING SPEECH.

The Roads Conference opened on Wednesday afternoon, Mr. H. T. Wakelam, M.INSTR.C.E., county engineer of Middlesex, presiding. In an address to the conference Mr. Wakelam said:—

The primary object of this gathering is to discuss papers prepared by members of the institution on the important question of road construction, maintenance and management. The question is not only of absorbing interest to those belonging to the institution, but also to the ratepayers of the United Kingdom. The ratepayers' interest, in fact, is of very substantial import, and if we can at this meeting, by an interchange of our experiences and views, produce something tangible in the way of assisting to lighten the financial burden attaching to road upkeep, we shall have attained a much-to-be-desired resultant benefit.

Thanks primarily to the work and efforts of the County Councils' Association, suggestions as to new methods and schemes of road classification have recently been published by the Road Board, with the principle of which methods and schemes I am sure we all agree. We have also lately read accounts of what the Chancellor of the Exchequer is proposing to do in the way of relief of local rates, with the principle of which, I again say, we all agree, provided relief can be given without taking money out of one pocket of the ratepayer to put it in the other, and the relief is given without increased Imperial taxation.

With regard to the proposed scheme of road classification, it would be well for us not to lose sight of the fact that in another room of this building, at the present moment, the important question of town planning is being discussed. Town planning is much interwoven with the question of roads, and especially so in correlation with arterial roads. I am bound to say that, to my mind, if we are not careful, "the cart will be going before the horse" in regard to the two questions which, as I have said, are so much interwoven. Far from it that I should decry town planning; personally I think it is one of the best things ever done in this country in relation to local government; but I do think "we should make haste slowly" in connection with town planning schemes. It would, to my mind, be infinitely better for the routes of any proposed arterial roads to be first laid down, thoroughly discussed by sectional or central committees, and decided upon, before most of the town planning schemes are finally settled. In this way they could be superimposed, so to say, on the arterial routes, and so avoid isolations. This, to me, appears to be the best mode of procedure; but as county councils—under one of which I have the privilege and pleasure to serve—have no powers under the Act, I feel somewhat diffident in commenting upon the matter.

HIGHWAY CASES.

This gathering, as I have said, is to discuss the question of roads, but it may not be misplaced if I at the outset refer for a moment to a legal judgment given on an appeal case at the beginning of this year by Lord Justice Vaughan Williams, Lord Justice Kennedy, and Lord Justice Swinfen Eady, in regard to the repair and support of bridges in the city of Worcester. The Birmingham Canal Company in the year 1812 made a canal, and, among others, there were nine bridges built in Worcester. The company were asked some time ago by the corporation to keep the bridges in a state of repair sufficient to carry the ordinary traffic which might reasonably be expected to pass over them. To this the company demurred, with the result that the corporation took the case to the Courts. After a hearing before Mr. Justice Phillimore, judgment was given by him in favour of the company. The defence was that the company were not bound to keep the bridges in a state of repair sufficient to carry the traffic which might be reasonably expected to pass along the roads and over the structures at the present time, and that the company were only bound to carry such traffic as was ordinary

when the bridges were originally built. Upon appeal the decision of Mr. Justice Phillimore was reversed by Lord Justice Vaughan Williams, Lord Justice Swinfen Eady and Lord Justice Kennedy, and the result of their lordships' judgment is of the greatest importance to all highway authorities.

After another recent hearing in the Chancery Division, Mr Justice Warrington gave judgment in a case in which a mandatory injunction was claimed to compel the Great Northern Railway Company to put in a proper state of repair a bridge which carried the public highway over the railway line. It was alleged that the present bridge was not strong enough to bear the modern heavy traffic that passed over it, but the defendants contended that the structure was not unsafe. Giving judgment, his lordship said he was of the opinion that the Locomotives and Highways Acts and the Motor Car Act did not relieve the defendants of the obligation to maintain the bridge; consequently there must be a declaration that the defendants were liable to put the bridge into such a condition as to bear the traffic that might be expected upon it.

I have referred briefly to these cases as they appear to me to have a great bearing on the question as to upon whom rests the liability and responsibility to keep in proper repair for modern traffic bridges of the kind covered by the two cases.

With regard to the particular business we are here to discuss, I should like to say that the papers presented to the meeting appear to contain many points and features of interest, indicative of careful preparation. The writers are of some considerable reputation in their profession, and when the discussion is opened you will all have opportunities of expressing your views upon the contents of each paper.

A RETROSPECT.

The subject of road evolution in this country is, or should be, of deep interest to all road engineers, and before the discussion commences on the papers I would like to make a few remarks in regard to the progress of road maintenance and management generally since the Roman period. I will be as brief as I can.

History tells us that before that period the ancient Britons were absolutely without roads, and that tracks were the only means of communication for the inhabitants of this country to follow. The Romans, on their arrival, set to work and constructed several great lines of roads which were practically straight in character, and which are so easily traceable on the map to-day. Those great lines of communication were evidently much used during the Roman period; but in regard to the connecting and branch roads nothing much is known. The principle of construction adopted by the Romans has been so often described that I will not dwell upon it.

About the twelfth century it began to be recognised that the community had common rights to, and were allowed to pass over, certain confined limits of land, which rights became well established, and the limits of highways, to which we are ourselves confined to-day, may possibly be in some cases those to which rights were obtained about that period.

From the twelfth to the eighteenth century nothing of great importance was attempted in the way of systematised maintenance, local dues being extracted by men appointed locally to succeed each other in carrying on the primitive road work of that time.

Nor, as a matter of fact, was much progress made until the days of Brindley, Macadam and Telford. In 1835 the first Highways and Locomotives Act was passed, and really may be considered to be the commencement of any organised system of road maintenance in this country. About that time, among other works, Telford was commissioned by the Government to reconstruct portions of the main Holyhead road at a cost, I believe, of something like £35,000, which

then appeared to have been considered a very large amount. Compared with the sums which are daily being expended in all directions in connection with road construction and maintenance at the present time, the amount does not seem a large one.

MODERN REQUIREMENTS.

The practice of construction and maintenance to-day is of a much more scientific nature than at any other period in the history of Great Britain. The stress of the modern mechanically propelled traffic, especially in and about largely populated areas, requires very careful consideration, and it is left to the members of this institution to devise ways and means best to deal with it. Great success has already been attained in this connection by the more seasoned and experienced among us. To insure a continuity of the good work special examinations will, in future, be held on road subjects by the Examination Board of the council of the institution for the benefit of those who are on the threshold of their road-making careers, and the council are looking forward to good results from the examinations.

It is now admitted by many engineers who visit this country from abroad that the main thoroughfares of England taken as a whole, are to-day the best in the world. A very few years ago members of this institution were twitted about their shortcomings in this connection, and it was a common thing to hear remarks made to the effect that English road engineers should visit continental areas to learn how to

make roads. This state of things, I am glad to say, has, within a comparatively short space of time, undergone a great change, and now, instead of English engineers being asked to go abroad, engineers from foreign countries are constantly visiting England seeking advice on the important problem of road construction.

WORK OF THE ROAD BOARD.

It is gratifying to think that the Road Board, under the able guidance of Sir George G. Bb., is giving valuable financial support in connection with the changes, which are to be seen on all sides of the country, in connection with new surfacings and improvements. That Sir George is taking an active, personal part in the movement is proved by the fact that he has been good enough to prepare a short paper for consideration at this meeting. There are other papers of a practical nature for consideration, and the knowledge of the "Road Question" possessed by the writers of the communication, and also by some of those I see around me to-day, augurs well for an interesting discussion, from which I hope much good will result. Sectional discussions, such as the one we had at Yarmouth last year, and the one we are looking forward to to-day, will, I hope, become a fixed part of our annual proceedings. I now have pleasure in declaring the discussion on the papers open, with the hope that as many as possible will give the meeting the benefit of their knowledge and experience.

(To be continued.)

ORPHAN FUND MEETING.

The annual meeting of subscribers to the Orphan Fund was held in the Town Hall, Cheltenham, on Wednesday morning, Mr. J. W. Cockrill in the chair.

Mr. T. COLE read a letter from Mr. O. Claude Robson, hon. secretary and hon. treasurer to the fund, regretting that, owing to an important council meeting, it would be impossible for him to reach Cheltenham in time to take part in the gathering that morning.

Mr. Cole afterwards read the annual report of the committee, as follows:—

ANNUAL REPORT.

To the Subscribers to the Orphan Fund of the Institution of Municipal and County Engineers.

GENTLEMEN, Your committee have pleasure in reporting that the revenue of the Orphan Fund during the year ended December 31, 1913, has been somewhat larger than that of the preceding year, while the benefits derived therefrom by the grantees has also been in excess of that for the year 1912.

The comparative results of income and expenditure for the two years of 1912 and 1913 may be summarised as follows—viz.:—

	1912		1913	
	£	s. d.	£	s. d.
Revenue:				
Balance from previous year	120	1 1	180	10 3
Donations	4	18 6	15	1 10
Subscriptions	128	11 0	139	18 6
Collections at meetings	23	16 3	28	14 3
Interest on investments	33	18 0	36	10 6
Total	£311	4 10	£400	15 4
Expenditure:				
Grants to orphans	120	0 0	170	0 0
Printing, stationery, postages, &c.	10	14 7	9	17 3
Purchase of London County 3 per cent stock			100	0 0
Transfer of stocks to new trustees			3	15 6
Balance carried forward	180	10 3	117	2 7
Total	£311	4 10	£400	15 4

An additional sum of £100 has been invested during the year in London County Council 3 per cent stock, the total amount of the investments now amounting to £1,051 19s., according to the market value at January, 1914, the income derived from which has been £36 10s. 6d. during the year. Owing to the depreciation in securities generally, your committee regret to report a reduction of £47 5s. 8d. in the capital value of the investments as compared to the valuation of 1912.

The accounts of the fund for the year 1913 have been duly audited by the accountants of the institution, Messrs. Wood, Drew & Co., and a balance-sheet duly approved by them is herewith appended, giving details of revenue and expenditure as follows—viz.:

CASH ACCOUNT FOR THE YEAR ENDED DECEMBER 31st, 1913.

Dr.	£	s.	d.	Cr.	£	s.	d.
Balance brought forward, Jan. 1st, 1913	180	10	3	Grants to orphans Case No. 1	10		
Donations	4	18	6	" 2	20		
Subscriptions	139	18	6	" 3	20		
In crest on £148 Portsmouth Corporation 3½ per cent stock	4	17	8	" 4	20		
Interest on £232 L. & N.W. Ry. 3 per cent debenture stock	6	11	0	" 5	25		
Interest on £100 West Ham Corporation 3½ per cent stock	3	1	4	" 6	40		
Interest on £264 15s. 4d. Consols 2½ per cent	6	4	8	" 7	15		
10% London County 3 per cent stock	15	15	10	Purchase of £124 L.C.C. 3 per cent stock	100	0	0
Total	£400	15	4	Transfer of stocks	3	15	6
				Printing, stationery, postages and sundries	9	17	3
				Balance	117	2	7
				Total	£400	15	4

GROSS ASSETS.

	£	s.	d.
Balance on current account	117	2	7
London and North Western Railway stock	179	16	0
Portsmouth Corporation stock	142	1	7
West Ham Corporation stock	86	0	0
Consols	189	19	5
London County stock	453	2	0
Total	£1,169	1	7

Examined and approved,

WOOD, DREW & CO.,

London: 139 Cannon-street, E.C. 4.
29th May, 1914.
Chartered Accountants.

It is gratifying to be able to record an addition of forty-two annual subscribers to the fund during the year 1913, the total that year having been 227, as against 185 in 1912. The donations principally relate to collections made at the various district meetings, and are doubtless the outcome of a circular letter sent by the honorary secretary to the various district secretaries in February, 1913. While fully recognising the addition to the revenue thus generously contributed, your committee cannot but wish that endeavours should also be made to increase the number of annual subscribers, the proportion of the subscribers to the muster roll of the institution being at the present time 13 per cent only.

The amount of subscriptions and donations received for the year 1913 may be summarised among the various districts as follows—viz.:—

Name of District.	Donations.	Subscriptions.	Total.						
	£	s.	d.	£	s.	d.	£	s.	d.
East Midland	5	0		20	9	6	20	14	6
Eastern	1	8	10	25	0	6	26	9	4
West Midland	—	—	—	15	15	6	15	15	6
Metropolitan	2	10	6	17	0	6	19	11	0
North Eastern	7	15	6	15	17	0	23	12	0
North Western	10	10	6	9	19	0	20	9	6
Southern	—	—	—	11	0	0	11	0	0
South Eastern	—	—	—	5	4	6	5	4	6
South Western	2	16	6	2	14	6	5	11	0
Welsh (North)	—	—	—	10	6		10	6	
Welsh (South)	—	—	—	5	3	6	5	14	0
Scottish	—	—	—	1	1	0	1	1	0
Irish	—	—	—	10	6		10	6	
India and the Colonies	—	—	—	2	2	0	2	2	0
Miscellaneous	16	2	3	1	1	0	17	3	3
Non-members	1	6	0	10	10	0	11	16	0

The grants made by the committee during the year have benefited in varying degrees twenty-two children, while one child remains at the British Orphan Asylum until the year 1916 by medium of purchase of a presentation in 1909. The annual expenditure made in the direction of grants is not a vast one, but your committee venture to hope that the modest payments on behalf of the children of our deceased brethren have in all cases proved of timely assistance to those in need.

Your committee, as indeed all members of the institution, much regret the loss of their old and greatly esteemed friend Mr. Charles Jones, of Ealing, who has been a member of the committee and subscriber to the fund from its inception. The vacancy upon the committee thus caused by his death has been filled by the election of Mr. E. J. Eiford, of Southend-on-Sea.

The ordinary vacancies occurring upon the committee were duly filled by the retiring members, Messrs. Blair, Cooper, Richardson and Thomas.

The position of honorary secretary and honorary treasurer has again been filled by Mr. O. Claude Robson, who was unanimously elected to the dual office at your last annual meeting.

LIST OF DONATIONS AND SUBSCRIPTIONS FOR THE YEAR ENDED DECEMBER 31, 1913.

Name.	Donation.		Annual Sub- scription.	
	£	s. d.	£	s. d.
<i>East Midland District.</i>				
Baldwin, L. L., Coalville..	—	—	0	10 0
Baxter, J. G. R., Grimshy ..	—	—	0	2 6
Bennett, E. H., Derby ..	—	—	0	5 0
Brown, A., Nottingham ..	—	—	1	1 0
Brown, C. F., Gainsborough ..	—	—	0	2 6
Burn, W., Sutton-in-Ashfield ..	—	—	0	5 0
Clare, J., Sleaford ..	—	—	0	5 0
Clare, S. F., Sleaford ..	—	—	0	1 0
Clark, W. G. J., Wigston Magna ..	—	—	0	2 6
Clarke, R. E., Arnold ..	—	—	0	5 0
Clews, C. A., Derby ..	—	—	0	10 0
Coales, H. G., Market Harborough ..	—	—	0	10 6
Collinge, T. P., Mansfield ..	—	—	0	10 6
Cook, F. P., Mansfield Woodhouse ..	—	—	1	1 0
Cordon, R. C., Belper ..	—	—	0	5 0
Court, W. H. A., Leicester ..	—	—	0	2 6
Crump, E. H., Hinckley ..	—	—	0	10 6
Elliot, A. H., Nottingham ..	0	5 0	—	—
Fenn, T., Belper ..	—	—	0	2 6
Frank, T. Pierson, Newark ..	—	—	0	10 6
Gordon, T. W., Nottingham ..	—	—	0	5 0
Gray, C. C., Scunthorpe ..	—	—	0	2 6
Haller, J. G., Carlton ..	—	—	0	10 6
Harrison, W. A., Long Eaton ..	—	—	0	2 6
Haseldine, W. S. T., Answorth ..	—	—	0	5 0
Hawley, G. W., Nottingham ..	—	—	0	10 6
Henry, T., East Retford ..	—	—	0	5 0
Hodson, C. F., Lincoln ..	—	—	0	5 0
Hooley, E. Purnell, Nottingham ..	—	—	1	1 0
Hopkinson, F., Worksop ..	—	—	1	1 0
Horton, J. W., Derby ..	—	—	0	10 6
Jaffrey, W., Matlock ..	—	—	0	5 0
Kennedy, J. D., Retford ..	—	—	0	5 0
MacBrair, R. A., Lincoln ..	—	—	0	10 6
Mason, S., Grimsby ..	—	—	0	2 6
Mawbey, E. G., Leicester ..	—	—	1	1 0
Maylan, S., Basford ..	—	—	0	10 6
Oakden, R., juur., Newark ..	—	—	0	10 6
Parker, A. L., Oakham ..	—	—	0	5 0
Parker, S. W., Gainsborough ..	—	—	0	10 6
Rawson, G., Worksop ..	—	—	0	10 6
Ryman, F. R., Stamford ..	—	—	0	5 0
Silcock, H., Mansfield ..	—	—	0	10 6
Tonge, J. A., Mansfield ..	—	—	0	5 0
Ward, J., Derby ..	—	—	1	1 0
Watford, P. A., Newark ..	—	—	0	5 0
Whyatt, H. G., Grimsby ..	—	—	1	1 0
Wright, W., Grantham ..	—	—	0	5 0
Wright, F. W., Ilkeston ..	—	—	0	5 0
<i>Eastern District.</i>				
Adamson, R. A., Chiswick ..	—	—	0	5 0
Barrett, E. J., Staines ..	—	—	0	10 6
Blackwell, E. J., Cambridge ..	—	—	1	1 0
Brown, R., Southall-Norwood ..	—	—	0	10 6
Burton, R. W., Dunmow ..	—	—	0	10 6
Coales, H. F., Sunbury-on-Thames ..	—	—	0	5 0
Cockrill, J. W., Great Yarmouth ..	—	—	1	1 0
Collins, A. E., Norwich ..	—	—	1	1 0
Collis-Adamson, A. C., Highgate ..	—	—	0	5 0
Cooper, L. A., Chiswick ..	—	—	0	10 6
Croxford, C. H., Wood Green ..	—	—	0	5 0
Croxford, J. W., Brentford ..	—	—	0	5 0
Dunn, J., Cambridge ..	—	—	0	10 6
Eiford, E. J., Southend-on-Sea ..	—	—	1	1 0
Farrington, W., Woodford ..	—	—	1	1 0
Fisher, R., Willesden ..	—	—	0	5 0
Gladwell, A., Slough ..	—	—	1	1 0
Goodyear, H., Colchester ..	—	—	0	5 0
Gregory, W., Hatfield ..	—	—	0	5 0
Harrison, P. T., Chelmsford ..	—	—	0	10 6
Haylor, B., Willesden ..	—	—	0	10 6
Hedges, R. N., Tring ..	—	—	0	5 0
James, A. C., Grays ..	—	—	1	1 0
Jenkin, C. J., Finchley ..	—	—	0	10 6
Jones, C., Ealing ..	1	1 0	—	—
Julian, J., Cambridge ..	—	—	0	5 0
Leete, W. H., Bedford ..	—	—	1	1 0
Lovegrove, E. J., Ilornsey ..	—	—	1	1 0
Neave, J., Walthamstow ..	—	—	0	5 0
Robson, O. C., Willesden ..	—	—	1	1 0
Savage, W. H., Cockfosters ..	—	—	1	1 0
Siddons, J. M., Oundle ..	—	—	0	5 0
Smith, F. Hall, Sheringham ..	—	—	0	5 0
Smith, T. R., Kettering ..	—	—	0	10 6
Smith, W. J., Willesden ..	—	—	0	5 0

Name.	Donation.		Annual Sub- scription.	
	£	s. d.	£	s. d.
Smyth, J. H., Willesden ..	—	—	0	10 6
Thomas, R. J., Aylesbury ..	—	—	1	1 0
Wakelam, H. T., Westminster ..	0	7 10	1	1 0
Webb, J. A., Great Stanmore ..	—	—	0	10 6
Willis, E., Chiswick ..	—	—	1	1 0
<i>West Midland District.</i>				
Butt, E. E. W., Birmingham ..	—	—	0	5 0
Clarry, W. A. H., Sutton Coldfield ..	—	—	0	10 6
Clarson, H. J., Tamworth ..	—	—	0	5 0
Cook, F. C., Nuneaton ..	—	—	0	10 6
Curral, A. E., Solihull ..	—	—	0	10 6
Davis, A. T., Shrewsbury ..	—	—	1	1 0
Douglas, S., Kenilworth ..	—	—	0	10 6
Eayrs, T. W., Birmingham ..	—	—	0	5 0
Piddian, W., Stourbridge ..	—	—	1	1 0
Gettings, C. F., Worcester ..	—	—	0	10 6
Greatorex, A. D., West Bromwich ..	—	—	1	1 0
Green, G., Wolverhampton ..	—	—	1	1 0
Jack, G. H., Hereford ..	—	—	0	10 0
King, J. Stuart, Birmingham ..	—	—	0	5 0
Lacey, G. W., Oswestry ..	—	—	0	10 6
Perkins, J., Birmingham ..	—	—	0	5 0
Plant, W., Stafford ..	—	—	0	10 6
Ransom, W., Worcester ..	—	—	0	2 6
Richardson, H., Birmingham ..	—	—	0	10 6
Rogers, W. E., Rugeley ..	—	—	0	10 6
Shipton, T. H., Oldbury ..	—	—	0	5 0
Stilgoe, H. E., Birmingham ..	—	—	1	1 0
Watson, J. D., Birmingham ..	—	—	1	1 0
Willcox, J. E., Birmingham ..	—	—	1	1 0
Willmot, J., Birmingham ..	—	—	1	1 0
Woodward, F., Stourbridge ..	—	—	0	10 6
<i>Metropolitan District.</i>				
Barber, J. P., Islington ..	—	—	1	1 0
Blair, W. N., St. Pancras ..	—	—	1	1 0
Boulnois, H. Percy, Westminster ..	—	—	1	1 0
Cole, T., Westminster ..	—	—	1	1 0
Finch, A. R., Kensington ..	—	—	1	1 0
Giles, H. A., Westminster ..	—	—	0	5 0
Jayward, T. W. A., Battersea ..	—	—	1	1 0
Higgins, T. W. E., Chelsea ..	—	—	1	1 0
Killick, J. S., Westminster ..	—	—	0	10 6
Killick, P. G., Finsbury ..	—	—	1	1 0
Maybury, H. P., Westminster ..	—	—	1	1 0
Moss-Flower, T. J., Westminster ..	—	—	1	1 0
Silcock, E. J., Westminster ..	—	—	2	2 0
Sumner, F., City Corporation ..	—	—	1	1 0
Van Patten, E., Catford ..	—	—	1	1 0
Willcocks, G. Waller, Roehampton ..	—	—	1	1 0
Winter, O. E., Hampstead ..	—	—	0	10 0
Collection at Metropolitan District Meeting (per Mr. N. Scorgie) ..	2	10 6	—	—
<i>North-Eastern District.</i>				
Beaumont, A., Beverley ..	—	—	1	1 0
Beaumont, G. E., Grenoside ..	—	—	1	1 0
Burton, W. E. H., Wakefield ..	—	—	0	10 6
Dean, S., Barnoldswick ..	0	10 6	—	—
Dickinson, R., Berwick-on-Tweed ..	—	—	0	5 0
Drew, J. H., Wath-on-Dearne ..	—	—	0	10 6
Foster, H. P., Leeds ..	—	—	0	2 6
Green, W., Castleford ..	—	—	0	5 0
Hadfield, W. J., Sheffield ..	—	—	1	1 0
Hailstone, T. H., Birstall ..	—	—	0	2 6
Hart, G. A., Leeds ..	—	—	0	10 6
Haywood, S. S., Brighouse ..	—	—	0	5 0
Ives, L., Wakefield ..	—	—	0	10 6
Kirby, T. O., Doncaster ..	—	—	1	1 0
Lancashire, W. T., Leeds ..	—	—	1	1 0
Loach, A. E., Wakefield ..	—	—	0	5 0
Lund, C., Cleckheaton ..	—	—	0	5 0
Martin, E. B., Rotherham ..	—	—	0	10 6
Massie, F., Wakefield ..	—	—	1	1 0
Mathews, E. R., Bridlington ..	—	—	1	1 0
Roseveare, L., South Shields ..	—	—	0	10 0
Rothera, A., Liversedge ..	—	—	0	2 6
Senior, S. M., York ..	—	—	0	2 6
Southwart, J., Rothwell, near Leeds ..	—	—	0	5 0
Steele, W. J., Newcastle-on-Tyne ..	—	—	1	1 0
Thackray, F. J., Hoyland Nether ..	—	—	0	2 6
Thompson, G. W., Hipperholme ..	—	—	0	5 0
Wakeford, J. P., Wakefield ..	—	—	0	10 6
Wike, C. F., Sheffield ..	—	—	1	1 0
Wilson, R. E., Knaresborough ..	—	—	0	2 6
Wrigley, G. E., Sowerby Bridge ..	—	—	0	5 0
Collection at Newcastle Meeting (per Mr. J. P. Wakeford) ..	4	2 0	—	—
Collection at Harrogate Meeting (per Mr. J. P. Wakeford) ..	3	3 0	—	—
<i>North-Western District.</i>				
Brodie, J. A., Liverpool ..	—	—	1	1 0
Brodie, J. S., Blackpool ..	—	—	1	1 0
Diver, D. J., Marple ..	—	—	0	10 6
Halstead, B., Brierfield ..	0	10 6	—	—
Heath, J., Urmston ..	—	—	0	5 0
Hellawell, O., Withington ..	—	—	0	10 6
Meade, T. de Courey, Manchester ..	—	—	1	1 0
Platt, S. S., Rochdale ..	—	—	1	1 0
Preece, A. J., Lytham ..	—	—	0	10 6
Smith-Saville, R. W., Darwen ..	—	—	0	5 0
Stubbs, W., Blackburn ..	—	—	0	10 6
Surtees, R. T., Newton-in-Makerfield ..	10	0 0	—	—
Travers, W. H., Wallasey ..	—	—	0	10 6
Wilding, J., Runcorn ..	—	—	0	10 6
Wiles, J. W., Manchester ..	—	—	0	10 6
Wolfenden, B. J., Bootle ..	—	—	0	10 6
Worrall, E., Manchester ..	—	—	1	1 0
<i>Southern District.</i>				
Frost, H., Gosport ..	—	—	0	10 6
Guibert, T. J., Guernsey ..	—	—	1	0 6
Hawkins, J. F., Reading ..	—	—	1	1 0
Jones, Lieut.-Col. A. S., Finchampstead ..	—	—	1	1 0
Lemon, Sir J., Southampton ..	—	—	1	1 0
McKenzie, L. S., Bristol ..	—	—	1	1 0
Phipps, F. R., Basingstoke ..	—	—	0	10 6
Pickering, J. S., Cheltenham ..	—	—	0	10 6
Read, R., Gloucester ..	—	—	1	1 0
Stallard, S., Oxford ..	—	—	1	1 0
White, W. H., Oxford ..	—	—	1	1 0
Yabbicom, T. H., Bristol ..	—	—	1	1 0

Name.	Donation		Annual Sub- scription.	
	£	s. d.	£	s. d.
<i>South-Eastern District.</i>				
Busbridge, T. A., Maidstone			0	10 6
Grant, F. T., Gravesend			0	10 6
Howard, H., Littlehampton			0	10 6
Jones, H. O., Folkestone			0	5 0
Norris, J. H., Godalming			0	10 6
Palmer, P. H., Hastings			1	1 0
Scott, H. H., Hove			1	1 0
Wilkinson, F., Wimbledon			0	5 0
Wood, F. J., Lewes			0	10 6
<i>South-Western District.</i>				
Chapman, H. T., Wells			1	1 0
Chowins, W. H., Burnham			0	10 0
Hutton, S., Exmouth			0	10 6
Saunders, E. Y., Barnstaple			0	10 6
Stephens, R., Ilminster			0	2 6
Collection at Tiverton Meeting (per Mr. H. T. Chapman)	1	12 3		
Collection at Paignton Meeting (per Mr. D. Edwards)	1	4 3		
<i>Welsh District (North).</i>				
England, J., Wrexham			0	10 6
<i>Welsh District (South).</i>				
Bell, G., Swansea			0	10 6
Bell, G. H., Swansea			0	5 0
Greenhill, F. M., Cardiff	0	10 6		
Harpur, W., Cardiff			1	1 0
Harpur, W. L., Brecon			0	5 0
Harvey, F. F., Merthyr Tydvil			0	10 6
Holden, L., Cardiff			0	2 6
Hybart, F. R., Barry			0	5 0
Jones, D. L., Merthyr Tydvil			0	2 6
Jones, W. J., Pentre, Rhondda			0	10 6
Priestly, C. H., Cardiff			0	10 6
Read, F., Pentre, Rhondda			0	10 6
Rimell, H. C., Cardiff			0	5 0
Shellard, I. F., Newport, Mon.			0	5 0
<i>Scottish District.</i>				
Campbell, A. H., Edinburgh			1	1 0
<i>Indian District.</i>				
Salkield, T., Delhi			1	1 0
<i>Irish District.</i>				
Hannigan, J. J., Monaghan	0	10 6		
<i>Abroad.</i>				
Bush, W. E., Auckland, N.Z.			1	1 0
<i>Miscellaneous.</i>				
Collection at Annual Meeting of Institution (per Mr. J. W. Cockrill)	16	2 3		
Lower Thames Valley District Surveyors' Association			1	1 0
<i>Non-Members of Institution.</i>				
Biggs, Mrs., Richmond			0	10 6
Carpenter, F. G., Wakefield			0	10 6
Cooper, C. H., Wimbledon	1	1 0		
Gunnis, J. W., Longford, Ireland			1	1 0
Humphreys, H. B., Westminster			1	1 0
Mansergh & Sons, Westminster			1	1 0
Renwick, H., Ilorsham	0	5 0		
Editor, THE SURVEYOR			5	5 0

The CHAIRMAN moved the adoption of the report, and proposed that the thanks of the meeting be accorded to Mr. Robson for his services as hon. treasurer and hon. secretary.

Mr. E. WILLIS (Chiswick) seconded. He had been connected with Mr. Robson for many years as his assistant, and later in connection with the Orphan Fund. No one could take a greater interest in the fund than Mr. Robson had done.

Mr. H. GILBERT WHYATT (Great Grimsby) said he would like to support the motion chiefly for the purpose of suiting Mr. Robson's convenience at future meetings. If in future years it was possible to have the meeting on the Thursday or Friday morning it ought to be done. He considered that the meeting ought not to be fixed without asking Mr. Robson if he could be present. He was sorry, and yet pleased, that other districts had beaten the East Midland in the amount subscribed, but they had not beaten them in the number of subscribers.

Mr. H. PERCY BOULNOIS (Westminster) commented on the fact that the Eastern District appeared to do so much better than the Western. With regard to the Metropolitan District he thought the position was most disappointing. There were sixteen subscribers, eight of whom, being in private practice, did not benefit one atom from the scheme. He supported the suggestion as to Mr. Robson; but for him the thing would have died out. He had used his energies in a marvellous way.

The CHAIRMAN remarked that the rise in the amount from the Eastern District was due to the annual meeting being held at Yarmouth and the collection of £16 or £17 taken there.

Mr. WHYATT: No, sir; your collection is given separately at the end of the report.

The PRESIDENT: I am glad it is so, and will try to maintain it if possible.

Mr. G. WILLIS (Chiswick) proposed the re-election of Mr. Claude Robson as hon. secretary and treasurer.

They all knew the interest Mr. Robson had taken in the fund. There was one point in the report—the increase in the grants from £120 to £170. That, for a small fund, was exceedingly good.

Mr. G. W. LACEY (Oswestry) seconded, and remarked that he could bear out all that had been said as to the interest Mr. Robson took in this fund. If anything could be done so that they could have his presence at the meeting, it would meet with the unanimous support of the subscribers. He would like Mr. Robson to take another opportunity of asking for the appointment of a charity steward in each district. Subscriptions of a guinea or half-guinea were not expected from the members generally, but they would be glad to receive amounts of 5s. or 2s. 6d.

Mr. F. MASSIE (Wakefield) said he was pleased this question of the appointment of a charity steward for each district had been raised. He had acted as chairman of the North-Eastern District for two years, and the secretary of the district was with him, and they were not aware of any request ever having been made to appoint a charity steward. The only way they could get the members to subscribe to this fund was by a personal canvass. About eighteen months ago he sent a circular to 150 members, and he got only three replies. He agreed that each district should be asked to appoint a charity steward, and thought that if this were done the subscriptions to the fund would be increased.

Mr. A. J. WEBB (Hendon) expressed the thanks of the members to the chairman for the great interest taken by him in this fund. At every meeting he had attended he had made a special point of asking the members present to subscribe.

Mr. E. WILLIS (Chiswick) supported the proposal to thank the chairman. He added that the wives of some of their members had expressed a wish to be allowed to subscribe, and if this were permitted he thought it would be advantageous to the fund.

Mr. E. PURNELL HOOLEY (Nottinghamshire) supported the idea of obtaining the help of the ladies. He had found that ladies were far better cadgers than men. If they got a ladies' committee to help them they might strengthen their resources very greatly. He had hoped to see one lady who had taken a great interest in the fund, and intended to ask her to take up the position of secretary. Might he hope that Miss Cole would come to their rescue, and that her father would back her up and guide her as he had done so well in the past?

Mr. E. WILLIS then proposed that a Ladies' Committee be formed, consisting of Mrs. Cockrill, Mrs. Thomas, Mrs. Hooley and Mrs. Hayward, with Miss Cole as secretary.

Mr. HOOLEY seconded, and it was carried.

THE ANNUAL DINNER.

The annual dinner of the institution was held on Wednesday evening in the town hall, the president, Mr. J. S. Pickering, in the chair.

Sir JAMES LEMON proposed "The Mayor and Corporation of Cheltenham." He remarked that when they tried to do good for themselves they also did good for the town which they served. They had been exceedingly well treated in the town of Cheltenham, and they congratulated themselves they were visiting that beautiful town. It had many advantages, but the authorities had utilised those advantages to the best of their power. The town had a reputation for its educational facilities, and Cheltenham College was one of the best schools in the country.

The MAYOR OF CHELTENHAM (Alderman Skillicorne), in responding, said they felt very proud of Cheltenham and its character as a garden town. He had had twenty-six years as a member of the corporation, and since he had been an alderman, or in the House of Lords, so to speak, he had taken a different view of things. He had the greatest sympathy with the officials. He often thought the official of a corporation was not quite so happy as the official of a private firm. He thought the time had arrived when pensions should be given to their officials when they retired from their arduous duties.

Mr. AGE GARDNER, M.P., proposed "The Institution of Municipal and County Engineers." He remarked upon the great problems of sanitation, housing and town planning, which confronted them, and said they were greatly indebted to the institution for having assisted local government in the way it had done. They were greatly indebted to Mr. Pickering in Cheltenham. He had been with them for eleven years. They could not offer too warm a

tribute to his zeal and the energy and ability with which he had discharged the duties of his high office.

The toast having been honoured,

Mr. J. S. PICKERING, in responding, said he had to thank Mr. Agg Gardner for the kind and graceful manner in which the toast had been proposed, and the hearty and generous response that it had secured. It was particularly gratifying on the visit of the members to Cheltenham that the success of the institution should be proposed by Cheltenham's most distinguished townsman. Mr. Agg Gardner having spent a most successful career in the service of his country and the town, it enabled him to speak with experience of the public benefit that was derived from institutions such as their own, and one looked upon it as a very great thing to have as their guest one who was held in such high esteem by his fellow townsmen and all who had the honour of his acquaintance. It was probably not generally known that this was the third occasion on which a meeting of the institution had been held in Cheltenham. The first meeting was in its early days, and so long ago that it had almost sunk into oblivion. Although it was thirty-nine years since the meeting was held, it was worth recording for several reasons, as the proposer of the toast then represented Cheltenham in Parliament, and had continued to do so, with only a slight interruption, ever since. That was a record of which the town might be proud. There was another reason why the meeting in 1875 was of interest. The town surveyor, Mr. Humphreys, read a paper in which it was considered the town had a low death-rate—17.2 per 1,000. Cheltenham had made remarkable progress since then, and had reduced its death-rate by something like 6 per 1,000. The mayor had told them the people in Cheltenham lived to 100 years, but if this rate of progress continued in the same ratio the death-rate would be nil. The institution had made very great progress during the forty-one years of its existence. The Cheltenham meeting of thirty-two years ago was attended by thirty-nine members, and to-day it was attended by over 400. The membership at that time was a little over 100; to-day it was over 1,700. It was not merely in numbers they had increased; the institution had grown in strength and influence, and it was now realised as essential to the well-being of the municipal engineering profession,

and also the development of measures brought about with the object of securing the health and convenience of humanity. For some years they had invited delegates to their annual conferences, and he felt sure it was to the mutual advantage of the members of the institution and the delegates who attended. Members of councils and their officials had one common object in view—that was the good of the town they had to serve. If the administration was to be carried out with the very best results it was essential that they should have complete confidence one in the other. Local government in this country compared favourably with any other country in the world, and he thought it was a matter for congratulation that our civic life was free from the dishonesty and corruption which was not uncommon in many parts of the world. One of the objects in the formation of their institution was to secure for their members some form of protection. There had been times when such a protective measure would have been a great advantage, but happily the local authorities had recognised not only the responsibility of their own position and that of the officials, but that these protective measures had become less and less necessary, though it did seem in the smaller towns that protection was necessary. He had now been connected with the institution for twenty-seven years, first as a graduate, and for the past seventeen years he had had the honour of a seat on the council. Apart from the professional advantage he had gained he valued even more the lasting friendship he had formed among the members. There was a freemasonry among their membership of which others knew nothing, but which, among those who participated, was highly prized. He appreciated to the fullest extent the honour they had conferred upon him in electing him president of the institution. He hoped that meeting would be the beginning of another era of very great prosperity for their institution. (Cheers.)

Mr. J. S. BRONIE (Blackpool) proposed the health of the ex-president and Mrs Cockrill, to which Mr. Cockrill responded.

Mr. H. E. STILGOE (Birmingham) proposed "The Visitors," for whom Alderman Wagborne, deputy mayor, Mr. H. R. Aldridge, and Mr. T. Adams, Local Government Board, responded.

Mr. NORMAN SCORGIE (Hackney) proposed "The Ladies," and Mr. F. C. Cook (Nuneaton) responded.

SCOTTISH DISTRICT MEETING AT DUNFERMLINE—(Conclusion).

Three papers on subjects connected with town planning came before the recent annual Scottish District meeting of the Institution of Municipal and County Engineers at Dunfermline. One of these—"A Town Planning Scheme: Its Effect on Housing and Architecture," by Mr. Raymond Unwin—was reproduced in last week's SURVEYOR, and we give the other two—"Early Examples of Town Planning in the City of Edinburgh," by Mr. A. H. Campbell, M.I.N.S.T.C.E., engineer to the corporation, and "Town Planning from a Lawyer's Point of View," by Mr. John L. Jack, town clerk of Dunfermline—in the present issue.

DISCUSSION OF MESSRS. CAMPBELL'S, JACK'S AND UNWIN'S PAPERS.

The CHAIRMAN (Mr. J. Bryce) congratulated the authors upon having given a vigorous, concise, lucid and helpful explanation of their papers.

Baillie FRASER (Edinburgh) said he was impressed with what Mr. Jack had said as to the legal aspect of this question, because as a rule it was legal matters which upset the apple-cart. Mr. Campbell's paper was very interesting to him, although it dealt with matters which were quite familiar to him. They had giants at town planning in the days referred to in Mr. Campbell's paper, but Edinburgh had afterwards sadly fallen off in that matter. They started splendidly, but it should be remembered that Edinburgh in those days was owned entirely by the corporation and one or two trusts, so that the land to be dealt with was then entirely under public control. Competitive designs were asked for planning out the land, and the competitors were given full instructions as to what was required. Now they had so many different owners that it was almost impossible to do anything of the kind; it was a matter of compromise, and they could not lay down any hard-and-fast general rules. They had to try to do something which would not injure the owners of the land, and would at the same time be for the advantage of the public, and often it was very difficult to reconcile the two interests. The town planning carried out in Edinburgh up to forty years

ago was fairly good, but then the land began to be sold to speculative builders, and streets were made of insufficient width, and laid out without any regard to what was best for the city as a whole, and houses were densely packed together. With their present town planning powers he hoped they would not again allow such things to happen. They would certainly see that the roads were of sufficient width, that the density of population was kept down to a reasonable figure, and that every dwelling had plenty of fresh air and light round it. They had five areas under consideration; three had been sanctioned by the Local Government Board, and one had been advertised. A fifth was in progress for 1,500 acres.

Mr. ROSS YOUNG (Lanarkshire) remarked that in town planning the difficulties only arose when they were actually getting to work. Mr. Jack had raised a very important question as to their powers in prescribing a width for county roads. In burghs they could bargain with landowners on the basis of prescribed widths of roads, but where the road was in a county they had a difficulty in bargaining with landowners, because the landowners could say: "I can make my road any width I like, and this road you have planned is far too wide for my purposes." If they could prescribe that the county roads should be the same width as in the burghs, then they had got a good way in advance. Mr. Unwin's paper was one of the best contributions they had to the subject. He would have liked Mr. Unwin to explain to what extent it was desirable to go into details in a town planning scheme. Some recommended showing only the arterial roads, others recommended showing the arterial and subsidiary roads, leaving out only the minor roads. He found great difficulty in laying out the roads before one had a complete plan and negotiated with the landowner, who always wanted to know how the scheme was going to suit his building plots. If they were going to secure open spaces in proper positions they must have a proper scheme; they required a full detailed plan in order to save those open spaces. In all the schemes which had been prepared, the land

unit question had been dealt with in different ways. He believed that the Birmingham, Ruislip and the German schemes all differed in regard to that matter. As to applying the land unit, they wanted to know whether physical boundaries settled the matter. There was much to be said for that method. Then Mr. Unwin raised the question as to the power an authority might exercise with regard to the design of a building. He was not sure that the Act provided for that. He did not think they could say to the person building that his design was not very pretty, and they would not allow it. An important question raised by Mr. Jack was as to the extent to which building could go on while the scheme was being got through. In one case they had 200 or 300 houses built while they were getting authority for a scheme; but these had been only under a feasible scheme put forward under the Building Act. On the other hand, if they had such things as lodging-houses in unsuitable positions they said to those concerned: "If you go on you go on at your own risk." They had not restricted building by having a town planning scheme, but it was important to fix their main lines so as to obtain immediate control over the area. There was a great variety of opinion as to the amount of contouring requiring, and as to its value. For a small burgh the contouring of 800 or 1,000 acres was a very big job; 50 or 60 acres a day was a fair day's work.

Baillie NORVAL (Dunfermline) said they contoured the whole of their 8,000 acres in six months to 5-ft. contours. They did it in the summer time, and of course they had to delay a good deal while the crops were on, and so they did not get it finished until the autumn. Their town planning scheme was now practically finished. They had had very great difficulties with the Admiralty in the first instance, but these had now been got over. They felt that Dunfermline had done some very effective spade work so far as Scotland was concerned in adapting the provisions of the Town Planning Act to Scottish requirements and Scottish necessities. It had been suggested that a ceiling height of 8 ft. or 8 ft. 6 in. was much too low. He did not know how it would be received in Scotland, but they had incorporated those figures in their scheme—8 ft. 6 in. for the ground floor, and 8 ft. for the top floor of cottages. They considered that by giving ample cubic air space they compensated entirely for the lowness of the ceiling. If any of them had ever lived in a house with an 8-ft. 6-in. ceiling height they would realise, provided they had sufficient floor space, that it was not such a very low ceiling after all, and that the room was quite comfortable. They had put that into the scheme in deference to the Admiralty, whose opinion was that houses of the English type should be provided for the large population from England that was expected to settle in Dunfermline for the working of the naval base. Those would be the first houses to be built in the new area, and they would serve as an object lesson for the rest of the area after the scheme had got under way. The main feature of the scheme was actually the provision of two large main arteries leading direct from the naval base to Dunfermline, and an endeavour to preserve to the utmost the individuality and character of the old town. They had planned these two main boulevards to make them attractive arteries, to induce the population to gravitate north towards the old centre.

Mr. J. THOMSON (Dundee) said they had started with 25 acres of land to make open spaces. They were threatened with building operations, and they did not know how to deal with the party who proposed to build within their area, particularly with regard to the boundaries of his feu. Their task was to deal with things as they were, and not with things as they would like them to be. As to betterment, they had difficulties with parties who said their property was being deteriorated, and with other parties immediately adjoining whose properties they assumed would be bettered.

Councillor DEAS (Edinburgh) asked as to the possibility of having competitive schemes for different areas. Reference had been made to the new town of Edinburgh having been the result of competitive schemes, and he would like to know whether the principle was feasible under present-day conditions.

Mr. J. YOUNG (Ayr) proposed a vote of thanks to the authors of the papers. He thought that of Mr. Unwin was like his book—suggestive and inspiring. Mr. Unwin had gone into the principles of town planning schemes very thoroughly, and had raised a very high ideal in their minds as to what to attempt in planning out different areas. Then Mr. Jack, with his practical and thoroughly Scottish mind and legal

acumen, had set forth all the difficulties authorities had to encounter in getting up a town planning scheme, and putting into the scheme those regulations which were so important to its success. An outstanding feature of all town planning schemes was the size of the land unit for the different classes of properties that were likely to be erected in the areas dealt with in different schemes. He would like an expression of opinion as to what should be the size of the land unit—whether 3 acres, 5 acres or 10 acres—and whether the unit should be marked off irrespective of any natural boundaries, proprietary boundaries, or main or secondary boundaries; also whether any compensation would have to be paid to proprietors for leaving land marked off as land units. Again, whether compensation should be paid for the different classes of land, the different manner in which the land was to be developed, whether for small cottage property or for expensive villas, or for factories, or for works of a public character, open spaces, or other things.

Mr. W. A. MACARTNEY (Johnstone), who seconded the vote of thanks, said each paper had a distinct individuality, and each was of great value to the public. It was sometimes laid to the charge of engineers that their designs were not very pretty; but, generally engineers' designs were workable, and that was the main thing to be considered. Mr. Jack's paper gave them some very necessary information as to dealing with the grievances of persons affected by schemes. They were bound to have laws to keep themselves and other people in order, and they must have regulations made in compliance with those laws. If the authorities did all the building that was carried out, they would not require schemes; but there were men who were out simply to make money, and it was desirable to have limitations to place upon these gentlemen and their shrewdness and foresight. In laying out a new area such as Hampstead, they could ensure model conditions, and regulate the building; but in an old town they had to make the best they could of an unsatisfactory state of things. As to the height of rooms, that was a question of the kind of construction. If they were putting up tenements, as, unfortunately, had been done, and was likely to be done, in Scotland for many years to come, they must insist upon a certain cubic space, and, owing to the price of land, it was easier to get it upwards than horizontally. As long as they had the tenement style of construction it would be necessary to insist upon a good height of ceiling; but where there were commodious ground-floor houses, then the type of construction agreed to in the case of Dunfermline was feasible and would be satisfactory.

The CHAIRMAN said he hoped that in the Dunfermline scheme they would be able to abolish the tenement system throughout the area. He did not see why they should not be able to do this, because he understood that the land was to be got from £10 an acre per annum. In Glasgow and its suburbs they had to pay six to ten times the price, so that there they were up against the tenement system, and had been so at all the conferences that had taken place during the past year. It was impossible to get cottages where they wanted them in Glasgow, but he did not see anything impossible in regard to getting them in the Dunfermline area. He was sure that Dunfermline had the sympathy of the whole of that meeting in the hope that tenements would not be planted in that area. He was inclined to think that the Town Planning Act gave them some control over the character of the buildings, and he thought that every locality who went in for a town planning scheme should have an advisory architect. It would probably not be possible for a small authority to have an architect permanently employed, but they could retain a man of some standing to whom plans could be referred when necessary. In a city it was not difficult to keep an architect for that work; but every authority should be in a position to prevent the monotonous, repulsive style of building that had been going on for so many years in their Scottish towns.

The vote of thanks was carried.

Mr. CAMPBELL, in reply, said Mr. Unwin had dealt with the character of buildings, and referred to the control which the Act gave in that respect. Mr. Unwin thought that this would be held to embrace some control over the style of the elevations of the buildings. That was a matter which had engaged their attention in Edinburgh very much. Some of them thought that in such a city, and, indeed, in most cities, they ought to be able to exercise some sort of local oversight and some judicial authority in requiring any alteration or modification of the design or elevation; but up to the

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present moment he was bound to say that they had failed to get that. They had no precise specific power in that respect, saving as to the material to be used in the elevation. In the Dean of Guild Court in 1883 they were held to have a complete dominant with respect to the material to be used in the elevation, but with regard to the style of elevation they had not that power. Mr. Unwin asked whether they should not have that power. The latest example they had was in the Ruislip scheme, where the Local Government Board granted that some form of control might be exercised, though he thought it was not very effective. The clause in the draft order read: "In regard to the design of the buildings to be erected, if the council are of opinion that the character of the buildings, whether on account of the design or the undue repetition of the design, or the materials to be used or proposed to be erected, would be injurious to the amenity of the neighbourhood, the council may, subject to an appeal to the Local Government Board, require reasonable alterations to be made." He understood that in Dunfermline they had gone one better, and Mr. Jack would no doubt explain in his reply how in Dunfermline they were superior in this respect. But even that, he thought, was not very effective. Control was already granted to many authorities in English cities, particularly the power to control elevation upon land which, on account of new areas carried out by the council, became frontage land. The council were then supreme in the matter of elevation without further trouble—in fact, without appeal. The landowner, or person proposing to build, could not proceed without the consent of the council. He thought that, as in an ordinary case of back land becoming front land, Parliament had sanctioned the granting of that power, the Local Government Board, both in England and Scotland, should grant some greater measure of authority and control in dealing with elevations. For the want of such a power they had to put up with such elevations, to take a notorious case, as that which in Edinburgh had quite ruined the Canongate. There they had something which was nothing short of a monstrosity. In order to preserve the amenities of architecture, the local authorities ought to be granted much greater powers than they now possessed.

Mr. RAYMOND UNWIN, replying to the criticism as to the height of ceilings, said if they were going to lodge a number of families in one room the limit of the number of families was the limit of floor space,

and they must have high ceilings. But he hoped they were going to change that in Scotland, and were going to use the Town Planning Act to control the land in such a way that they would not be forced to pile families one upon another as in times past. The builder should be persuaded that he would be wise in building over as wide an area as possible so as to get as many acres as possible covered. That was the whole secret of town planning. They would not find in countries where town planning had been put into practice those dreadful tenements. Every family ought to have a cottage of five or six rooms, and they would find it better to have the space outwards than to have it upwards. With regard to the character of buildings, he could only say that he thought that what their chairman said was well worthy of consideration. Architects thought that there ought to be architectural control over the elevations of buildings so as to get a harmonious effect, and this could not be achieved if people were allowed to put up whatever they liked. The Local Government Board were advised that in England this control could be exercised under the Town Planning Act. He heard only the other day of a deputation from the Royal Institution of British Architects to Mr. Samuel, who, in all probability, would propose to substitute an appeal to an architect appointed by the R.I.B.A. for the appeal to the Local Government Board. Personally, he did not say that that was the best course, but it was evident that they had the sympathy of the Local Government Board. The suggestion by Mr. Bryce of a consulting architect for a local authority was one that deserved consideration; but it would not meet every case. Where the elevation was in question the surveyor was not the man to decide: just as they would not expect an architect, as a rule, to have studied road problems. He thought there should be an appeal to some impartial person appointed, probably, by the Local Government Board, who should decide whether or not what the architect required was of sufficient importance to put the expense of it upon the man who was to build. He thought it was best to have a practising architect of some standing to whom the plans could be submitted; the cost would be trifling, and the improvement in the town would be vastly greater than in any other way. As to the details of a scheme being shown on the plan, he believed that the right way in town planning, and the way in which they would very shortly be expected to proceed, was to have two stages, and that on the first they should have a somewhat definite skeleton plan. Then they should proceed to get agreements between the landowners and the local authority so as to avoid running any risks of having difficulties afterwards; that was a point not provided for by the Act. Then they would be in a position to superimpose details. The whole area of a town ought to be protected at once, and the chief roads should be indicated, and other points, which were of very great importance as putting limitations on the use of the land, should be sent out as soon as possible. Then they could go on and prepare their detailed scheme, and that was where time ought to be taken. The first stage ought to be quick, and the second very slow; whereas it was too often the case that the first stage had to hurry over the second stage because they had difficulties which had not been provided against in the first stage. He quite agreed with the gentleman who said that they must at once state their outline to a large extent, so that they might get their main lines rightly placed and the details filled in. But it was dangerous to put too much detail into the plan unless they could find some way, as had been done in Dunfermline, to provide a certain series of detailed roads which were specially indicated on the plans, though, of course, subject to some possible modifications. As to contouring, it was far and away the most economical thing to contour their land before laying out a road.

Mr. JACK, in reply, said that in the Act of 1899 there was a provision that a town planning scheme could only be followed by a subsequent scheme prepared in the same manner. It was a very serious question whether, if once roads were laid down, they were not bound to be made according to the provision of the Act. He was rather inclined to the view that the roads as laid down in the plan could not be departed from except by means of another scheme. With regard to the character of buildings, he was inclined to the view that they had control over the design, and could regulate the height and character of the buildings with a view to the amenity of the neighbourhood. In the Dunfermline scheme they had a clause that, if the council were advised that certain

designs would be detrimental to amenity they might demand such alterations as they might be advised were reasonable, subject always to an appeal to the Local Government Board, with a further appeal, on points of law, to the Court of Quarter Sessions. In Dunfermline they had been very successful so far in making agreements with landowners with respect to matters connected with the plan, the arrangement generally being that the council made no claim for betterment, and the landowner no claim for compensation. With regard to building in an area after a town planning scheme had been projected, one gentleman had told them that the Act of 1909 was prepared with a view to dealing with conditions in England. Parliament was asked to have that Act held over in order that provisions might be inserted dealing with Scottish conditions, but the only concession they could get through was one with regard to the notices necessary before a scheme could be entered into. In England it was usual to issue certain notices to all the landowners, occupiers and tenants in the district. That, in fact, was the original regulation, but he understood that under the new regulation the English authorities would be put into the same position as the Scottish. In Scotland all they had to do was to put notices in the newspapers in the first instance; but when they applied for the approval of a scheme they had to give these individual notices to owner, occupier and tenant. He considered that was all nonsense, because the notice in the papers was quite sufficient. With regard to the control of the land while the scheme was being got through, it was complained that, from the moment a scheme was applied for the land for building purposes was sterilised. That was a point which they could have dealt with if they had been framing the measure to meet Scottish conditions. If they had had the framing of this Act for Scotland, no doubt they would have made provision that no building should be allowed within the area except with the consent of the responsible authority. In that case no landowner or feuer would have suffered greater detriment than at the present moment. He believed people in Dunfermline were taking risks in the building of houses which, if they had been clients, he would have advised them not to take. One such case came before the court only that week. A man wanted to put houses on the area of a proposed road; but a man who took that risk under their scheme or any other scheme must know that when the road came to be made under the town planning scheme his house must come down. With regard to the height of ceilings, he thought there was an impression that in the Dunfermline scheme they were proposing to allow 8 ft. 6 in. in all houses. What they were doing was to allow these low ceilings only in houses that were not built for tenements.

Mr. CAMPBELL said it had been made evident that the great problem of town planning was the monopoly of no particular individual or profession. It was the business of the architect, the lawyer, the landscape gardener, and, above all, the guiding and restraining and providing hand of their committees, were all necessary. With the power of organisation the Act gave them, they might hope to see something better arising in the areas under their control than the haphazard, confused mess which, during the last forty or fifty years, and grown up to the disgrace of our cities and towns.

Bath Sewage Disposal Scheme.—The Bath sewage disposal works, which have involved an outlay of £224,682, were formally opened last week.

Rural Council's Conference.—At the resumed conference of rural councils, held at the Guildhall, London, referred to in last week's issue, a resolution was agreed to that, in order to minimise the unavoidable delay imposed on rural councils desiring to adopt the Private Street Works Act, 1892, the Local Government Board be urged to invest rural councils with the powers of that Act generally, without requiring them to obtain a separate Order for every street or block of streets to be made up. On the proposition of Mr. H. S. Tebbitt, surveyor to the Tutbury Rural District Council, the Executive Committee were instructed to consider the granting of powers to local authorities to enforce the cutting of hedges and the lopping of trees where they obstructed the view of traffic, and to empower the authorities to refuse plans for new buildings, the erection of which would cause danger or risk to users of motors or other vehicles, or to the general public.

HEAVY MOTOR VEHICLES AND TRACTION ENGINES ON ROADS.

DEPUTATION TO MR. HERBERT SAMUEL.

On Wednesday a deputation from the County Councils Association of England and Wales and of Scotland, and of the Urban and Rural District Councils Association, waited on the President of the Local Government Board to urge an amendment of the law and the administrative regulations with respect to heavy motor-cars and traction engines. The deputation suggested that heavy motor-cars and traction engines should pay an adequate licence fee, the proceeds of which should be distributed among road authorities, and that trackless trolley services and motor omnibuses should contribute towards the maintenance of roads, while road authorities should have power to regulate the running of such vehicles.

Mr. Herbert Samuel, in reply, said he proposed that a technical committee should review the regulations relating to weight and other technical questions. He fully recognised there was a general sense of injustice that these vehicles which did so much damage did not contribute more towards the cost of roads, and the deputation had made out a strong case for calling on them to pay a larger sum and for the proceeds to be distributed to the local authorities. Whatever was done, let them not return to the system of the toll bar. That matter, however, was one for the Chancellor of the Exchequer, and while it could hardly be added to this year's Budget, he hoped the time was not far distant when the wishes of the deputation would be to some degree met. He also announced that a Joint Committee of both Houses of Parliament would be proposed to consider what provisions should be inserted in local bills dealing with motor omnibuses and trackless trolley services, and whether general legislation dealing with those services was required.

HERTFORD COUNTY SURVEYORSHIP.

SELECTION COMMITTEE'S RECOMMENDATION.

The committee having in hand the selection of a successor to Mr. Urban A. Smith, M.INST.C.E., county surveyor of Hertford—now consulting engineer and surveyor to the council—have recommended the appointment of Mr. J. S. Killick, ASSOC.M.INST.C.E., assistant engineer to the Road Board.

Prior to securing his present position, Mr. Killick was for nearly eight years surveyor of highways to the Croydon Rural District Council. He served his articles with the present county surveyor of Oxfordshire, and in 1897 became an assistant in the office of the surveyor to the Hoyland Nether, Yorks, Urban District Council, being appointed a year later an assistant surveyor under the Wombwell Urban District Council, in the same county. From 1899 to 1904 he held the position of surveyor to the Maidstone Rural District Council.

The Hertfordshire appointment, which comes up for confirmation at a meeting of the county council on July 20th, carries with it a commencing salary of £800 per annum.

Profits on London Housing Schemes.—According to a report submitted to the London County Council on Tuesday on the housing of the working classes, the financial results of the year ended March 31st last show a net surplus on all dwellings and estates in course of development of £15,977, compared with £7,298 in 1912-13. This is stated to be the most favourable result attained by the council.

County Councils Association.—At a meeting of the council of this body in London on Wednesday a number of resolutions relating to the Finance Bill were adopted, and approval given to the general principle of substituting Exchequer grants for assigned revenues. Among the resolutions was the following: "Roads.—(a) That the paragraphs with regard to roads in the second column of Part I. of the second schedule will be extremely uncertain and unequal in application unless at the same time the law relating to main roads is amended; (b) that, for the purposes of these grants, 'roads' should include bridges and bridge roads."

Assistants' and Students' Section.

CONDUCTED BY SYDNEY G. TURNER, ASSOC.M.INST.C.E.

All communications in regard to this page must be addressed to The Editor, St. Bride's House, 24 Bride-lane, Fleet-street, E.C. Envelopes must be marked "Assistants' Section" in the top left-hand corner. Correspondents are invited to submit questions for consideration and answers

to the questions which appear. For the contributions considered to be the most meritorious, one or more premiums in books will be awarded monthly. Diagrams must be drawn to scale on separate sheets, ready for reproduction.

QUESTIONS.

This week answers are invited to the following questions:—

404. Collapsing Strength of Pipes.—What is the collapsing pressure in lbs. per square inch of a 3-in. cast-iron pipe, 12 ft. long, and of $\frac{1}{4}$ -in. thickness? Pressure on outside of pipe only. (H. V. A.)

405. Disinfection.—Sketch and describe a form of steam disinfecter suitable for use in a town of 30,000 inhabitants.

406. Building Construction.—Sketch a mansard roof, showing timbers; also a dormer window in an ordinary roof. (Junior.)

407. Surveying.—Describe a method of setting out circular curves by means of offsets. (M.C.E.)

408. Pumping.—How many gallons of water per minute will a 7-in. double-acting pump deliver? Stroke 30-in., revolutions 27. Give formula and say how much should be allowed for slip. (A. B.)

[The Editor is at all times glad to hear from readers who desire to submit questions regarding matters of general interest, points of daily practice, &c., for insertion in the "Assistants' and Students' Section." Questions which are published are taken into consideration, as well as other matter, in awarding the Monthly Premium.]

REPLIES TO QUESTIONS.

402. Column Design.—A hollow cast-iron column is 9 in. in external diameter, its length is 12 ft., and its two ends are firmly built in. The compressive load it supports is 60 tons. What thickness must the metal be in order to have a factor of safety of 10? (T. R.)

For the purpose of this problem it will be most convenient to use Gordon's formula for ascertaining the stress per square inch which would correspond to a factor of safety of 10, and if f_p = the safe stress in ton/in.² on the section, f_c = the safe compressive stress of a short specimen of cast iron, a = a constant depending upon how the ends are fixed, and is = $\frac{1}{750}$ when, as in the present case, both ends are rigidly built in, l = the overall length of the column in inches, and d = its external diameter in inches, then

$$f_p = \frac{f_c}{1 + a \left(\frac{l}{d}\right)^2}$$

The ultimate compressive resistance of cast iron as generally used in columns is 40 ton/in.²; so that, with a factor of safety of 10, the value of f_c will be 4 ton/in.²

Now, inserting these figures in the formula, we get:—

$$f_p = \frac{4}{1 + \frac{1}{750} \left(\frac{144}{9}\right)^2} = 3 \text{ ton in.}^2$$

The load is 60 tons, so that the area of metal required will be:—

$$60 \div 3 = 20 \text{ in.}^2$$

The area of a circle 9-in. diameter is 63.6 in.²; therefore the area of the hollow core will be:—

$$63.6 - 20 = 43.6 \text{ in.}^2$$

The radius of a circle of this area will be:—

$$= \sqrt{43.6 \div \pi} = 3.72 \text{ inches.}$$

Therefore the thickness of metal will be:—

$$4.5 - 3.72 = 0.78 \text{ in.}$$

which is, for practical purposes, $\frac{3}{4}$ in. (E. E. W.)

403. Rain Gauge.—Describe, with sketches, a reliable form of rain gauge.

The most common form of rain gauge is that known as the "Snowdon" (Fig. 1), which is best

made of copper, and should have a circular funnel of 5-in. or 8-in. diameter; the Meteorological Office require it to be 8 in., but 5 in. is quite suitable, and is sanctioned by the British Rainfall Organisation.

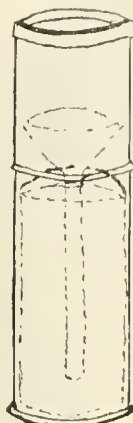


FIG. 1.—"SNOWDON" GAUGE.



FIG. 2.—CAMDEN MEASURE.

There is a can and bottle inside to collect the water, and a 6-in. cylinder on top of the funnel, with a sharp brass rim. The top of the rim should be 1 ft. above the ground.

The water is measured with a glass measure (Fig. 2), graduated in inches, and with the lower part shaped as a cone, which enables a fall of .005 to be easily read (the definition of a "rain" day).

Since the Meteorological Office began publishing their readings in millimetres last month, the makers have been supplying metric measures; but the neces-

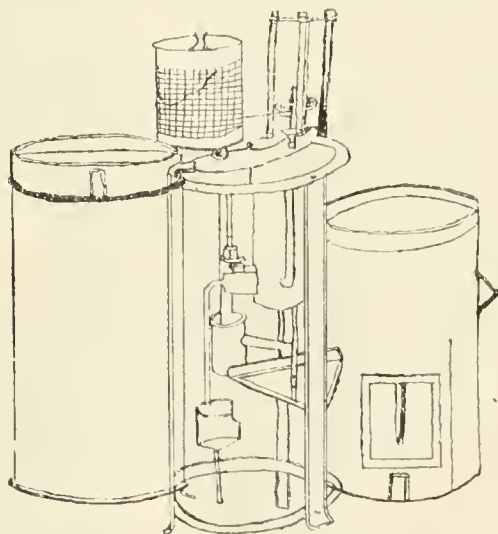


FIG. 3.—FERNLEY SELF-RECORDING RAIN GAUGE.

sary calculation can be readily made, and many observers prefer to continue to record in inches.

1 millimetre = .03937 in., or, approximately, .04 in.

The best form of self-recording gauge is the "Fernley" pattern, patented by Mr. J. Bazendale, of the Fernley Observatory, Southport (Figs. 3 and 4). The principle of this is a float rising in a chamber into which rain falls.

The rain from the funnel passes into the float chamber, and causes the float to rise to the top of the chart, this representing $\frac{1}{4}$ in. of rainfall. At this juncture the water is syphoned away, the float descends to zero in six seconds, and is ready to commence a fresh upward trace.

In the plan (Fig. 4) the main syphon tube (D) is of very wide bore, and at the end of it is a trap (E)

to prevent air being sucked up into the syphon. A branch pipe (F) of smaller bore than the main syphon is attached to this tube (D), and leading into (F) is another pipe (G). The tilting bucket (H) is connected by a rod (J) with the tripping gear, actuated by the cam (K), when the float reaches its highest position.

When the float reaches its highest position, and the cam (K) has turned the weight over, the bucket (H) is upturned, and the water therefrom pours into (G), creating a vacuum in the wide bore syphon (D) to fully prime it, and thus empty the reservoir (A). In the course of syphoning some water is carried

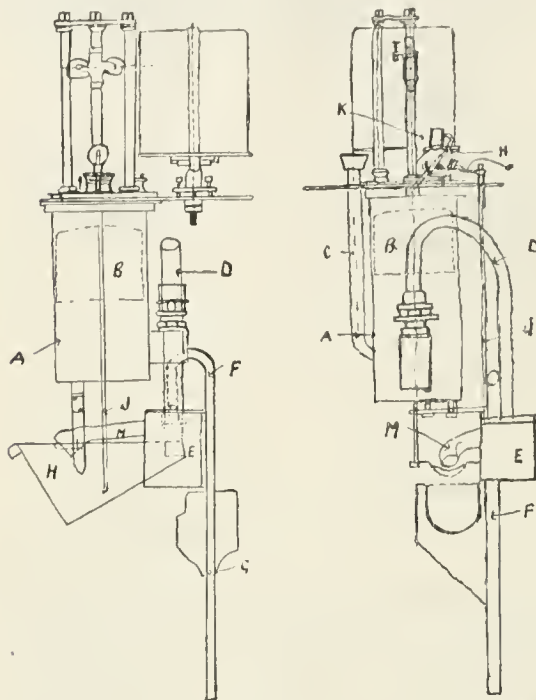


FIG. 4.

through a pipe (M) into the tilting bucket, which is then ready for discharging on the next occasion.

The pen carrier consists of two anti-friction wheels, which do not press continuously upon the guide rods. The guides are braced with a third rod in triangular form.

When the cam turns the weighted arm past its centre of gravity, it falls suddenly, the elbow striking the knob of the rod attached to the tilting bucket. The "detent" (N) keeps the weight from being accidentally overturned, and only releases it when the pen is close to the top of the chart.

As the pen carrier descends to zero, a pin on the descending float rod automatically returns the weighted arm into its previous position.

The small lever (O) helps to raise the bucket into its preliminary horizontal position.

The case is of two parts. The lower metal well of iron, completely galvanised, containing the copper float chamber and syphon arrangement, is sunk into the earth up to the rim. The cover, made of copper, surmounted by an 11-in. accurately turned brass ring, is provided with lugs to permit of easy removal, ventilation holes for the heating in winter, a glass window for the observation of the chart, and a slot for fitting into the correct position on the rim of the well. (G. C. W., *Norbury*.)

Rubber Roads Again.—At a Press view of the fourth International Rubber and Allied Industries Congress and Exhibition—which opened at the Royal Agricultural Hall, Islington, on Wednesday—Sir Henry Blake, president, stated that the day was coming when the streets of London would be paved with rubber. Fifty British and foreign Governments are taking official part in the exhibition, and delegates will come from all parts of the world. Among the novelties to be seen is a rubber lawn tennis court, the first ever built. It has been laid by a British firm with British-grown plantation rubber. There will also be shown plaster casts of rubber and stone steps, from the same flight of stairs, which have been in use an equal time. The stone steps have worn down 2½ in., whereas at no part is the rubber worn more than ¼ in. in the twenty-four years the steps have been in use.

LOCAL GOVERNMENT BOARD INQUIRIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

INQUIRIES HELD.

Barnsley T.C. (June 17th. Major J. Stewart).—£1,065 for the purchase of a motor wagon and tar-sprayer.—It was explained that the motor vehicle was required to deal more expeditiously with the removal of refuse. In regard to the work of spraying the roads with tar, the council considered that it would be more satisfactory to possess a machine instead of having to hire one as in the past.

East Sussex C.C. (June 11th. Mr. P. M. Cross-thwaite).—£2,262 for sea defence works. The county council accountant, Mr. I. T. Mellvee, asked that the repayment should be for over a period of thirty years. The engineer of the works, Mr. J. S. Owens, stated that the proposed expenditure was necessitated by the fall of a cliff.

Gateshead T.C. (June 16th. Mr. A. W. Brightmore).—£23,000 for the provision of a refuse staith between High Level-road and the Tyne to the east of the High Level Bridge. The town clerk (Mr. W. Swinburne) said the council had had the question of the disposal of the town's refuse under consideration for a considerable time. About 1901 they erected staiths at Redhugh, and that scheme had proved so successful that the council had decided to repeat it. They considered the site most suitable, having regard to the needs of the borough. The method of conveying the refuse to a staith and then out to sea was the most efficient and economical. They would be enabled to dispose of the town refuse at a cost much lower than that involved by the use of a destructor.

Gwyrfaï R.D.C. (June 17th. Mr. E. Leonard).—£6,760 for the purchase of land and the erection of thirty-six workmen's dwellings in the quarry villages of Clwtybont and Ebenezer. The surveyor, Mr. Watkin Thomas, submitted the plans, and described the houses to be erected. Ten would contain a parlour, a living-room and scullery, and four bedrooms, and would let at 4s. 9d. a week, and twenty-six would have a living-room, a scullery, and three bedrooms, and would let at 3s. 9d. a week. The houses would be built on four sites, the purchase price of the land being £80 per acre. The inspector said he thought the figures given by the surveyor were too high, and that the tenders that would be received would be much lower.

Heckmondwike U.D.C. (June 18th. Dr. L. Seymour).—£450 for the provision of a disinfecting station.—It was explained that the one belonging to the Dewsbury Joint Hospital Board, in which Heckmondwike are partners, was too far away to be of use to the latter place, the distance being 4½ miles.

Iford U.D.C. (June 12th. Major C. E. Norton).—£21,100 for the erection of public baths.—It was stated that the existing baths were erected in 1894, when the population was only 12,000, and they were now totally inadequate. The council intended seriously to consider the utilisation of the present baths for the purposes of teaching school children swimming.

Kirkby-in-Ashfield U.D.C. (June 10th. Mr. Edgar Dudley).—£1,190 for the purchase of land for a recreation ground.—The area, it was stated, was over 7 acres, and the price £150 per acre.

Neath R.D.C. (June 8th. Major J. Stewart).—£3,250 for works of water supply at Dylais Higher (Seven Sisters and Onllwyn). Mr. Edward Powell, representing the council, said that under the Ystradfellte Water Bill, 1902, the whole of the area under the jurisdiction of the public authority was to be supplied, and the present application was in relation to the provision of distribution mains to connect with the main pipe line. In a few years the population of Dylais Higher had quadrupled, and the present population of 5,500 would probably be increased to 30,000 in thirty years.

Romford R.D.C. (June 11th. Mr. M. K. North).—£470 for works of sewerage for the parish of Dagenham, and £2,095 for works of private street improvement. The surveyor, Mr. W. J. Grant, explained with respect to the proposed paving works that the roads were not all built upon, and in some instances sections only would be made up.

St. Mellons R.D.C. (June 9th. Major J. Stewart).—£600 for private street improvements in Tredegar-

street, Rhiwderin. Mr. Gomer Morgan, sanitary surveyor, stated that the total length of the road it was proposed to make up was 630 ft. 9 in. The road had previously been roughly formed, and a little kerbing had been put by the owners here and there, but there had been no combined effort.

Sheffield T.C. (June 11th. Mr. F. H. Tulloch).—£5,650 for the widening of Campo-lane, Whitham, Sandygate, Worktop, and Cricket Inn roads; £1,000 for the widening of Bramall-lane and for laying out St. Mary's churchyard as an open space; and £1,000 for the provision of bowling green pavilions in the Crookesmoor recreation ground, Whiteley Woods, and Hillsborough park.—It was explained that property was to be purchased for the widening of Campo-lane, and that with respect to Whitham-street the land to be utilised formed part of the city water undertaking. The other improvements had become necessary owing to the increase of traffic. With regard to the proposed pavilions, it was stated that the game of bowls was very popular in Sheffield, and that the corporation had now sixteen bowling greens. Evidence as to the proposals was given by Mr. Partington, of the city engineer's department.

Worcester T.C. (June 17th. Mr. T. C. Ekin).—£650 for the purchase of land for the extension of the sewage disposal works.—The area of the land was stated to be over 5 acres. The borough surveyor, Mr. T. Caink, stated that complaints had arisen with respect to the sewage works owing to the surface of the land becoming clogged. He was now experimenting on a totally different arrangement by upward instead of downward filtration. If the experimental filters were successful, he would convert the whole of them to upward filtration. The inspector said that it was a disquieting feature that the works were—he would not say constantly breaking down—but had failed four or five times since last September, giving rise to those complaints. Mr. Caink stated that in the process of time all the defects would be eliminated.

Worktop U.D.C. (June 12th. Mr. F. O. Stanford).—£550 for the erection of a public lavatory in Victoria Square.—The surveyor, Mr. G. Rawson, stated that the estimated cost of the road work was £505, and that the remaining £45 was for improvements to the footpath.

APPLICATIONS FOR LOANS.

Burton-on-Trent T.C.—£5,000, supplemental loan for the extension of the retort house.

Cambridge T.C.—£2,400 for the erection of twelve workmen's dwellings.

Falkirk T.C.—£8,000 for the extension of the electricity works.

Hastings T.C.—£2,300 for the provision of a fire station, and £682 for water main extension.

Honiton T.C.—£4,700 for a sewerage and sewage disposal scheme.

Kingstown (Co. Dublin) U.D.C.—£7,900 for a housing scheme.

Nelson T.C.—£21,500 for a tip and culverting works.

Salford T.C.—£520 for the purchase of land for playing fields.

Southend T.C.—£5,328 for making up certain streets.

West Lancashire R.D.C.—£823 for the electricity undertaking.

Wortley R.D.C.—£4,000 for the erection of a small-pox hospital.

LOANS SANCTIONED.

Bath R.D.C.—£3,231 for works of sewerage.

Brighton T.C.—£4,550 for street improvement, and £1,025 for the purchase of a depot.

East Barnet Valley U.D.C.—£3,283 for the purchase of land for a recreation ground.

Eppingham R.D.C.—£730 for the erection of cottages.

Hailsham R.D.C.—£6,757 for the Polegate sewerage scheme.

Heckmondwike U.D.C.—£600 for the purposes of the market.

Keighley R.D.C.—£2,250 for a new cemetery.

Newport Pagnell R.D.C.—£1,585 for the Loughton housing scheme.

Romford R.D.C.—£350 for works of private street improvement.

Tetbury U.D.C.—£730 for works of water supply.

Wirral R.D.C.—£2,200 for street improvement.

FORTHCOMING INQUIRIES.

	JUNE.	£
29.— Manchester. For the purposes of playing fields and street works (Mr. R. H. Bicknell)		20,641
29.— South Mimms. For a housing scheme (Mr. F. O. Stanford)		1,750
30.— Aylesbury. For sewage disposal works (Mr. A. G. Drury)		5,100
30.— Bognor. For pleasure grounds and street works (Mr. M. K. North)		—
30.— Carlisle. For the purposes of pleasure grounds and sewerage (Mr. A. W. Brightmore)		3,160
30.— Haworth. For works of sewage disposal (Mr. R. G. Hetherington)		650
30.— Lytham. For private street improvement (Mr. R. H. Bicknell)		800
30.— Redditch. For the electricity undertaking (Mr. T. C. Ekin)		18,000
30.— Weymouth. For the provision of public conveniences (Mr. W. O. E. Meade-King)		570

JULY.

1.— Burnley. For works of water supply (Mr. R. G. Hetherington)		380
1.— Harrogate. For additions to the Kursaal (Major J. Stewart)		6,200
1.— Harrow. For road widening (Mr. Edgar Dudley)		1,875
1.— Hexham. For works of sewage disposal (Mr. A. W. Brightmore)		1,400
1.— Heysham. For the purposes of an isolation hospital (Dr. W. W. E. Fletcher)		600
1.— Northwood. For works of street lighting (Mr. T. C. Ekin)		500
1.— Sidmouth. For the gas undertaking (Mr. W. O. E. Meade-King)		6,190
1.— Trowbridge. For the purposes of an isolation hospital (Dr. F. R. Seymour)		—
1.— Wirksworth. For the provision of automatic controllers for street lamps (Mr. R. H. Bicknell)		160
2.— Chorley. For works of sewerage and the provision of public baths (Mr. R. G. Hetherington)		9,700
2.— Denton. For ventilation and lighting works (Major J. Stewart)		310
2.— Devonport. For street and sewerage works (Mr. W. O. E. Meade-King)		7,805
2.— Hornsey. For the erection of an electricity station (Mr. T. C. Ekin)		13,744
3.— Sheffield. For sewerage and street works (Major J. Stewart)		20,406
3.— Wellington. For the erection of council offices and a public convenience (Mr. W. O. E. Meade-King)		2,088
3.— Whitley. For street improvement (Mr. A. W. Brightmore)		1,870
9.— Bromley. For works of paving (Mr. M. K. North)		13,231

TOWN PLANNING.

JUNE.

30.—**Southend.** (Mr. George L. Pepler)

JULY.

7.—**Doncaster.** (Mr. George L. Pepler)

10.—**Merton.** (Mr. Thomas Adams)

St. Paul's Bridge Designs.—Mr. G. Washington Broyne, R.S.A., of 24 Charlotte-square, Edinburgh, has been awarded the first prize of £300 by the Bridge House Estates Committee of the City of London Corporation in the competition for designs for the architectural treatment of the new St. Paul's Bridge, which is estimated to cost £1,646,000. The second prize of £200 was won by Mr. Charles E. Barry, Parliament-mansions, Victoria-street, Westminster, and the third of £100 by Mr. E. R. D. Selway, A.R.I.B.A., 9A Fouknay-road, Bedford-hill, S.W.

Municipal Work in Progress and Projected.

The Editor invites the co-operation of SURVEYOR readers with a view to making information given under this head as complete and accurate as possible.

The following are among the more important projected works of which particulars appear below: Buildings—Brighton £25,000, Devon £15,040, Edinburgh £100,000; housing and town planning—Ogmore and Garw; roads and materials—Southend £24,800; sewerage and sewage disposal—Barton-on-Trent £30,000, Hailsham £7,190; water, gas and electricity—Southampton £22,000. Particulars of other projected works will be found on our "Local Government Board Inquiries" pages.

BUILDINGS.

Ashburton U.D.C.—The surveyor, Mr. A. Wilson, has received instructions to prepare an estimate of the cost of erecting a public convenience.

Bishop Stortford U.D.C.—The council are considering the advisability of purchasing the Wharf House property on the Causeway for council offices and depot. It is proposed to sell the present office in North-street and the depot in South-street. The estate is on the riverside, and there is a dock which could be converted into public baths.

Bourne R.D.C.—The tender of Messrs. Thornhill, Lincoln, at £1,060, has been accepted for the erection of an isolation hospital.

Bradford T.C.—A proposal to construct an open-air bath in Lister Park has been agreed to.

Brighton T.C.—A special committee recommend extensive alterations at the Aquarium, at an estimated cost of £25,000.

Broadstairs U.D.C.—The council have adopted the amended plans of the surveyor, Mr. H. Hurd, for alterations to the slipway, including steps from the slipway to the sands, the whole of the work to be constructed in Jarrah wood at an estimated cost of £180.

Cannock U.D.C.—The tender of Mr. C. Linford, of Cannock, at £110, has been accepted for the construction of a public convenience at Cannock, and the surveyor, Mr. R. Blanchard, has received instructions to prepare plans for a convenience for both sexes at Hednesford.

Cardiff T.C.—It has been agreed to strengthen the bridge between Bridge-street and Guildford-street, and reduce the sharpness of the road approaches, at an estimated cost of £1,725.

Dawlish U.D.C.—The surveyor, Mr. S. F. C. Churchward, has prepared plans for a new harbour or landing stage, which it is proposed to discuss at the next meeting of the council.

Devon C.C.—The Public Health and Housing Committee are proposing to carry out extensions at the Hawkmoor sanatorium, at an estimated cost of £15,040.

Edinburgh T.C.—Investigation is being made into a proposed scheme for a new fruit and vegetable market on the site of the old gasworks the cost of which is, approximately, £100,000.

Hull T.C.—The Health Committee are, subject to official sanction, inviting tenders for a sanatorium at Cottingham, the plans of which have been prepared by the city architect.

Salteoats T.C.—The council are considering a proposal for the enlargement of the joint hospital, at an estimated cost of £1,700.

Sedgley U.D.C.—The surveyor, Mr. F. W. Turton, and the medical officer have received instructions to confer on plans prepared for a public mortuary.

HOUSING AND TOWN PLANNING.

Bradford T.C.—A decision has been reached to promote schemes under Part II. of the Housing and Town Planning Act, 1909, to deal with lands undeveloped or partially developed within and in the neighbourhood of the city.

Evesham R.D.C.—A site has been obtained at Brefforton for a housing scheme at £80 per acre, and plans have been approved for the erection of twenty cottages, at an estimated cost of £3,370.—The council have accepted a tender, at £1,000, for the Littleton housing scheme.

Hungerford R.D.C.—The surveyor, Mr. W. S. Raine, has received instructions to prepare an estimate for the erection of four cottages.

Ogmore and Garw U.D.C.—It has been decided to carry out a housing scheme, at an estimated cost of £14,100.

Sedbergh R.D.C.—The Local Government Board having pressed the council to build cottages for the working classes, owing to there being a scarcity in the neighbourhood, the council have secured suitable land in Station-road, and are in negotiation for other land at Millthrop. Mr. John Stalker, architect, of Kendal, has been instructed to prepare plans. Twelve cottages will be built upon 1 acre of ground, and each cottage will have an average of 240 sq. yds. of garden ground.

Wortley R.D.C.—The council have, in reply to a letter from the Local Government Board, stated that 300 more houses were required in the district, representing 5 per cent of the houses under a rental of £16 per annum.

Ystradgynlais U.D.C.—The council have approved a scheme for the erection of sixty workmen's houses.

PARKS AND OPEN SPACES.

Abercarn U.D.C.—The council have referred to the West Ward members a plan prepared by the surveyor, Mr. John Williams, for laying out the Distillery ground. The estimated cost is £1,370, and if an open-air swimming bath is included, there will be an addition of £500.

Birkenhead T.C.—A new recreation ground adjoining Birkenhead Park was formally opened on Tuesday last. The cost of the site was £2,200, and the land was laid out at an expenditure of £1,100.

Newmarket U.D.C.—The surveyor, Mr. W. H. Eley, has received instructions to lay out the memorial hall grounds, at an estimated cost of £175.

Southend T.C.—A decision has been reached to purchase the Bellairs estate, Leigh, comprising 270 acres, for £16,500, subject to the sanction of the Local Government Board.

ROADS AND MATERIALS.

Aberdeenshire C.C.—It has been agreed by the Garioch District Committee to replace forty-five direction posts on the main road, and provide fourteen additional posts and sign-posts, at a cost of £3 16s. per post. The chairman, Mr. H. D. McCombie, referring to the recent visit of the chief engineer of the Road Board to Aberdeenshire, said two points struck him in the conversations he had had during the visit of the chief engineer. With regard to dangerous corners, the Road Board did not seem to be in favour of large expenditure in cutting off such corners. They did not seem to be in favour of making roads better in order to facilitate motor searching. Evidently they were not willing to give money for that purpose. They were willing to cut down hedges and so forth to give a better view of the road. That, in the public interest, was a very sound view.

Bideford T.C.—It has been agreed to purchase a steam roller from Messrs. Isaac & Son, at a cost of £600.

Cottingham U.D.C.—The county council having declined to support this council in an application to the Road Board for a grant towards the Hull-road improvement, the council have resolved to depart from the usual custom and make application themselves.

Devizes T.C.—The roads in the town have been treated with Westrumite, at a cost of £38. This is generally spoken of as having proved to be very satisfactory.

Farnborough U.D.C.—The surveyor, Mr. J. E. Hargreaves, has received instructions to carry out private street improvement works in Cambridge-road and Closeworth road by means of direct labour.

Hampstead B.C.—Repairs are to be carried out in England's-lane (with lithofalt blocks), Avenue-road, and Hillgrove-road, at an estimated cost of £1,536.

Keswick U.D.C.—The surveyor, Mr. W. Hodgson, has completed the scheme of flagging, for which the

sum of £820 was borrowed, and has received the congratulations of the Streets Committee on doing the work so economically. These congratulations were endorsed by the whole council at a meeting recently.

Liskeard R.D.C.—It has been decided to ask the Road Board to lend £1,000, free of interest, in order further to improve the road from St. Cleen to Cheese-wring.

Lowestoft T.C.—Statutory notices have been served for making up a number of streets under section 150 of the Public Health Act, 1875.

Monmouthshire C.C.—The council are promoting a scheme for a new road from Bedwas to Caerphilly, including the construction of a new bridge, which avoids the rise, and cuts out the circuitous bend in the present highway.

Neath R.D.C.—A committee has been appointed to interview the owner of the land in Dylais Valley, through which it is proposed to construct a new road. The surveyor, Mr. D. M. Davies, has submitted a report with reference to the proposed scheme, and suggests that as the road would improve the property of the owner he should give the land free of cost, as others have done in similar instances.

Selby U.D.C.—The Highways Committee recommend that the Local Government Board be asked to sanction the purchase of property in Gowthorpe-street, to enable the council to make a new road into Flaxley-road, at an estimated cost of £3,600.

Southend T.C.—The Road Board have sanctioned a grant of £5,000, and a loan of £16,000, in aid of the cost of improving the main road to Bourne Green. The estimated cost of the work is £21,800.

Weston-super-Mare U.D.C.—The surveyor, Mr. H. A. Brown, in his annual report states that during the past year forty-six roads and streets have been reconstructed or resurfaced, and that 5,319 super. yds. of artificial stone paving have been laid. About sixty roads and streets have recently been tar-sprayed (including main roads) at a cost of £507.

Woking U.D.C.—Approval has been given to the plans of the surveyor, Mr. G. J. Wooldridge, for widening Triggs-lane, at an estimated cost of £124, and a scheme for widening Old Woking road near Broadmead bridge, at an estimated cost of £1,840, has been submitted to the county council for their consideration.

SEWERAGE AND SEWAGE DISPOSAL.

Burnham (Somerset) U.D.C.—The surveyor, Mr. W. H. Chowins, has been engaged as engineer to carry out a drainage scheme in the proposed new area at a remuneration of 100 guineas, and an assistant surveyor will be engaged by the council for nine months at a salary of £2 10s. per week.

Burton-on-Trent T.C.—A decision has been reached to duplicate the sewage rising main from the pumping station to the farm, a distance of $1\frac{1}{2}$ miles, at an estimated cost of £30,000.

Dalton (Lancs) U.D.C.—Two new sprinklers are to be constructed at the sewage disposal works, at an estimated cost of £330.

Esher and the Dittons U.D.C.—The tender of Messrs. Sireeter Brothers, of Croydon, at £630, has been accepted for the laying of a sewer in Ember Court-road, and with respect to the proposed sewer in Alexandra-road the council agreed that, as there was so much difference between the surveyor's estimate of the cost of the work (£110) and the lowest tender (£196), the surveyor should carry out the work by the council's workmen.

Hailsham R.D.C.—The Local Government Board have formally sanctioned the sewerage and sewage disposal scheme for Polegate, at an estimated cost of £7,190.

Honiton R.D.C.—It has been agreed that the storm water pipes at Fenton be separated from the sewer, and that a separate new sewerage system with proper disposal works be constructed for the village.

Honiton T.C.—It has been agreed to comply with certain amendments proposed by the Local Government Board in the sewerage and sewage disposal scheme. The borough surveyor, Mr. A. Tilloison, estimates the cost of the extra works at £200. The estimated total cost of the scheme is £1,700.

Sedgley U.D.C.—A report has been submitted to the effect that a joint committee of Sedgley and Coseley district councils, in conjunction with the County Committee, had agreed to instruct Messrs. Willcox & Raikes, as sanitary engineers, and Messrs. W. F. Clarke, W. H. Hughes, and A. P. Taft, as mining engineers, to report upon the two urban districts with a view to ascertaining the best practicable method of sewerage of the districts, either in parts or as a whole, or individually, and to confer with the county medical officer on the feasibility and sufficiency of their recommendations.

WATER, GAS, AND ELECTRICITY.

Belfast T.C.—Tenders are to be obtained for new electricity plant.

Bury St. Edmunds T.C.—The council have adopted a recommendation from the Electricity Supply Committee to adopt a system of free wiring through a contractor, for the supply of electricity to houses in the borough, as suggested by the electrical engineer; that by way of an experiment the system should be applied to not more than twelve houses of a rental of not less than £14 a year each; and that the electrical engineer be authorised to arrange terms with a contractor for carrying out the necessary wiring, at the expense of the corporation.

Exeter T.C.—There was a profit of £1,446 on last year's working of the tramways. It is proposed to deal with the surplus by giving a discount of 15 per cent to the Lighting Committee, dating back to April, 1913, by reducing the charge for current to the tramways from 1½d. per unit to 1¼d. per unit, and that the balance should be devoted to the installation of the high-pressure turbo-alternator at the power station.

Gourock T.C.—The first sod of the new works at Daff Valley in connection with a water supply scheme was cut last week. The new reservoir will have a capacity of 162,000,000 gallons, being 180 days' storage, a supply equal to 50 gallons per head per day for an estimated population of 12,000. The works will occupy ground to the extent of about 65 acres, and are expected to cost something like £22,000. Mr. A. Lettich, of Glasgow, is the engineer-in-charge.

Lurgan U.D.C.—A resolution has been passed agreeing to purchase the local gas and chemical undertaking for a sum of £10,000.

Saxmundham U.D.C.—The tender of Mr. Charles Ball, of Letchworth, Herts., at £4,903, has been provisionally accepted for the proposed water supply works.

Southampton T.C.—The Water Committee recommend the town council to construct an additional reservoir at Bassett, at an estimated cost of £22,000.

MISCELLANEOUS.

Cork T.C.—After the usual tests by the city engineer, the council have accepted the tender of the Ship Canal Portland Cement Manufacturers, Ellesmere Port, for the supply of cement at £2 0s. 1d. per ton.

Kingston (Surrey) T.C.—For the year to June, 1915, the tender of Messrs. Doulton & Co. has been accepted for drain pipes, &c., and that of Mr. J. Jonas for scavengers' brooms. Messrs. Ide & Son's tender of £300 has been accepted for the erection of a new urinal near the Kingston Hotel.—The surveyor, Mr. R. H. Clucas, was on Tuesday authorised to engage the services of three suitable men to take the census of road traffic, at a salary of £2 2s. per week each.

FOR OTHER ADVERTISEMENTS

See End of Paper.

BOROUGH OF HORNSEY.

The Town Council invite applications for the position of Second Assistant Engineer and Surveyor. Salary £200 per annum, rising by annual increments of £10 to £250. Applications, stating age, qualifications and experience, accompanied by copies of not more than three testimonials, should be forwarded to the undersigned not later than Saturday, the 4th of July.

E. J. LOVEGROVE,
Borough Engineer and Surveyor.

Municipal Offices,
Highgate, N.

June 25, 1914.

(1746)

BOROUGH OF WARWICK.**SEWAGE DISPOSAL WORKS.****RESIDENT ENGINEER.**

The candidate must have had previous experience on similar works, be able to set out the works, test materials, use the various surveying instruments, and measure up work done.

The person appointed will be required to act under the directions of Messrs. Dodd & Dodd, M.A.I.N.S.T.C.E., the Engineers to the Council.

The salary will be Three Guineas per week.

Applications, endorsed "Resident Engineer," stating age and qualifications, accompanied by copies of three recent testimonials, to be sent to the undersigned not later than 12 o'clock noon on Tuesday, the 14th day of July, 1914.

Applicants who canvass any member of the Council, either directly or indirectly, will be disqualified.

(By order)

BRABAZON CAMPBELL,

(1,743)

Town Clerk.

TO PAVING CONTRACTORS AND OTHERS.

The Wandsworth Borough Council is prepared to receive Tenders for the Execution of Wood Paving and other works in Streatham High-road, and Streatham-hill.

Form of Contract, Specification and Drawings may be seen, and Form of Tender obtained, at the office of the Borough Engineer, Mr. P. Dodd, M.A.I.N.S.T.C.E., 215 Balham High-road, S.W., between the hours of 10 and 4 (Saturdays 10 till 1).

Contractors will be required, in the case of all workmen employed by them in and about the execution of the Contract, to pay wages at not less and observe hours of labour not greater than the rates and hours recognised by the Associations of Employers and Employees, and in practice obtained in the district where the work is to be executed, and to pay to all carmen a wage of not less than four shillings and sixpence per day.

Tenders (enclosed in a sealed envelope, endorsed "Tender for Wood Paving Works") must be delivered at the Council House, East-hill, Wandsworth, S.W., and may be placed by the persons tendering in the Tender-box provided for the purpose, not later than Ten o'clock in the forenoon of Tuesday, 7th July next. No Tender will be received unless it is made upon one of the printed forms issued for the purpose. The Council does not bind itself to accept the lowest or any Tender.

D. A. NICHOLL,

Town Clerk.

Council House,
Wandsworth, S.W.
June, 1914.

(1,745)

DARLINGTON RURAL DISTRICT COUNCIL.**TENDERS FOR HAULAGE PLANT.**

The above Council, having adopted rubber-tyred petrol wagons for haulage purposes, wish to dispose of the following plant, for which Tenders are invited:

8-h.p. McLaren Compound Traction Engine, with roller wheels for converting into road roller.

2 Speeds. Cylinders and rings as new. New tubes. 21-in. diameter. Boiler insured at 140-lb. pressure.

Travelling wheels 6-ft. diameter, and recently straked.

7-h.p. Aveling & Porter Compound Traction Engine, convertible into road roller fitted with roller wheels only. Two speeds. Tubes 21-in. diameter. Boiler insured at 150-lb. pressure. Fitted with Morison Patent Scarifier.

Four 8-ton Traction Wagons, with side doors. Wheels 9 in. wide, recently rebushed.

The whole of this plant can be inspected on application to Mr. A. Potter, Council's Slag Works, Middle-ton St. George (Dinsdale Station).

Tenders, to be endorsed "Tender for Haulage Plant," to be sent to the undersigned not later than the 15th July.

JOHN ROBINSON,

Highway Surveyor.

Surveyor's Office,
Crown-street,
Darlington.

(1,744)

PERSONAL.

Mr. Bernard Glossop, surveyor and clerk to the Heage (Derbyshire) Urban District Council, has resigned.

Mr. H. L. Bottomley, of Brighouse, has been appointed surveyor to the Healden Bridge Urban District Council.

Mr. W. Stoddart, for nearly forty years chief surveyor in the city engineer's department of the Nottingham Corporation, died, we regret to state, last week.

Mr. C. P. Stubbs, of Aintree, has been appointed temporary general assistant in the surveyor's department of the Hindley Urban District Council at a salary of £78.

Mr. F. B. Drake, ASSOC. M.A.I.N.S.T.C.E., town engineer of Oudtshoorn, Cape Province, has been appointed, from 127 candidates, road engineer to the (recently unified) city corporation of Cape Town.

Mr. J. Johnson, highway surveyor to the Keynsham Rural District Council, has received an increase of salary of £15 this year, with £10 a year for the next four years, rising to a maximum of £230.

Mr. T. N. Young, son of the late waterworks manager, has been appointed engineering manager to the water undertaking to the Epsom Urban District Council, at a salary of £200 per annum, rising to £250, with house, fuel and light free, and £27 motor car allowance.

Mr. C. H. Croxford, surveyor, and Mr. W. P. Harding, clerk to the Wood Green Urban District Council, are the donors of a silver challenge cup for rowing at the annual sports of the town hall staff, and at the reunion at Pangbourne on the 15th inst. the trophy was won by Messrs. King, Longland, and Burr (cox), of the surveyor's department, after a keen contest. The surveyor's and the clerk's department have each held the cup five times.

Mr. James S. Cree, Aberfeldy, has been appointed road surveyor to the Highland District Committee of the Perthshire County Council, at a salary of £350. Mr. Cree is thirty-two years of age, and was educated at Murthly Public School and Perth Academy. He entered the office of the late Mr. William Bell, whom he succeeds, fifteen years ago, and has for the past eight years been principal road assistant. He was inspector-in-charge of the construction of the Aberfeldy waterworks, which cost about £4,000.

Mr. H. W. Smith, to whom reference was made in the last issue of THE SURVEYOR, under the heading "A Borough Surveyor's Travels," has his services to Scarborough dealt with by a well-informed and discriminating critic of the *Scarborough Post*, who uses the *nom de plume* of "Observer." Mr. Smith, the writer states, was appointed borough engineer and surveyor in December, 1896, and at that time the only pleasure grounds in the town were the Holbeck Gardens, the Clarence Gardens, the Valley Park, and the Weaponness estate. "The go-ahead policy of the corporation," he proceeds to say, "synchronises with the advent of the borough engineer. The average ratepayer has little idea of what we owe to this painstaking, capable, courteous, conscientious, and brilliant official. Not only is he in the first rank as an engineer and surveyor, but he is also an eminent architect, and as a landscape gardener has few equals. He designed the present town hall, he built the sanatorium, he has erected all the public conveniences in the borough; the various pavilions and shelters and the entrancingly beautiful bungalows on the North and South Cliffs are the outcome of his creative genius. He is now engaged in constructing a bathing pool on the South Sands, and in the South Cliff Gardens (the late Belvedere Gardens) he is rearing a structure which will surpass in beauty anything he has yet attempted. For some years he has had charge of the Marine Drive, and his experience of sea-defence works is unique. He has saved the corporation hundreds of pounds in architects' fees alone, and since he took over the duties of Marine Drive engineer has saved that body the annual salary paid to that official."

The Government's Housing Bill.—Replying to a question in the House of Commons on Wednesday, the Prime Minister said he hoped the Housing Bill, which would take the place of the housing provisions now excluded from the Revenue Bill, would be introduced next week.

Law Notes.

EDITED BY J. B. REIGNIER CONDER, 11, Old Jewry Chambers, E.C., Solicitor of the Supreme Court.

The Editor will be pleased to answer any questions affecting the practice of engineers and surveyors to local authorities. Queries (which should be written legibly on foolscap paper, on one side only) should be addressed to "The Law Editor," at the office of THE SURVEYOR, accompanied by the writer's name and address, but correspondents who do not wish their names to be published should also furnish a "nom de

plume." Where necessary, copies of local Acts or documents referred to should be enclosed. All explanatory diagrams must be drawn and lettered in black ink only, and in such style as to be fit for direct reproduction—i.e., without re-drawing or amendment. Unless these conditions are complied with we cannot undertake to reply to queries.

HIGHWAY: RAILWAY BRIDGE: STANDARD OF REPAIR.—In *Attorney-General v. Great Northern Railway Company* (Chancery Division; Mr. Justice Warrington) an important question was decided as to the extent of the liability of the company for the repair of a bridge erected in 1867, carrying a highway over their railway at Crouch End. The bridge was insufficient to carry heavy motor traffic, and the point in dispute was whether the company were bound to render it sufficient for that purpose, or whether they could only be compelled to maintain it in a state sufficient for such traffic as it was capable of sustaining at the time of its erection, and as was ordinary on the highway at that date. A further point was whether the company could limit their obligations by affixing the usual statutory notice to the bridge under the Locomotives and Motor Car Acts. Mr. Justice Warrington held that the company were bound to maintain the bridge in a condition of safety for the passage of such traffic as might be expected to use the highway, of which it formed part at the present time, and that they were not relieved of this liability by the provisions of the Locomotives and Motor Car Acts giving power to exclude heavy traffic. A similar decision was arrived at, it may be remembered, by the Court of Appeal in the case of a canal bridge in *Attorney-General v. Sharpness New Docks, &c., Company* (noted at p. 520 ante). In the course of his judgment in the present case, Mr. Justice Warrington said that there were certain principles established by authority—viz.: (1) Where persons, acting under statutory powers, for their own purposes, interrupted a highway, they were under a *prima facie* obligation to construct and maintain such works as might be necessary to restore the use of the highway to the public; (2) the body responsible for the maintenance of the highway was bound to maintain it in a condition sufficient for such traffic as might be reasonably expected to pass over it—i.e., to keep it "up to date"; (3) there was no distinction in this respect between the solid part of a highway and a bridge; (4) in order to rebut the presumption mentioned in (1) the persons in question must show that the statute under which they were acting expressly exempted them from the implied obligation. It was not enough that the statute was silent on the point. Applying these principles, his lordship said he could find no provision in the Railways Clauses Consolidation Act, 1845, which defined, expressly or by implication, the obligation to maintain the bridge imposed by sec. 46. The measure of that obligation must therefore be sought in the above general principles. The standard according to which the bridge was to be maintained was to be determined by the nature and extent of the traffic to be expected upon the highway of which the bridge formed part.

QUERIES AND REPLIES.

In order to avoid confusion querists are requested to use distinctive words as nouns de plume. The letter X, combinations such as X.Y.Z., and words such as "engineer" and "surveyor," should never be used.

OFFICER OF LOCAL AUTHORITY: REMUNERATION FOR EXTRA SERVICES.—"Civic" writes: My council has appointed me engineer in connection with an important scheme, and has agreed to pay me a fee by means of an increase of salary for the next two years. I am a full-time officer. I have asked for an agreement under seal which will provide that, in the event of my leaving the service of the council before the expiry of the above period, the balance of fee due shall be paid to me, but the clerk says that this cannot be done. His view is that the only way in which I can be paid is by an increase of salary, and that immediately I leave my salary will cease. But in that event could not the balance be paid to me either (1) as an increase of salary for the month which would have to expire after my giving notice to leave, or (2) as an allowance for extra services? (See *Edwards v. Salmon* (1889, 23 Q.B.D., 531; 54 J.P.

180; 58 L.J.Q.B., 571; 30 W.R., 166, as to allowances). Please refer to the case of the Penmaenmawr Urban District Council and their surveyor in the High Court. I have not the date, but it is during the last two or three years, and was reported in THE SURVEYOR.

The case of *Edwards v. Salmon* (*supra*) is not quite on all fours with the present case, but it does, I think, show that it is not necessarily illegal to pay an officer a lump sum for extra services which he has rendered beyond the scope of his employment. If therefore "Civic" should leave the service of the council before the expiration of the two years, the council could, in my opinion, pay him for such extra services as he has actually rendered. In order to avoid any question, however, it would be well to apply to the Local Government Board for their approval of the payment being made, and if they sanction it the district auditor could not disallow the payment. I have not been able to trace the Penmaenmawr case.

PRIVATE STREET WORKS: SURFACE-WATER SEWER: QUARRY.—"W. R. D. C." writes: (1) The Local Government Board have by Order put into force in the contributory place of W. within this rural district the provisions of the Private Street Works Act, 1892, except as to sewerage, for certain specified streets. The contributory place is sewered on the separate system, and a foul-water sewer is provided for the streets in question. The question now arises as to whether the expense of a surface-water drain to carry the water off the surface of the streets themselves can be included in the apportionment on the owners. This surface-water drain is absolutely essential for the street, and would be equally necessary (though slightly cheaper) if the combined system were in operation, on account of the position of the foul-water sewer. How must this be charged? (2) A second question with respect to the same streets is as to the liability for the filling up of a quarry. This quarry is of varying depths of from 6 ft. to 20 ft., and is not now worked. Is the owner of the quarry solely responsible, or must it be included in the total estimate and apportioned among all the owners in the street? The street cannot be made up without filling this up.

(1) In my opinion the expense of a surface-water sewer cannot be included in the apportionment in the absence of an Order applying the provisions of the Act as to sewerage. (2) I do not see how the filling up of the quarry can be included in the works, inasmuch as it forms no part of the street.

UNDERGROUND WATER.—"W. R." writes: I am anxious to obtain information on the right of property owners to underground water, and on arbitration for the acquisition of land for waterworks where the owner claimed special valuation because there happened to be springs, wells, &c., which, until the water authority had constructed, or proposed constructing, work, had no particular value. Can you help me with data as to names of cases, results, &c., on this point? I know there are a number of cases on record, but living, as I do, out of England, I cannot trace them.

An owner of land has, as such, the right of drawing all water he can which flows underground in no defined channel, or in a channel which, though capable of being defined and ascertained, is not in fact known. But he cannot exercise this right if the direct result of so doing is to divert water from a stream, having a defined course above ground, to the prejudice of the riparian owners on such stream. See *Chasemore v. Richards* (7 H.L.C., 349); *Acton v. Blundell* (13 L.J., Ex., 289); *Ewart v. Belfast Guardians* (9 L.R., Ir., 173); *Bradford Corporation v. Ferrand* (1902, 2 Ch., 655); *Grand Junction Canal Company v. Shugar* (L.R., 6 Ch., 433); *English v. Metropolitan Water Board* (1907, 1 K.B., 588).

DISTRICT COUNCILLOR.—"Ratepayer" writes: Can one person be elected as district councillor for two separate townships in the same rural area?

By sec. 24, subsec. (4), of the Local Government Act, 1894, the qualification of a rural district councillor is the same as that of a guardian, and any person qualified to be a guardian for a union comprising the district is qualified to be a district councillor for the district. By sec. 20, subsec. (2), a person is not qualified to be a guardian for a poor law union unless he is a parochial elector within the union or has for twelve months before the election resided in the union. By sec. 24, subsec. (1), the councillors are elected by the parishes or other areas for the election of guardians in the district. The election of a councillor by one parish or area does not apparently prevent him from being also elected by another parish or area, assuming that he possesses the necessary qualifications in both parishes or areas.

Institution of Water Engineers.

SUMMER GENERAL MEETING AT STOCKPORT—(2).

Among the papers read at the recent meeting of the Institution of Water Engineers at Stockport was one by Prof. Sheridan Delépine, of the University of Manchester.

In introducing Prof. Delépine the President (Mr. Thomas Molyneux) said that the Professor was no stranger to them. Those of the members who went to Bolton in 1903 would remember that Prof. Delépine gave them a paper there, and on that occasion many of them did not see eye to eye with what he said. Subsequent events had, he thought, shown that the Professor was in advance of them, and what he had to tell them that day would, he had no doubt, be of benefit to them individually and to the institution.

Prof. Delépine then read his paper, and at the close he threw a series of pictures on the screen in explanation of his address.

CHARACTERS OF MECHANICALLY-FILTERED WATER.

By Prof. SHERIDAN DELÉPINE, M.B., C.M., M.Sc.,
of the University of Manchester.

The effects of the treatment of water by means of coagulants and pressure mechanical filters do not appear to have been fully understood in the past. Since 1901, when the author had for the first time the opportunity of observing on a large scale the action of pressure filters, he has had several opportunities of testing the action of important installations, and has more than once noticed that although the results obtained were highly satisfactory, the conditions of guarantee suggested by or imposed upon the contractors had not been fulfilled, because the effects of filtration had been different from what had been expected. From a hygienic point of view many of the requirements were valueless, and a consideration of what could be expected to take place in a mechanical filter would have been sufficient to show that some of the conditions could not be realised, and that among those capable of realisation there were several which were not of material importance.

To make this clear the author will briefly discuss the conditions of guarantee included in a contract which came under his notice about four years ago. The water to be treated was a very soft water. The only conditions to which reference need be made for the present were included in 12 clauses which, in the form finally agreed to by both sides, read as follows:—

"The contractors to guarantee purification to the following extent:

"(1) The removal of 95 per cent. of the discoloration present in the raw water.

"(2) The removal of 95 per cent. of the suspended matter and 45 per cent. of the organic matter in solution in the raw water.

"(3) The filtered water not to take up more than .035 grain of lead in solution per gallon (0.05 per 100,000) after being in contact continuously with new lead during a period of 24 hours.

"(4) The filtered water to have no odour when heated to 100 deg. Fahr.

"(5) The filtered water in appearance on examination in a 2ft. tube to be clear and bright.

"(6) The filtered water not to contain any alumina in excess of that present in the raw water previous to treatment and filtration.

"(7) The filtered water not to contain:—

"(a) any *bacillus coli communis* in quantities not exceeding 10 c.c. of water.

"(b) more than 100 bacteria growing at 20 deg. Cent. on peptone gelatine (plus 10) in 3 days in 1 c.c. of water.

"(8) The free ammonia present in the raw water to be reduced by at least 25 per cent. after treatment and filtration.

"(9) The albuminoid ammonia in the filtered water not to exceed .003 grain per gallon (0.0042 per 100,000).

"(10) The oxygen absorbed from permanganate in four hours not to exceed .035 grain per gallon (0.05 per 100,000).

"(11) The permanent hardness of the filtered water

to be increased not less than 10 per cent. above the raw water.

"(12) The filtered water to have no deleterious action whatever on wrought-iron, steel or cast-iron pipes."

In another contract which came under the author's notice at about the same time some of the conditions were stated differently. Only five of these need be mentioned—viz.:

"(1) The colour of the filtered water shall not exceed 10 deg. of the platinum cobalt scale, when 1 deg. corresponds to 1 part of platinum per 1,000,000.

"(3) The filtered water shall be tested for its action on lead in the following manner: A length of new lead pipe, 3-in. internal diameter and 3 ft. long, bent into the form of a U tube, shall be filled with water from the sample to be tested. The ends of the tube shall be sealed, and the whole left standing for twenty-four hours. At the end of this period the tube shall be emptied, rinsed with the filtered water, and then refilled from the sample. The whole shall be sealed and again left for twenty-four hours, and the water then run off and tested for dissolved lead.

"The lead found in solution shall not exceed 0.05 parts per 100,000.

"(5) The filtered water shall be free from turbidity as measured by the immersion of a platinum wire, 1 mm. in diameter, which shall be visible at a depth of 50 in.

"(7) Bacteria.—When the unfiltered water contains less than 500 per cubic centimetre, the bacteria present in the filtered water shall not exceed 20.

"When the unfiltered water contains more than 500 and less than 1,000 per cubic centimetre, the bacteria removed shall, on the average, be not less than 97 per cent of the whole, within a minimum for each sample of 96 per cent.

"When the unfiltered water contains more than 1,000 per cubic centimetre, the bacteria removed shall not be less than 98 per cent.

"Acidity.—The filtered water shall in no case be acid, and the alkalinity shall not exceed 1½ deg.

"The test for acidity shall be made by evaporating 500 c.c. to a small bulk, and filtrating with N/10 caustic soda solution.

"The test for alkalinity shall be made by adding an excess of N/10 sulphuric acid solution, boiling to expel the carbon-dioxide, and determining the excess of acid. The indicator used shall be phenolphthalein, and each degree of acidity or alkalinity respectively shall be equal to 1 c.c. of the corresponding N/10 solution used to neutralise 500 c.c. of the water."

The conditions enumerated above indicate fairly completely the characteristics which successfully treated water was expected to have. It will be noticed that some of these are indicated in absolute terms, while others are stated in terms relative to the characteristics of the raw water. The object in view in imposing conditions on a contractor is that the water should, after treatment, be free from any objectionable property—that is, so far as its essential properties are concerned.

A properly treated water intended for ordinary drinking and domestic purposes should be free from—

(1) Discoloration.

(2) Appreciable turbidity.

(3) Any product capable of imparting to it an unpleasant taste or smell.

(4) Any excess of bacteria, and more specially of bacteria indicating dangerous, or possibly dangerous, pollution.

(5) Any material power to act on metals, and more specially on lead.

(6) Any product imparting to the water an unusual physiological action.

(7) An excess of mineral matter capable of imparting to the water excessive hardness.

It is quite possible to state in absolute terms the characteristics of a water satisfying these desiderata, and there are methods by which one can accurately ascertain whether a treated water meets these necessary requirements. It is therefore unnecessary to rely upon the percentage improvement which has taken place as a result of treatment—a test which may lead to gross errors, seeing that the fulfilment of such conditions would not be proof that the water was fit for domestic purposes, and *vice versa*. For example,

a water so polluted that it contained before treatment 10,000,000 bacteria and associated products of decomposition would not be rendered satisfactory by treatment, even if the number of bacteria removed amounted to 98 per cent, for this would still leave 200,000 bacteria in the treated water. Similarly a reduction in the free ammonia by at least 25 per cent would not in such a case be proof that other soluble objectionable products of decomposition were not present in the water.

On the other hand, no constant material reduction in number of bacteria could be expected from the treatment of a water usually containing less than 10 bacteria per cubic centimetre, and a 50 per cent increase in number would not be an indication that the water was unsuitable for domestic purposes; neither is the absence of any reduction in the amount of free ammonia material when the quantity is originally very low. As a matter of fact, the quantities of free or saline ammonia usually present in drinking water are quite immaterial from a hygienic point of view even when the water is distinctly polluted. The ammonia figure is only of use as an indicator of pollution when other more direct methods are not available for the purpose of ascertaining whether pathogenic or faecal bacteria are possibly present.

The author now proposes to discuss some actual results obtained in connection with two installations of pressure mechanical filters of different types (erected by two of the leading firms in this country) which may be designated by the letters A and B.

Both installations yielded excellent results, and for the purpose of this discussion we will suppose that the conditions enumerated at the beginning of this paper had to be met in each case. In both cases the waters to be treated were derived from peaty moorlands, were therefore liable to discoloration, soft, had

in the twelve cases in which the colour of the treated water was greenish-blue. It is obvious that when the water appeared to be of a pure blue colour no trace of original discoloration could be detected.

In the case of installation B, the water of a reservoir was examined six times, and found to be:—

	Before Treatment.	After Treatment.
Dull brown	4 times	0 times
Yellowish brown or dull brown	2 "	0 "
Greenish blue	0 "	4 "
Pale blue	0 "	2 "

These remarks indicate that, as far as the colour is concerned, the treatment can be considered as satisfactory when the colour of the treated water is either pale blue or greenish blue, and a statement to that effect is far more likely to be correct and to be clearly understood than a figure indicating the percentage of discoloration removed, as may be done by the platinum or other colorimetric method.

Condition 2.—Removal of 95 per cent of the suspended matter and 45 per cent of the organic matter in solution in the raw water.

The second part of this clause is, in the author's opinion, entirely unnecessary. The figures relating to oxygen absorbed, and various nitrogenous products, would, if information were needed regarding organic products, give most of the information required. The estimation of volatile and organic matter as usually conducted does not give results capable of simple interpretation.

The first part of the clause, which relates to suspended matter, is one which offers certain difficulties of interpretation. The coarse suspended matter which was present in most of the samples of raw water was invariably removed by treatment, and in ordinary light the treated water appeared to be quite clear; a

No.	Weight moist.	General composition of deposit.				Mineral matter.				
		Water.	Organic matter.	Mineral matter.	Total solids.	Iron, Fe ₂ O ₃	Alumina Al ₂ O ₃	Silica, SiO ₂	Calcium, CaO.	Magnesium, Mg ₂ P ₂ O ₇ .
I. (Heavy coarser particles sand like.)	5.263	3.654	0.249	1.360	1.609	0.198	0.075	0.923	0.139	0.032
II. (Heavy fine particles dark sand like.)	3.462	3.124	0.091	0.247	0.338	0.045	0.035	0.090	0.023	0.049
III. (Dark brown gelatinous deposit.)	92.625	85.978	1.804	4.843	6.647	1.405	0.2078	2.179	0.526	0.385
IV. (Greyish white gelatinous deposit.)	26.131	25.816	0.094	0.224	0.318	0.026	0.055	0.071	0.044	0.013
V. (Water separated from sediment.)	530.00	529.899	0.030	0.062	0.101	0.001	0.002	0.004	0.023	0.010
Totals	657.484	648.471	2.277	6.736	9.013	1.675	0.3758	3.267	0.755	0.489

a marked action on lead, and required the same kind of chemical and mechanical treatment.

Filter A had to deal with the water of four reservoirs. The water from each of these reservoirs was examined both bacteriologically and chemically before and after treatment at short intervals during a period of over 1½ years, but it will suffice to deal with only one set of observations in each case. Some of the observations relate, in the case of A, to the initial period, when the working of the filters had not been fully adjusted. The author will deal seriatim with the conditions of guarantee in the light of the analytical results obtained in the laboratory. Tables giving the results of two short series of tests carried out lately in connection with both installations are given in an appendix.

Condition 1.—Removal of 95 per cent of the discoloration present in the raw water.

The water of the four reservoirs was examined thirty-two times, and found to be, when examined in good daylight in a 2-ft tube:—

	Before Treatment.	After Treatment.
Dark or dull brown	14 times	0 times
Brown	5 "	0 "
Yellow or brownish yellow	8 "	0 "
Yellowish green	5 "	0 "
Greenish blue	0 "	12 "
Pale blue	0 "	20 "

On attempting to estimate colorimetrically the amount of yellow or brown discoloration which had been removed by treatment, it was found that more than 95 per cent of the discoloration had been removed

platinum wire, 1 mm. thick, could invariably be seen through 50 in. of water, but when the water was strongly illuminated, and examined against a dark ground, a slight turbidity or opalescence was usually recognisable. This turbidity was not due to the suspended matter originally present in the raw water, but to the presence of extremely fine particles. This slight turbidity was generally more marked when the quantities of chemicals had not been completely adjusted. Before this was done it was possible by gravimetric method to show that there was slightly more insoluble suspended matter in the treated than in the untreated water; after adjustment the reverse was true; but in both cases it was clear that the suspended matter which caused turbidity in the raw water had been replaced in the treated water by another kind of suspended matter. This suspended matter was composed almost entirely of minute particles, many of which were almost ultramicroscopic. It had, therefore, nothing in common with the coarse particles which caused the turbidity of the untreated water.

When the treated water was made to pass through a sedimentation tank, a dark gelatinous layer was, in the course of several months, deposited on the sides and bottom of the tank. This deposit was due to the separation of the fine particles contained in the water. Through Mr. Molyneux's kindness the author has had an opportunity of investigating the nature of this deposit. By a process of elutriation, it was possible to separate from it five types of constituents:—

(1) Fine, heavy, reddish, greyish and white sandy particles, which separated easily from water in about one minute (that is, after they had been freed from

the surrounding gelatinous mass). These particles had to the naked eye the characters of fine sand grains and silicious debris. This part of the sediment was very scanty.

(2) Much finer, heavy particles of a dark-grey colour, which separated from the water almost as rapidly as the coarser particles.

(3) Extremely fine, dark-brown particles held by semi-gelatinous flakes, which separated from the water in about half-an-hour in the form of a semi-gelatinous mass. This contracted in the course of twenty-four hours to about half of its original bulk.

(4) A greyish-white sediment difficult to separate from the previous parts, and composed of very light flakes. In the course of several hours these formed a very light flocculent sediment, which continued to contract for several days.

(5) After separation of these various deposits the water still retained a slight whitish opalescent appearance, due to the presence of extremely minute particles, which, in the course of a month, formed an extremely thin, whitish film on the bottom of the vessel to which it adhered. This layer could be separated from the vessel as a very soft whitish pellicle.

Mr. Heap, at the author's request, has kindly analysed these various constituents with the results given in the foregoing table.

The composition of this sediment indicates that it is partly composed of fine particles derived from—

- (1) The filtering material.
- (2) The walls and other parts of the filter, which are composed of iron.

(3) Precipitates resulting from the addition of lime salts, and from the rearrangement of the constituents of the water during treatment. It will be noticed that this alteration in the composition of the water is one of the desired effects of treatment, and that, when a soft water is dealt with, it is reasonable to expect an increase in the amount of soluble mineral constituents.

The finer particles of iron and silica are probably produced by attrition during the washing of the filters, when the grains of sand, or broken quartz, are thrown into a state of active motion.

The suspended matter just described may, by deposition in the mains, form very slowly a thin coating, which for a long time would be incapable of reducing materially the carrying capacity of the mains, and would probably have a protecting action. Such a coating should be easily removed by simple mechanical means if it ever became too thick.

Very different effects are observed when untreated moorland waters are conveyed by iron pipes; in such cases the inner surface of the pipes is rapidly incrustated with organic matter mixed with mineral deposits. This incrustation is associated with more or less rapid erosion, more specially when the deposit scales off or is removed. The author has seen pipes lined in this way with rough nodulated deposits more than ½ in. in thickness, firmly adherent and very hard, which diminished considerably the carrying capacity of the mains.

The nature of the suspended matter which is found in treated water is interesting chiefly from this point of view, for, as previously explained, this matter does not affect either the appearance or the hygienic value of the water.

Condition 3.—The treated water not to take more than 0.35 grain of lead in solution per gallon—i.e., 0.05 part per 100,000.

The results obtained at installations A and B showed that this important condition was easily met, even in the case of water having considerable action on lead before treatment.

The author has in another place* explained that in order to obtain comparable results it is necessary to use pure bright lead under very definite conditions for the purpose of testing the action of water on that metal. The method described in the second set of conditions enumerated at the beginning of this paper does not appear satisfactory, for the author has found that the action of the same water on several new lead pipes obtained from the same source varied considerably. Some pipes yield much more lead than others. Lead pipes which have been exposed to air containing traces of sulphuretted hydrogen yield much less lead, even after several washings, than pipes which have always been kept in air free from that gas. The action of water is modified by many other factors which cannot be controlled when lead pipes are used for the purpose of this test.

Conditions 4 and 5 need not be discussed. It is sufficient to say that the treated water was always found free from odour. The question of clearness has already been discussed under clause 2.

Condition 6.—The filtered water not to contain any alumina in excess of that in the raw water previous to treatment and filtration.

The accurate estimation of the amount of alumina in the raw and in the treated water was found to involve an expenditure of time which the results did not justify. Both before and after treatment the amount found was very small, and, with very few exceptions, no excess of alumina was discovered in the treated water. The slight turbidity and the increase in the amount of solids previously alluded to cannot therefore be attributed to an increase of that product during the passage of the water through the filter.

The results of 40 analyses made in the author's laboratory by Mr. Heap may be tabulated as follows:—

INSTALLATION A.—ALUMINA IN WATER.

Reservoir 1.		Reservoir 2.		Reservoir 3.		Reservoir 4.	
Before treatment.	After treatment.	Before treatment.	After treatment.	Before treatment.	After treatment.	Before treatment.	After treatment.
0.05	0.05	0.20	0.10	0.20	0.20	0.40	0.20
0.17	0.05	0.42	0.02	0.14	0.05	0.29	0.24
0.08	0.05	0.33	0.23	0.33	Traces	0.27	Traces
0.02	0.02	0.01	0.03	0.65	0.10	0.75	0.80
0.60	0.95	0.50	0.80	0.35	0.10	0.30	0.20

Condition 7.—The filtered water not to contain:—

- (a) Any *bacillus coli communis* in quantities not exceeding 10 c.c. of water.
- (b) More than 100 bacteria growing at 20 deg. Cent. on peptone gelatine in three days in 1 c.c. of water.

With regard to installation A, quantities of raw water exceeding 10 c.c. were tested sixty-two times, and the *bacillus coli communis* was found to be present on seven different occasions. The treated water was tested the same number of times and never found to contain this bacillus in 10 c.c. Over 100 c.c. of each sample was used in each test. Installation B yielded equally good results.

With regard to the total number of bacteria, some details will be found in the table at the end of this paper. In the case of installation A, the number of bacteria found in the treated water rose above 10 on 7 occasions out of 32, and above 20 only once out of the same number of observations, when the total reached 47. The results were, therefore, eminently satisfactory, yet on four occasions on which there were only 1, 2 and 5 bacteria in the untreated water, there was an increase after treatment, but this increase was quite immaterial. If the condition as regards the number of bacteria had been stated in the form of a percentage improvement, as in the second set of conditions (No. 7), the treated water would have been condemned on those four occasions, and yet on each of them the treated water would have been of great bacterial purity. The number of bacteria in the raw water before treatment was generally low, but it reached 1,400 once, 385 once, and was about 50 or more on nine occasions.

Installation B also yielded excellent results as regards the reduction in the number of bacteria.

Condition 8.—The free ammonia present in the raw water to be reduced by at least 25 per cent. after treatment and filtration.

The author has already stated that this condition is of no importance and should never be insisted upon. As a matter of fact, it does not appear to be capable of realisation.

In the case of installation A, the results obtained in connection with each of the 4 reservoirs were as follows:—

FREE AMMONIA IN TREATED WATER AS COMPARED WITH RAW WATER.

	Increased.	Unchanged.	Reduced.
Reservoir 1	1 occasion	2 occasions	5 occasions
" 2	1 "	5 "	2 "
" 3	2 occasions	1 occasion	5 "
" 4	1 occasion	3 occasions	4 "
Totals	5 occasions	11 occasions	16 occasions

* Journal of the Royal Sanitary Institute, xxxv., p. 117, 1914.

With regard to installation B, the free ammonia was increased twice, unchanged once, and reduced once.

Condition 9.—The albuminoid ammonia in the filtered water not to exceed 0.033 grain per gallon (0.042 part per 100,000).

Installation A gave very good results. The albuminoid ammonia was reduced, sometimes considerably, on thirty-two occasions out of thirty-two. Once only was the reduction so slight as to be doubtful. The amount found in the treated water was well below the limit indicated, except on three occasions, when the amounts found in the treated water were, respectively, 0.0048, 0.0044, 0.0044—i.e., 0.0006, 0.0002, 0.0002 above the amount allowed—which are insignificant quantities well within the limits of experimental error.

Installation B yielded similar results.

Condition 10.—The oxygen absorbed from permanganate in four hours not to exceed 0.035 grain per gallon (0.05 part per 100,000).

This condition was amply fulfilled by filters A and B on thirty-four out of thirty-six occasions, and the two failures were due to exceptional and accidental circumstances. The amount of oxygen absorbed by permanganate of potash indicates the amount of oxidisable matter which is chiefly organic matter. The removal of this oxidisable matter is of importance, and this was very thoroughly effected by the filters.

Condition 11.—The permanent hardness of the water to be increased not less than 10 per cent above that of the raw water.

When dealing with hard water it might be convenient to indicate in terms of percentage how much the hardness should be reduced, but in the case of a soft water, when increase of the hardness has for object the removal of the action which the water has on lead, it is useless to demand a percentage increase. What is wanted is that the water should not act on lead, and this can be tested directly. It is also obvious that when a water is exceedingly soft, a 10 per cent increase may be quite insufficient to render the water inactive as regards lead. This is actually what happened in one instance. The hardness had been increased by treatment to the extent of 30 per cent, and yet the water had still a marked action on lead.

The reaction of the water is a better indicator of its probable action on lead, but even the reaction cannot always be depended upon, and it appears to the author safer to rely on a direct estimation of the actual action of water upon pure lead than to trust to the indications given by hardness or reaction. The reaction is, however, a valuable indicator in the practical working of filters. When one knows the average composition of water, and the extent of its action on lead, the reaction may be generally used with advantage for the purpose of determining the quantity of chemicals to be used.

The tests for reaction given in the second set of conditions quoted at the beginning of this paper do not, however, seem to the author so suitable in current work as the combined use of three indicators. Mr. Heap, who has charge of chemical water analyses in the author's laboratory, has paid special attention to this point, and has supplied the following short statement of the way in which he estimates the reaction in ordinary routine work.

Indicators—

Methyl Orange.—2 grammes dissolved in 1 litre of water.

Laemoid.—2 grammes dissolved in 1 litre of 75 per cent alcohol and water.

Phenolphthalein.—2 grammes dissolved in 1 litre of 75 per cent alcohol.

Titration.—In the case of waters showing an alkaline reaction with an indicator, they are titrated with centinormal sulphuric acid, and in the case of an acid reaction the titration is made with centinormal caustic soda. The quantities taken are 100 c.c. of the water and 1 c.c. of indicator.

The results are expressed in cubic centimetres of normal acid or alkali in 100,000 cubic centimetres of the water.

Methyl Orange.—This gives the bicarbonates of calcium and magnesium.

Phenolphthalein. Laemoid.—When no colour is given in the cold with phenolphthalein and the water is alkaline to laemoid, it means that no normal carbonates are present and that the alkalinity is due entirely to acid carbonates.

GENERAL CONCLUSIONS.

The facts recorded in this communication show that the results of treatment by coagulants and

mechanical filtration of soft moorland water are eminently satisfactory when reliable plants are used. The author has also had the opportunity of observing the effects of treatment of hard waters by the same method, and these have also been satisfactory. The seven essential conditions indicated at the beginning of this paper can easily be met when the best types of pressure mechanical filters are properly worked. As to the conditions to which the author attaches little or no importance, some have been satisfied, while others have remained unsatisfied. He would therefore suggest the following conditions as meeting the requirements of the case.—

Essential conditions—

(1) The water viewed in a 2-ft. tube shall be of a pale blue colour, or retain not more of any original yellow or brown discoloration than an amount capable of giving to the water a bluish green colour.

(2) The water viewed in a 2-ft. tube shall be clear.

(3) The water when heated to 30 deg. Cent. and to 100 deg. Cent. shall be free from any appreciable smell.

(4) One cubic centimetre of filtered water shall never contain more than 100 bacteria, capable of growing in three days on peptone bouillon gelatine (+10) incubated at 20 deg. Cent.

(5) Any quantity less than 10 c.c. of the filtered water shall not contain the *bacillus coli communis*.

(6) The filtered water shall have no material action on bright pure lead after being in contact continuously for twenty-four hours at a temperature of 20 deg. Cent. (By material action is meant an action causing the taking up by the water of more than 1 part of lead in 2,000,000 parts of water. When the lead is completely immersed, the ratio between the surface of lead and the volume of water is as 1 to 4).

(7) The hardness of the filtered water as tested by Clarke's method shall not, except in special cases, exceed 10 per 100,000.

(8) The amount of alumina in the filtered water shall not exceed the amount of alumina in the raw water.

(9) The filtered water shall contain no copper, lead, zinc, or more than traces of iron.

Conditions regarding which the scientific referee may exercise his discretion:—

(10) 100,000 parts of filtered water should not take more than 0.05 part of oxygen from permanganate of potash in acid solution in four hours at 27 deg. Cent.

(11) Free ammonia in the filtered water should not exceed 0.02 part in 100,000.

(12) The albuminoid ammonia in the filtered water should not exceed 0.005 part per 100,000.

The author cannot conclude this paper without expressing grateful thanks to Mr. T. Molyneux and to Mr. F. J. Dixon for the trouble they have taken to make certain observations, and in forwarding to the author some special samples needed to complete the work. He also desires to thank the representative of Messrs. Mather & Platt, and of Messrs. Bell Brothers, for the very ready manner in which they have replied to inquiries. The waters treated had different characters; useful comparison could be made only if the same water had been treated by both methods. The small number of examples selected for the purpose of this paper (out of a considerable number of observations) are sufficient to show that both installations have worked very satisfactorily. Finally the author wishes to acknowledge the very great help received from Dr. E. J. Sidebotham and Mr. H. Heap, who respectively have charge of the bacteriological and of the chemical analysis of water in the author's laboratory.

DISCUSSION OF PROF. DELEPINE'S PAPER.

Mr. F. J. Dixon (Ashon-under-Lyne), in opening the discussion, said he could not speak from a scientific point of view—he could only speak from actual experience which he had gained from association with Prof. Delépine—association which he could assure them had been very instructive to both of them. The paper was a very interesting one, especially when it covered two installations on a different type, and treated practically with similar classes of water. He noticed in the paper that Prof. Delépine somewhat condemned the conditions of guarantee included in installation "A." He (Mr. Dixon) happened to be the unfortunate gentleman who formulated the conditions for installation "A." That was some four years ago, and he was ready to plead that some of the conditions were severe, but if anything, they erred on the right side from the

engineer's point of view. His only regret was that when he framed his specification and conditions of guarantee he had not more knowledge of chemistry, which would have assisted him in excluding those conditions which Prof. Delépine had criticised. Another thing he regretted was that he did not call in the advice of eminent scientists, such as Prof. Delépine or Prof. Franklin, but the conditions in his case were somewhat different. He had to work at a very low cost, and his committee always raised objections to calling in outside experts. He did the very best he could under the circumstances to safeguard his committee, and he felt, especially after hearing the paper, that he had attained that object. They would, he thought, notice in the concluding remarks of Prof. Delépine that the results came out fairly satisfactorily from the basis of the original conditions which he (Mr. Dixon) included. The conditions for installation "B" were he believed laid down by a very eminent man, Prof. Franklin, and he noticed in clause 7 the Professor paid great attention to the reduction of the percentage of bacteria. He must admit that that was not a very satisfactory clause, and in his clause 7 he did not include that percentage, but he stated distinctly that there should be a certain amount of bacteria in so many cubic centimetres of water, which he thought had been fully justified by the results. The colour of the water which Prof. Delépine showed undoubtedly must be very satisfactory to them all, for it showed that of 32 samples which he examined the water was practically colourless; 95 per cent of the discoloration was removed, showing that the results from a colour point of view were very satisfactory. The references to suspended matter were undoubtedly very interesting. In his original samples which he sent to the Professor about eighteen months or two years ago, when he received the results of his examinations, he was at a loss to understand why there was such a large increase of suspended matter. He could not understand it at all. He thought the contractors would not be able to comply with those conditions, and he was very pleased to find that the increased suspended matter in the treated water was accounted for by the fine particles of the filtering medium which had evidently passed through the filter and gone into the water. He thought it was only fair to the contractors who put down his plant to say that at the commencement when they put the medium in there was a certain amount of dust caused by the granulating of the quartz or sand and that by constant washing those particles undoubtedly had increased, especially in the installation which he had under his control. They were all familiar with the medium when washing, and if anything the attrition was greater in the installation which he controlled than in the one which they visited the previous day at Kinder. In the process of watching the results of the washing of the filter medium he found after opening some of the filters that the whole of the medium was not thoroughly washed. He drew the attention of the contractors to this, and suggested that the reason was that the high velocity with which they had to drive the propellers in order to bring the medium through the central tube was too great, and did not allow sufficient time thoroughly to wash each particle of sand. The sand was pushed rapidly by, instead of being slowly pushed through the tube—at the time the speed of the propeller was something like 650 revolutions per minute. That of course was a very high speed; and he found that the life of the propeller section of the jets would be very short. He suggested to the contractors that they should reduce the speed, and they did reduce it to something like 350 revolutions, with very excellent results. The Professor was acquainted with those conditions and he could not understand why the suspended matter was not increased in the filtrate, as it had hitherto been. He (Mr. Dixon) told him in conversation what had been done to reduce the dust. He also found that the washing of filters was greatly improved by the slow speed of propellers. Referring to the sediment which Prof. Delépine found in the clear water while at Kinder, he (the speaker) was wondering how long after treatment the Professor discovered any sediment. In the sample which the Professor had passed round, and which he had had for three weeks, he (Mr. Dixon) could not detect any sediment with the naked eye. He had also had samples which had been kept for three and six months, and had never seen any sediment, and he was of opinion that there was very little sediment in

the new mains which were on the filtered side of the installation. They had an inspection cover on one of the 24-in. mains which he had inspected. There was a certain amount of small green slime, but he had never found any deposit such as was found in the clear water-well at Kinder. He was wondering whether the fine suspended matter might be due to the velocity with which the water passed through the pipes. They were greatly indebted to the Professor for giving them the constituent parts of the sediment which was found, as it proved that it was undoubtedly due to the medium and to the pipes. They would notice that the iron was very pronounced, which would be due to the interior of the filters coming away. He (the speaker) observed that in his specification he specified that the filters should have three coats of paint on the interior. In the case of the filters at Kinder those coats might remain intact, but in his case they did not, because of the scouring action of the medium driven through the pipes. The result was that the iron was exposed, and no doubt the contact of the water with the exposed iron caused those small particles of iron that were passing in the filter which the Professor discovered. He would like to know whether the Professor had since found the same quantity of iron in the water as he did when he first took the samples. Passing to another point, he thought they would all agree in thinking that the Professor had adopted a very excellent way in arriving at the action of the water on lead. They were methods which were adopted by a good many scientists, including scientific men in America and Germany. He thought that they would agree that the results obtained by the Professor were excellent, and that his test was a very severe one—far more severe than the methods hitherto adopted. He thought they had to congratulate Prof. Delépine on bringing forward those results in such an excellent way. He (Mr. Dixon) only regretted that the members were not present at the Manchester University when Prof. Delépine gave a lecture on the action of water on lead, in connection with the Royal Sanitary Institute. They could hardly realise the difference between the lead foil before and after contact. The test was undoubtedly the most severe which could be applied, and if water came out satisfactory under it he thought it was water as to which they might be well satisfied. With regard to bacteria at the works which were under his (the speaker's) control, it was very curious that after water had been passed through the filter the bacteria increased. The number of bacteria in the original water was so small that it did not affect the results, but, as he had said, it was very strange that the number in the filtrate should be increased, and he would like to hear from Prof. Delépine what was the cause of that. The indicators which the Professor enumerated in his paper were very useful to the man in charge. As he (Mr. Dixon) explained in a paper which he read in London, it would be beneficial if there was a simple method for the man in charge readily to ascertain the condition of his water for the purpose of knowing the quantity of chemicals required to deal with it. The Professor had been good enough to prepare those indicators, and they were very helpful with the exception of one case. In the case of a supply which he had at Greenfield Valley, obtained from an impounded reservoir and from springs, during a drought they used more of the spring water than of the impounded reservoir water. The reason was that unfortunately there was no waste water channel round the reservoir, which held 200,000,000 gallons, and consequently they had to put the whole of the water as it came down direct into the reservoirs. In the case of a storm a lot of suspended matter was brought down and made the reservoir very turbid. If he used a lot of the water it necessitated the flushing out of the filters perhaps every twelve hours. He had been in the habit of using a good deal of the spring water, which was hard, but he had never had those waters separately analysed. When a man used that water after drought, he must have used an excess quantity of tunnel water, which was very hard water. He had known when the hardness was equal to 16 Clarke's scale. When the man tested that water to know what the reaction would be by his indicator, which was a laemoid one, he found that it showed a neutral action, and when he sent a sample to Prof. Delépine he got a very bad report. The plumbo-solvent action in the unfiltered water showed .36, and in the filtered water it showed .26. He could not under-

stand such a result being shown, and upon investigation by Prof. Delépine, he found it was due to the excessive alkalinity which was present in the water. In the last table in the paper—table "B"—if they compared it with the two waters, he thought the results were extremely satisfactory for installation "A." They would notice that the action on lead before filtration was what he would call very excessive, in every case .36 being the minimum. In one case in July it was as high as 2, and in every case after filtration, and treatment with the very small use of chemicals—not more than .3 grain per 1,000 gallons—it was neutral. If they compared the two waters he thought the results were far more satisfactory than installation "B," because the unfiltered water was very easy water. In no case was the action on lead before filtration above .12, so it was evident that the work which installation "B" had been doing was nowhere near as severe as installation "A."

Mr. W. T. BURGESS (London) said that Prof. Delépine had given them some very valuable information concerning mechanical filters, and the reasonable conditions that might be formulated for makers. He quite supported Prof. Delépine in his criticisms as to some conditions which were unreasonable. For instance, when the water had too few microbes in it, it was absolutely unreasonable to insist that they should take a definite percentage out. In fact, as the Professor had told them, it was quite possible that water that had but few bacteria in it should come out of the filters with a larger number. With reference to the action on lead, he noticed that in one of the installations it was specified that the water should not be capable of taking up lead to a greater extent than 0.05 per 100,000. He had come across conditions in which even that proportion of lead was not desirable. He certainly thought the Professor had not erred on the side of unreasonableness in insisting, at any rate, that the water should give not more than .05 per 100,000 after treatment. For himself, he had tried all sorts of methods for testing waters for their action on lead. He had tried the method adopted by Mr. Houston in connection with his researches for the Local Government Board—using pure sheets of lead—but he still pinned his faith to trials in lead pipes, and he believed he would continue to do so. Whenever he was testing water on lead pipes, knowing the difficulty that there was in always getting the same sort of pipe, it was his habit to have control water which he knew something about, and if he was making a series of experiments he always had his pipes cut from the same new coil of lead. It was important to see that the interiors of the pipe were nice and clean, and that could only be done by rubbing—it was unsafe to use chemicals. He was quite satisfied that he would stick to lead pipes for his testing. Condition 7, referring to the hardness of filtered water, was very important, and there was a lot to be said about the question of the hardness of filtered water. He did not see that that condition was one that could be insisted upon. Hardness of the filtered water as tested by Clarke's method was not to exceed 10 per 100,000, but anybody who had anything to do with mechanical filtration and the treatment of water with chemicals knew that it was going to increase the hardness of the water. The increase in the hardness was perfectly definite, and depended upon the quantity of the chemicals used. If too much chemicals were used the cost would be so excessive as to condemn the process. He would like to see any reference to the hardness of the water omitted altogether from the conditions.

Mr. F. W. HOBSON (Loughborough) said he thought it would be interesting if Prof. Delépine would explain the nature of the figures in his paper relating to the sludge taken out of the tank at Kinder. It would also be interesting if they could be told if the deposit was obtained when the filters were first started, or whether the tank had been cleared out in the meantime.

The PRESIDENT said he had pleasure in proposing a vote of thanks to Prof. Delépine for his interesting and instructive paper. Mechanical filtration, they must remember, was the development of a process to provide drinking water which had long been used for manufacturing purposes. Mechanical filters had been in use for fifty or sixty years for clearing river water for manufacturing purposes, and it was owing to the thought and ability which gentlemen like Prof. Delépine had brought to bear upon the subject that the mechanical filter had been so perfected that the

water which was turned out by mechanical filters now was practically equal to any distilled water.

Mr. E. J. SILCOCK (Westminster) seconded the vote, which was carried unanimously.

Mr. WILLIAM PATERSON, being unable to attend personally, sent the following remarks on Professor Delépine's paper: Professor Delépine is to be heartily congratulated upon his timely paper, as the facts he brings out will undoubtedly receive careful consideration by the members of council, who, our esteemed president advises, are engaged upon the framing of satisfactory contract guarantee clauses. The title of the paper might perhaps more precisely indicate its contents were it to read "Characters of Pressure-filtered Moorland Waters," because it refers exclusively to experience of pressure filters, and the special nature of the filtrate, to which the author calls our particular attention, may, as we see, be exclusively characteristic of pressure, and not gravity filtration; further, they particularly apply to the mechanical filtration of soft, artificially hardened moorland waters and not turbid and calcareous supplies. The author remarks that, "although the results obtained were highly satisfactory, the condition of guarantee had not been fulfilled, because the effects of filtration have not turned out what might have been expected," and later says that "a consideration of what could be expected would have been sufficient to say that some of the conditions could not be realised." Consider the position of two contractors "X" and "Y" tendering to a specification containing such a guarantee clause. Let us suppose contractor "X" takes the specification seriously, and, after elaborate and costly analytical tests on the crude water before and after treatment with various reagents, proves conclusively that the guarantee required is impossible of attainment. Contractor "Y," on the other hand, swallows the guarantee clause whole and trusts to luck. Most probably he will receive the contract on the ground that he alone is prepared to guarantee fulfilment of all the clauses in the guarantee form. Obviously those responsible for the framing of the specification unwittingly inflict a grave injustice on contractor "X," who has at much expense proved by tests that the conditions required were impossible of attainment. For this reason it must be obvious that it is urgently necessary for an independent authoritative body like the Institution of Water Engineers to establish some form of guarantee which, if fulfilled, will comply with all the essential conditions of a pure potable water without calling for conditions to be complied with which no responsible contractor could conscientiously undertake. I am in entire agreement with all that Professor Delépine has to say in criticism of the guarantee clauses. There is no precision in the term "removal of 95 per cent of the discoloration," and the requirement that .45 per cent of the organic matter in solution must be removed might lead to serious misunderstanding unless it is agreed as to how this must be estimated. In one case that came under my experience the reduction of organic matter when estimated by the albuminoid ammonia test was 63 per cent, while the oxygen absorb test showed only 31 per cent reduction. Again, the free ammonia in a treated water may quite as frequently be increased as diminished, as the treatment more or less shows traces of ammonia in commercial alumina. The condition No. 10, "The oxygen absorbed from permanganate in four hours not to exceed 0.035 grains per gallon," is in some cases practically impossible of attainment. In one simple case that came under my notice lately the oxygen absorbed by the crude water was no less than .8, while this was reduced to 0.15, or 81 per cent, an excellent case, but far from complying with the figure called for by the specification. This proves the necessity, as far as possible, for making tests of samples of water obtained before giving a binding guarantee as to the official figures to be obtained. The author draws attention to the fact that, whilst under normal working conditions the water was apparently cleared, when viewed in a strong light there was a slight turbidity or opalescence due to suspended matter, composed almost entirely of minute particles which were practically ultra-microscopic, and goes on to say that when the treated water was made to pass through a sedimentation tank a dark gelatinous layer was deposited on the sides and bottom of the tank. The deposit was due to the separation of the fine par-

ticles contained in the water. From the interesting analysis given he concludes that this is composed of (1) filtering material, (2) iron from the filter walls, (3) precipitation resulting from the lime salts, and says it is reasonable to expect an increase in the soluble mineral constituents; but I venture to suggest that, while the analysis shows that results are exceedingly good, they would have been better had this insoluble precipitate been removed by the filtration process, and see no reason why this should not be effected by allowing time for the chemical reaction to complete before filtration. It is claimed that on the addition of a coagulant the reaction is instantaneous. My experience is that, while its effect in clearing the water from discoloration would lend one to imagine that this was so, time is essential for the completion of the reaction, and the slight, exceedingly minute precipitate described by the author is due to the completion of the reaction if the water has been freed from discoloration and gross suspended matter. The remedy, in my opinion, is the provision of a storage tank to allow a completion of the chemical reaction before the water passes on to the filter. The excellent summary of the essential conditions which the author has given appear to be very fair, and should be acceptable to any responsible contractor. The only suggestion that I should make is that Clause 3 might read: "The filtered water and vapour therefrom shall be free from odour at all temperatures up to 100 deg. Cent." Clause 7 seems hardly essential, as with a soft moorland water a licence to increase the hardness to 10 parts per 100,000 is too sweeping. The requirements desired could be obtained by specifying that the hardness is not to be increased more than 2 or 3 parts per 100,000. My experience is that it is generally desirable to insert a clause guaranteeing the weight and cost of the reagents required per 100,000 gallons purified. Professor Delépine is to be congratulated upon his excellent paper, which doubtless will lead to the framing of satisfactory standard guarantee clauses.

Prof. DELÉPINE said he had to thank the members for the very kind reception they had accorded his paper. He would like to remove a misconception which was in Mr. Dixon's mind. He (the Professor) did not say that Mr. Dixon was responsible for the conditions which he had criticised. Mr. Dixon was only responsible for putting them forward on the advice of experts who at the time thought them to be necessary. It was those gentlemen who made the conditions, and immediately he (Prof. Delépine) saw them he told Mr. Dixon that he thought some of them would never be fulfilled, and that if he acted shylock he would be able to break through any contract. He would reply in writing to the other questions which had been asked.

(To be continued.)

Surveyors' Institution Special Diploma Examinations.—The following members have been successful in obtaining the Special Diploma in Sanitary Science—namely, Messrs. Edgar O. Brown, Dover; George Harold Gudgeon, Bayswater, W.; Maurice K. Matthews, Tottenham Court-road, W.

Law of Private Street Works.—It is surely a commentary on our system of legislation relating to what may be termed domestic matters that the owner of house property (to say nothing of the occupiers of his houses) has to thread his way through a maze of statutes and decisions to ascertain his rights and his liabilities in connection with questions which may arise every day. Such, however, being the case, text-books dealing with what on the face of them might be deemed to be simple matters have become an actual necessity, although the owner of property is lucky if the text-book suffices and he is not driven to consult a specialist. The work before us* deals with one of such subjects, private street works under the Public Health Acts and the Private Street Works Act, 1882, but not with the Metropolitan Management Acts; the statements in the text are supported by decided cases, with references printed in the text; there is also a table of cases and an index, and it should prove a useful hand-book. We find the recent decisions included, and the work seems to have been carefully prepared.—*The Builder*.

* "Notes on the Law of Private Street Works under the Public Health Acts." By J. B. Reiguer Conder, a Solicitor of the Supreme Court. 3s. 6d. nett. London: St. Bride's Press, Limited, 24 Bride-lane, E.C.

SCUNTHORPE AND CROSBY JOINT SEWERAGE BOARD.

NEW DISPOSAL WORKS.

The inauguration of new sewage disposal works provided by the Scunthorpe and Crosby Joint Sewerage Board took place on the 19th inst. The population draining to the works is about 20,000, and the dry-weather flow of sewage is about 500,000 gallons per twenty-four hours.

As the population of the two parishes is increasing rapidly, the sewers have been designed of a capacity to deal with the sewage of a population of 30,000. The disposal works are so arranged that the necessary extensions may be readily carried out in order to be able to deal with the higher figure. The whole volume of the sewage gravitates to the works at such a level as to permit of treatment through the tanks and filters without recourse to pumping.

The treatment of the sewage is as follows: On arrival at the works it is passed through screening and detritus tanks. These tanks are in duplicate to facilitate emptying and cleaning, &c. They are each 34 ft. by 6 ft. by 6 ft. deep, and have a total capacity of 15,500 gallons.

The septic tanks are 92 ft. by 22 ft. 9 in. by 6 ft. deep, and their total capacity 313,000 gallons. The filter-beds are sixteen in number, and are of the circular type with revolving sprinklers. They have a total capacity of 10,368 cub. yds. They are each 73 ft. diameter, and their average depth is 4 ft. The filtering medium is clean, hard, blast-furnace slag, and varies in size 2½-in. to ¼-in. There are two storm-water tanks, each 68 ft. 6 in. by 29 ft. 2 in. and 5 ft. deep, having a capacity of 125,000 gallons.

The total cost of the works amounts to about £31,000.

The work was divided into four contracts. The main sewer through the town was constructed by Mr. H. E. Buckley, of Bradford; the cast-iron outfall sewer and timber trestles were by Messrs. Sangwin & Co., of Hull; the disposal works by Messrs. Lane Brothers, of Manfield; and the cast-iron pipes for the outfall sewer were supplied by the Stanton Iron Company, near Nottingham; the oil engine and pump were supplied by the Campbell Gas Engine Company; the revolving distributors by Messrs. Adams-Hydraulics, Limited; the slag and floor tiles for filter-beds by Messrs. C. L. Stiff & Co., and the valves and other ironwork fittings by Messrs. W. E. Farrer, Limited. The engineers received valuable assistance throughout from Mr. J. E. Laybourn, the resident clerk of the works.

The engineers for the scheme were Messrs. Herbert Walker & Son, Nottingham.

SOME RECENT PUBLICATIONS.*

POWER AND POWER TRANSMISSION. By E. W. Kerr, M.E. Third Edition. Price 8s. 6d. nett. London: Chapman & Hall, Limited.

In preparing this the third edition of his work, the author has thoroughly revised the whole, while much has been entirely rewritten. The first of the three parts into which the book is divided deals with machinery and mechanics. The elementary principles are explained in an introductory chapter, and in subsequent chapters the several mechanical devices for power transmission are dealt with. The second part is devoted to steam power, while the final division deals with such matters as pumping machinery, internal combustion engines, water power, compressed air, and hot-air engines. The work is clearly written, and the illustrations are excellent. At the conclusion of each chapter there are several problems to be worked by the student. The new edition should be even more successful than its predecessors.

Claridge's Asphalte is being used on the roofs of King Edward's Memorial Church and Lloyds Bank Limited new premises, Hull.

"Pudlo" in Sewerage Work.—For the large sewerage works at Adare, on Lord Dunraven's estate, Pudlo has been specified to waterproof all the cement work.

* Any of the publications reviewed, or referred to as received, will be forwarded by the St. Bride's Press, Limited, on receipt of published price, plus postage in the case of nett books.

Early Examples of Town Planning in the City of Edinburgh.*

By A. H. CAMPBELL, M.INST.C.E., Engineer to the Corporation.

In this period of what may be called the renaissance of local government it is refreshing to turn to early examples of town planning furnished by the Corporation of Edinburgh and other public trusts in the laying-out of the new town.

THE OLD TOWN OF EDINBURGH.

In most striking contrast to the closely piled and many-storied blocks of the old town is the straight, rectangular plan distinctive of the new town, with its wide thoroughfares, its lavish allotment of land for gardens, and the stately edifices flanking its principal thoroughfares. It is, as it were, the swing of the pendulum from the congestion resulting from close aggregation of people who inhabited the pent-up



[Mr. Campbell is a native of Edinburgh, and received his technical education at the Heriot-Watt College and Edinburgh University as a student under the late Prof. Fleeming Jenkin. He was for six years assistant engineer in the Edinburgh burgh engineer's department, to which he returned as chief in October, 1919, after an absence of twenty-one years, during which interval he held in succession the positions of borough surveyor of Stratford-on-Avon, city surveyor of Canterbury, and borough engineer and surveyor of East Ham. He is a member of the Institution of Civil Engineers, and of the Institution of Municipal and County Engineers; also a Fellow of the Royal Sanitary Institute.]

closes of the ancient Royal Mile—known as High-street and Cannongate—to that of distribution of the people which resulted from the planning and development of the new town. But this change in the domestic and social conditions of the people was not attained without much physical change in the city's natural features. Thus, between the old town (represented at its two extremities, by the Royal Palace of Holyrood on the east, and the Fortress or Castle, crowning the rocky summit on the west) and the new town, then undeveloped, a "gulf was fixed" in the presence of the Nor' Loch Valley, a deep hollow situate at the base of the Castle Rock and thence sloping eastwards towards Calton and Canongate. The ridge of this slope has been not inaptly called "the spinal cord" of the city.

The draining of this Nor' Loch about 1763 was the first work towards the reclamation of this marsh, and the preliminary step towards its present-day service as a public park and pleasure ground, known as Princes-street Gardens. But it was essential to the development of the new town that this valley should be spanned, and thus unite the old town upon the south with the contemplated new town upon the north. Hence came the first "North Bridge," commenced in the year 1763, and opened for traffic, after

a chequered constructional experience, in 1772. The north side of the city being thus linked up to its ancient civic centre in the High-street, the territory upon the north became ripe for the founding of a new city, or rather for the expansion of an ancient city upon new lines. In 1767 an Act was obtained for extending the ancient royalty of the city over the fields to the north. Thanks to civic foresight and the natural prosperity of the city as the Scottish capital, right well has this new town developed to its present-day importance. The land was held principally by the City Corporation and the George Heriot's Trust. This ownership of the land by public bodies facilitated the steps which resulted in the adoption of a plan upon which this new town should be laid out, commencing with the plateau of Princes-street, and thence along the northern slopes of the city, with Queen-street as the boundary of this first effort at town planning.

CRAIG'S PLAN OF PRINCES-STREET, ETC. (1767)

The plan of James Craig (a local architect) was selected in competition (1767). This plan was deservedly regarded at the time as a work of genius, and when compared with the streets of the ancient city must have impressed the popular mind as nothing short of a revolution in the laying-out of a town, showing, as it did, spacious rectangular building blocks intersected by wide streets and finely conceived terminal squares, known as St. Andrew-square and Charlotte-square, on east and west respectively. Curiously, although George-street is now regarded as secondary to Princes-street, the intention of the designer was that George-street should be the principal shopping street and dominant feature of the plan, with Princes-street subsidiary or secondary thereto, and as a residential road, which indeed it was. Time has, however, effected in this respect a complete conversion and almost entire reconstruction of Princes-street into the great shopping street of the city. Writing upon this plan of Craig's, Mr. Peter Macnaughton, s.s.c., clerk to the Heriot Governors, says:—

"The enterprise of a municipality, which deliberately set out to build a new town on a new site, evoked great interest throughout the country, and King George III. took a lively personal interest in the scheme. The names of the streets testify to the enthusiastic loyalty for the Hanoverian dynasty which animated the citizens of Edinburgh through the events of the Rebellion of 1745 must have been still fresh in the memories of the people. The plan is dedicated by the author 'To His Sacred Majesty George III., the Munificent Patron of every polite and liberal art, this plan of the new streets and squares intended for ancient Capital of North Britain, one of the happy consequences of the peace, security, and liberty his people enjoy under his mild and auspicious Government, is with the utmost humility inscribed by His Majesty's most devoted servant and subject James Craig.' The street names are themselves a tribute of loyalty, the principal street, in Craig's view, being called after His Majesty himself—George-street. The squares were named St. Andrew's-square and St. George's-square, after the patron saints of Scotland and England, but St. George's-square gave way to Charlotte-square, it having evidently been regarded as somewhat invidious to omit the name of the Royal Consort. It is said that Princes-street was originally named St. Giles's-street, after the patron saint of the city but that the King, on the plan being submitted to him, expressed his disapproval, and promptly named it Princes-street, after the heir to the throne. Then we have Rose-street and Thistle-street, the respective emblems of the two countries. In his 'Memorials of Edinburgh in the Olden Times,' published in 1848, Mr. Daniel Wilson, secretary of the Society of Antiquaries, says: 'The regular array of parallelograms thus sketched out for the future city was received by the denizens of the old town with raptures of applause. Pent up in narrow and crooked wynds, its broad, straight avenues seemed the beau-ideal of perfection, and the more sanguine of them panted to see the

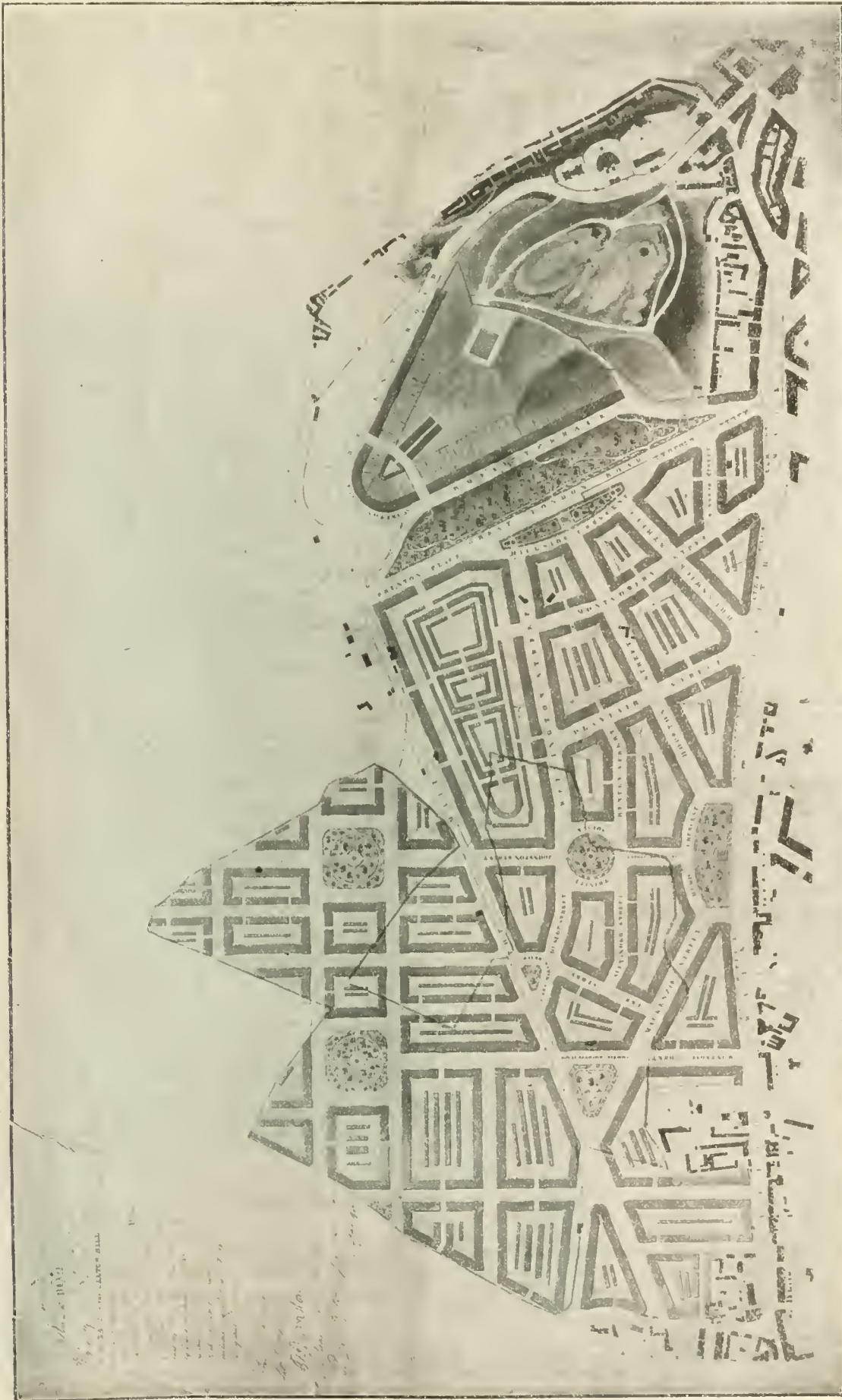
* Paper read at the meeting of the Institution of Municipal and County Engineers, held at Dunfermline on June 5th and 6th.

magnificent design realised. Some echo of their enthusiastic admiration still lingers with us.”

PRINCES-STREET GARDENS (1763-1816).

The great valley of the Nor' Loch, at that date just

somewhat of the latent value of the land for such profitable purpose as its conversion into building sites. Building operations were actually begun, but the public sense prevailed, so that, after much pro-



EDINBURGH TOWN PLANNING: PLAYFAIR'S CALTON HILL PLAN. 1819.

reclaimed by drainage and bounded by the broad boulevard—now Princes-street—formed a most tempting site for building developments, especially so to proprietors, it may be, needy and eager to realise

tracted litigation, an Act of Parliament was obtained in 1816 enacting, *inter alia*, "That it should not be lawful, nor in the power of the Lord Provost, magistrates and council, or their successors in office to

erect or sanction the erection of any building whatever to be erected in any part of the ground belonging to the community of the said city on the south side of Princes-street."

From this Act, confirmed and re-enacted by subsequent Acts, dates the preservation of this uniquely beautiful valley in the centre of the city as a perpetual pleasure ground for the people—probably unsurpassable in its combination and variety of natural features unspoilt by the builder's and the gardener's art, which have their part, nevertheless, in this beautiful city landscape.

The realisation of Craig's building plan proceeded rapidly, and culminated in the building of Charlotte-square (1800) as a terminal feature upon the west. This square is probably the most dignified and stately of all our city squares, the architecture being noted as one of the finest works of Adams. With the then approaching completion of Craig's plan, and the continued demand created by the flow of fashion migrating from the High-street and Cannongate to this new town, the need arose for the development of further building lands, lying still northwards, and declining towards the valley of the Forth.

LEITH WALK (1774).

Mention must here be made of the formation of Leith Walk in 1774, a great highway extending from Princes-street, Edinburgh, to the heart of Leith—a distance of $1\frac{1}{2}$ miles, and having a width of from 68 ft. to 163 ft.

REID AND SIBBALD'S PLAN FOR NORTH SIDE (1804-6).

Again resort was had to a town plan, and in turn that piece of land bounded by Heriot-row upon the south to Fettes-row upon the north, and from Bellevue on the east to the old-time village of Stockbridge on the west, was made the subject of a town plan. This land again was vested, principally in Public Trusts, and so enabled this large tract to be treated and planned out as one subject. This development plan, prepared about 1806, adheres to the bold conception—although albeit severe formality—of Craig's scheme for Princes-street, George-street and Queen-street areas.

The joint authors of this plan were Messrs. Robert Reid and William Sibbald—the former being the architect to His Majesty in Scotland, while the latter held the position of city superintendent of works. . . . The leading ideas are streets and buildings ranged in rectangular order, straight, but impressive by their great width, fronted by palatial buildings, chiefly of a residential kind, and having that continuous stretch of woodland and greenery as garden ground, extending practically the entire length of the plan from east to west, between Queen-street on the south and Heriot-row upon the north, with the gardens of Drummond-place and Royal-circus balancing the northern fringe of this area.

GARDEN SPACES THE LUNGS OF A CITY.

It is the free introduction of the garden idea into those early plans, both of Craig and again of Reid and Sibbald, that give to them such outward attractiveness, and add to their worth from a public health and amenity point of view. The inclusion of such "lungs" as essential adjuncts of city development is evidence of the foresight of the planners, and of the appreciation, by landowners and citizens alike, of those things that really matter, and which stamp a city as composed of something more than mere stone and lime, or an accumulation of bricks and mortar. This recognition of recreation or airing spaces as vitally essential to the growth of a town has set the pace, which, happily, has been well maintained in other areas which followed on, north and south of the ancient city boundary, such as Moray-place, Ainslie-place, and in more recent times the squares and gardens of the west end; while the gardens of George-square, Nicolson-square, St. Patrick-square, Gayfield-square and St. James'-square, &c., all pay tribute to the same idea of a central garden space as indispensable to the successful hygienic grouping of buildings and the growth of communities.

It is regrettable that this custom of those early planners has not been followed in the more utilitarian plans of later days, and thus have preserved for the city in those areas of a crowded kind spaces and airing grounds for the inhabitants. The passion for extracting from the land its utmost yield in building, and therefore in money, applied not indeed so much in Edinburgh as in other cities, and seems to have obsessed the owners to the exclusion of those finer points of estate planning, indicative of regard for

amenity and for health. It is well, therefore, that a new era has set in, and the public sense reawakened to the need for the garden and the playing-field as indispensable parts of the planning of building estates, and the initial contribution of the landowner towards the necessities of his future subjects resident upon the land. We . . . see in the succeeding plans how this provision of air space was still further developed—or neglected—in the plans for the Calton Hill and the district lying away to the north thereof, and partly within the burgh of Leith. This was a very large part of the city, at its north-east boundary, and bordering the neighbouring burgh. The land was owned principally by the corporation as trustees of the Trinity Hospital, and by George Heriot's Trust, together with other interests of a minor kind.

CALTON HILL AND LANDS TO THE NORTH THEREOF: PLAYFAIR'S AND OTHER PLANS (1819).

Again, the results of voluntary combination by the landowners are to be witnessed in the singularly impressive series of competitive plans . . . prepared about the year 1819.

[In submitting photo copies of these plans to the members, Mr. Campbell observed that they provided material not only of present-day interest in the doings of our city rulers a century ago, but were real object lessons and examples worthy, in their main features, of reproduction in the plans of the present. They were instructive too as works of art, and in that respect might encourage the youthful town planner of to-day in the clear and graphic expression of his ideas by drawings that indicated care and displayed skill in design, culture of hand, as well as quality of head, combining at once the conception of the artist and the common sense and practical experience of the man of affairs. It was those qualities that were, he said, needed in the town planner of to-day, and if those century-old town plans were studied as examples of the art and science of town planning, much good would have been done. Space and time forbade a critical exposition of each plan which, with possibly one exception, were in their leading lines and their general treatment remarkably good. Like the plans which preceded them of earlier areas, they were deficient in points and matters now deemed essential. It was sad to relate that the adopted plan of Playfair's had suffered much mutilation in execution owing primarily to the incursion of railways in the Leith-walk locality, so that it was only the noble terraces that girdled the Calton-hill and the fringe of the hillside upon the north that had been realised.]

EFFECT OF RAILWAYS UPON TOWN PLANS.

Truly the havoc of the railway age and the commercialism of the latter part of the nineteenth century seem to have paid scant respect to the better vision and the finer conception of an earlier generation. Although too late to redeem that particular area from the hands of the spoiler, the lessons taught by that period of decadence remain with us as a warning against the intrusion of a railway into the realm of a town plan, except under adequate safeguards, securing the area against the wrecking of unconsidered railway plans. Railway expansion may go hand-in-hand with town planning, and this is the business of the town planner, that he may ensure the land against ill-considered proposals whether of a railway or other enterprise. Intelligent co-operation and timely representation can generally secure the desires of both without injury to the plan of development.

The next area to be taken in hand was that tract of land, the property of the Earl of Moray, overlooking the water of Leith and Dean Valley, and embracing Moray-place, Ainslie-place, Randolph-crescent and Cliff. For this area plans were prepared by Gillespie Graham about the year 1823, and this plan probably approximates nearest to the ideas of the town planner of to-day in the freedom and informality as compared with the earlier plans referred to in this paper.

MORAY-PLACE, ETC.: GRAHAM'S PLAN (1823).

The site of this was exceptionally fine, including, as it did, the wooded and grandly picturesque slopes of the water of Leith Valley. The plan of development is made to dovetail into the western termination of Craig's plan of Princes-street and Queen-street, and of Reid and Sibbald's plan of the territory to the north thereof. Internally this plan of Graham's is attractive and novel in its departures from the straight lines of the earlier plans. In lieu thereof we have the curved lines of Moray-place, Ainslie-place and Randolph-crescent encircling a series of gardens along the

axial line of the plan and flanked by palatial town mansions of exceptionally dignified architectural treatment. This is noticeably so in Moray-place. Criticism is sometimes directed against Graham's plan that it disposes the "backs" of the houses towards the Dean Bridge and the deep valley of the Water of Leith spanned by that bridge. In explanation of this seemingly reasonable objection it should be remembered that this plan was prepared at least nine or ten years before the Dean Bridge was erected, or probably even projected. There was therefore no justification from a public point of view why at that date buildings should front instead of back upon the valley; nor can it be seriously maintained that any loss of amenity has been suffered by reason of the disposition adopted. The many-storied mansions of Moray-place, crowning the wooded slopes of the valley, and the terraced treatment of the gardens of those mansions, present from the bridge a combination at once pleasing to the eye, effective as a picture, and void of offence against the æsthetics of this beautiful valley.

WEST-END DEVELOPMENTS: MELVILLE-STREET, ETC.

Concurrently with the development of the Earl of Moray's estate came the western outgrowth of the city in those streets called Melville-street, Coates-crescent, Atholl-crescent, &c. The planning of this area is in no wise inferior to the excellence of the earlier examples that have been described. Modelled upon similar lines, the area worthily sustains the traditions of the New Town, both as regards the width of its streets and the quiet dignity of its architecture. The later additions to or extensions of this plan in the buildings of St. Mary's Episcopal Cathedral at the extreme west end of Melville-street and directly in line thereof form a noble terminal feature to the west, with St. George's Established Church and its domed crown close in the view towards the eastern end.

IMPORTANCE OF SUITABLE VISTAS IN TOWN PLANNING.

Those terminal features serve to show the importance in town planning of securing good and suitable vistas as the natural and proper termini to leading thoroughfares, and that not only in the formal type of town planning, but likewise in the freer treatment of the informal style adopted in the planning of suburban parts. It will be conceded that the various designers of the New Town of Edinburgh recognised the part which may be played in giving to leading streets suitable terminal features. To mention a few, consider Princes-street with the Calton-hill, and its many monuments closing in the eastern vista, while St. George's Campanile Tower and the stately spire of St. Mary's Cathedral terminate the western view; or, again, George-street, with its Melville Monument on the east and St. George's parish church and dome on the west; Howe-street, with the appropriately disposed St. Stephen's Church at its northern terminus; or Hanover-street, with the classic Royal Academy in the immediate foreground, backed by the turreted terminals of the Assembly Halls, and crowned by that triumph of Gothic architecture in the lofty spire by Pugin; or see the Scott Monument from St. Giles'-square; while the Castle is the dominating feature, visible from all points of the city's compass. All these and many others that attract the eye at nearly every turn in our New Town bear witness to the foresight of those early planners, to whom we must pay grateful tribute, and to the passion that then prevailed of adorning, by worthy architectural dispositions, the city so favoured initially by Nature, and yet also presenting, by reason of Nature, those very barriers that have made the planning of the city and the linking up of its several parts so physically difficult and so constructionally expensive. Upon this aspect of the subject the following notes are submitted.

The author has mentioned the North Bridge as the first link in the chain of important connecting works undertaken by the corporation for the bridging of the valleys by which Nature had seemed to bar the city's growth. The influence of the first North Bridge in opening up the north side has been apparent. A like problem awaited solution in preparing the way for another new town waiting to grow up on the southern slopes of the old city. This was to be accomplished through the building of the South Bridge.

SOUTH BRIDGE (1735-1738)

is a viaduct about 300 yds. long, spanning the Cowgate Valley, and immediately to the south of High-street. The roadway is carried upon a series of nineteen arches built up in flatted sections with a longitudinal partition wall under the centre of the street, and divid-

ing the business premises that now line this highway. Those arches serve as vaults and stores attached to the shops, and as cellarage to the premises on the lower levels of the street. Constructionally this work must have involved heavy cost, and presents much interest to the student of design, revealing evidence of ingenuity in suiting the supports of the bridge to the future service of the street and its frontages. South Bridge is now one of the principal shopping centres; it has a width of 60 ft., and crosses the Cowgate at a height of 37 ft. Its cost, including the purchase of the old Merlyn's Wynd and buildings, is stated to have been £65,000. The new building sites fronting this new road realised upwards of £80,000; truly "there is that scattereth and yet increaseth." The formation of this new highway prepared the way for the development of the city upon its south side, commencing with the laying out of the suburb of Newington about 1806.

THE MOUND (1781-1830).

Another valley crossed, to unite the old with the new town upon the north, was the site of the old Nor' Loch, at a distance of about 600 yds. west from the North Bridge, and called "The Mound." It is so named because the crossing is effected by a great mound of earth, designated at one time "The Mud-Brig." Commenced about the year 1781, it served as a "toom" for the deposits of earth and rubbish (obtained, doubtless, from the building up of the New Town). It is computed to contain about 2,000,000 cartloads of earth. Although opened for traffic in 1787, it continued to be widened and improved until, in 1830, it was completed substantially as it now appears. The Mound is now pierced by two tunnels carrying the main lines of the North British Railway through the Princes-street valley. Flanked upon both sides by grassy slopes, and winding steeply up the hill, the Royal Scottish Academy at the base and the Bank of Scotland at the summit are worthy subjects of architectural study, and give to this highway its own distinctive charm. It is about 400 yds. in length, and has a road width of 50 ft.

REGENT BRIDGE, WATERLOO-PLACE AND REGENT-ROAD (1815-1819).

Spanning a deep ravine known as the Lower Calton, and thence skirting the southern slope of the Calton-hill, this work was really in the nature of a viaduct for about 160 yds. of its length. It opened out the enclosure which till then, by a block of mean buildings, terminated the eastern end of Princes-street, and concealed the fine prospect of the Calton-hill and its monuments as the natural and fitting terminal feature of Princes-street, of which it now forms the eastern prolongation, and the leading highway out of the city to Dunbar, Berwick and London. This work was first projected in 1784, soon after the completion of the North Bridge and the commencement of Princes-street developments; but it was not until 1817 that it took active shape, being opened in 1819 by Prince Leopold, afterwards King of Belgium. It was fitting, following upon the triumph of Waterloo, that the Sovereign-designate of that country should be associated with the work perpetuating in name that memorable victory. The roadway of Waterloo-place is carried from the low level by a series of arches which are now enclosed, and used in conjunction with the business premises which front the highway. Owing to the depth of the ravine and its precipitous nature, the work must have been of a difficult and costly kind. The clear width of the road is 70 ft.; the height of viaduct is 50 ft.; the total length of this highway, including Regent-road as the essential part of the scheme, is 1,300 yds.

KING'S BRIDGE AND JOHNSON-TERRACE (1827).

Constructed about 1827, this highway forms an easy decline from the Lawnmarket to Castle-terrace, immediately skirting the south base of the precipitous Castle Rock, rising at its side to a height of about 260 ft. This work must have involved the clearance of many ancient buildings, which stood upon the site of what is now the Tolbooth Parish Church, and forms the eastern termination of the new road, where it debouches from the old Castle Hill. It must also have involved the cutting through of much rock to form the fine terrace which it now presents. The length of this road is about 600 yds., and its width 65 ft.

GEORGE IV. BRIDGE (1827-1836)

is a viaduct running parallel to the South Bridge, and a work of precisely similar nature, spanning the

same valley at a distance of about 400 yds. westward therefrom. It is really the sequel to "The Mound," of which it forms the continuation southwards, and thus operates to the relief of traffic from the South Bridge. It is raised upon a series of arches, fully 300 yds. in length, some two or three stories in height, the top story showing an exceptionally fine piece of finished masonry, well worthy of inspection and study as an exhibition of grained vaulting. The cost of this work alone is stated to have been very great; considered side by side with the South Bridge, which is a work of even greater magnitude, and the limited resources of those days, this must have demanded on the part of the city rulers much courage and enterprise, especially when we remember those earlier works of heavy cost, for the repayment of which the city's finances were chargeable.

Those various undertakings of bridge and highway construction, however, had opened the way for the rapid developments which followed upon the south side of the city, in the Newington, Grange, Blackford, and Warrender Park districts. It is difficult to conceive how such developments would have been possible without those two arterial lines of communication in the South Bridge and George IV. Bridge. Without them, the only accesses would have been St. Mary-street and Pleasance upon the east, with the West Bow and Candlemaker-row upon the west. The very thought of such unsuitable accesses stirs a sense of gratitude to the city fathers of those days who, foreseeing the needs of the morrow, were not afraid to venture, even at such great cost, to prepare the way for those developments, upon which the growth and progress of the city depended.

THE DEAN BRIDGE (1832).

The provision of suitable means of communication was essential to the development of the lands of Dean Park, lying to the north and west of the Dean Valley.

By the co-operation of town council and landowner—although principally at the cost of the latter (Lord Provost Learmouth)—the now famous Dean Bridge was erected about 1832 from the design of Thomas Telford. This bridge, by virtue of the eminence of its engineer, its strikingly impressive design, and its picturesque setting, has acquired a deserved acknowledged reputation as one of the sights of the city. It is probably the finest example of a stone arch bridge to be found. It consists of four arches, each 96 ft. span, and 106 ft. high to road level. Its total length is about 450 ft., with a 39-ft. width between parapets. Although when built its immediate purpose was local estate development, it is now the leading highway to that greater engineering achievement the Forth Bridge, and *via* Queensferry it is the direct highway to the North of Scotland.

But these works, numerous and costly though they were, do not complete the chain of city improvements falling within the title of this paper. The formation of Cockburn-street and the old Waverley Bridge, carried out by private enterprise about 1859; also Chambers-street, Jeffrey-street, St. Mary-street, and Marshall-street, &c., included within that programme of city improvements during the *regime* of Lord Provost Chambers (1870), and works of a subsequent date (1895) which embraced the reconstruction of the North Bridge at a cost of about £217,000, testify to the fact that each generation has now for fully 150 years busied itself with thinking out and putting into execution schemes for the betterment of the city, and making it worthy of the reputation it has earned as "The City Beautiful."

There is still scope left, although it may be upon a scale less grand and formal, yet nevertheless essentially beneficial, and needing the exercise of the same qualities as influenced our predecessors in their day, so that the present generation may make its contribution and add its link to the continuing chain.

Abstract of the New Town Planning as shown on Map on view at the meeting.

CITY OF EDINBURGH.

PLANNING OF NEW TOWN A.D. 1767-1912.

Area embraced	...	...	...	796 acres.
Building area	...	...	...	322 acres
Roads	...	...	...	160 "
Public parks and open spaces	...	...	...	314 "
Total	...	...	...	796 acres
Number of houses within area equals	...	...	...	8,351
Equals a density of 10.5 houses per gross acre.				

INSTITUTION OF MUNICIPAL AND COUNTY ENGINEERS.

President—Mr. J. S. PICKERING, M.INST C.E., Borough Surveyor and Water Engineer, Cheltenham.

EASTERN DISTRICT.

An Eastern District meeting will be held at Tilbury on July 25th.

CLEETHORPES MEETING.

A meeting of the institution will be held at Cleethorpes on September 19th.

SCARBOROUGH MEETING.

A meeting of the institution in the North-Eastern District will take place on Saturday, September 26th, at Scarborough.

J. W. DUDLEY ROBINSON, B.S.C.(LOND.),
Secretary.

92 Victoria-street,
Westminster, S.W.

INSTITUTION OF MUNICIPAL ENGINEERS.

President—Mr. HORACE BOOT, M.I.E.E., M.I.MECH.E.

NORTHERN DISTRICT.

Meetings will be held in Cumberland this month, at Alnwick on Saturday, July 11th, Sunderland on Saturday, October 10th, Newcastle on Saturday, November 7th, and Newcastle on Saturday, December 12th.

A Northern District meeting, in combination with Yorkshire, will be held at Harrogate on Saturday, September 12th.

NORTH-WESTERN DISTRICT MEETING.

(July 3 and 4, 1914.)

PROGRAMME.

Friday, July 3rd.

General council meeting, tea and social to be held at the Mitre Hotel, Manchester.

6 p.m.—Tea. (Tickets, 2s. per head.)

7 p.m.—Council meeting.

8 p.m.—Smoking Concert, for which a capital programme has been arranged.

Saturday, July 4th.

Visit to the Ashton-under-Lyne, Stalybridge and Dukinfield waterworks.

EASTERN AND NORTH-EASTERN DISTRICTS.

A visit will be paid by these districts of the institution to-morrow (Saturday) to the quarries of the Enderby and Stoney Stanton Granite Company, Nareborough.

B. WYAND,
39 Victoria-street, S.W. *Secretary.*

APPOINTMENTS VACANT.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

SURVEYOR'S ASSISTANT.—June 29th.—Abertillery Urban District Council. £80 per annum.—Mr. William Gait, clerk.

SURVEYOR'S ASSISTANT. June 29th.—Corporation of Luton. £80 per annum.—Borough Surveyor.

JUNIOR ASSISTANT. — June 29th. — Somerset County Council. £80 per annum.—Mr. Edward Stead, county surveyor, Wells.

TEMPORARY SEWAGE WORKS ASSISTANT.—June 29th.—Corporation of Dewsbury. £2 2s. per week.—Mr. Henry Dearden, borough surveyor.

SURVEYOR'S ASSISTANT.—June 29th.—Slough Urban District Council. £90—£120 per annum.—Mr. W. W. Cooper, surveyor.

BOROUGH SURVEYOR'S ASSISTANT.—June 30th.—Corporation of Middleton. £90 per annum.—Mr. F. Entwistle, town clerk.

ARCHITECTURAL ASSISTANT.—July 1st.—Dewsbury Town Council. £90.—Mr. H. Ellis, town clerk.

TEMPORARY SURVEYING ASSISTANT.—July 2nd.—Royton Urban District Council. £2 2s. per week.—Mr. Ellis Harrison, clerk.

TEMPORARY ASSISTANT SURVEYOR.—July 4th.—Failsworth Urban District Council. £2 per week.—Mr. H. C. Broome, clerk.

SANITARY INSPECTOR.—July 4th.—Lewisham Borough Council. £150—£200.—Mr. E. W. Wright, town clerk, Town Hall, Catford, S.E.

TEMPORARY ASSISTANT.—July 4th.—Corporation of Chard. £78 per annum.—Mr. E. W. Hearn, borough engineer and surveyor.

ASSISTANT SURVEYOR.—July 4th.—Antrim County Council. £120.—Mr. A. Millar, deputy secretary, County Courthouse, Belfast.

SURVEYOR'S ASSISTANT.—July 4th.—Kidderminster Rural District Council. £1 10s. per week.—Mr. G. J. Shepherd, surveyor, 85 Chester-road, Kidderminster.

BOROUGH SURVEYOR'S ASSISTANT.—July 6th.—Corporation of Loughborough. £120 per annum.—Mr. Henry Perkins, town clerk.

SECOND ASSISTANT.—July 6th.—Devon County Council. £2 2s. per week.—Mr. R. M. Stone, county surveyor (northern division), The Square, Barnstaple.

CLERK OF WORKS.—July 6th.—Devon County Council. £3 per week.—Mr. W. P. Robinson, county surveyor (No. 2 division), 22 Queen-street, Exeter.

CLERK OF WORKS.—July 6th.—Ruislip-Northwood Urban District Council. £3 3s. per week.—Mr. Edmund R. Abbott, clerk, Northwood, Middlesex.

BUILDINGS SURVEYOR.—July 7th.—Hentley-on-Thames Rural District Council.—Mr. A. R. Lloyds, clerk.

CLERK OF WORKS.—July 7th.—Minehead Urban District Council.—Mr. L. C. Webber-Inledon, clerk.

ASSISTANT COUNTY SURVEYOR.—July 8th.—Somerset County Council. £200 per annum.—Mr. Edward Stead, county surveyor, Wells.

ASSISTANT SANITARY INSPECTOR.—July 15th.—Highland District Committee of the Perth County Council. £100.—Mr. R. McNicoll, County Buildings, Perth.

CITY SURVEYOR.—August 4th.—Municipal Council of Sydney, New South Wales. £1,000—£1,300 per annum.—Mr. Thomas H. Nesbitt, town clerk, Town Hall, Sydney.

DISTRICT ENGINEER.—Public Works Department of the British Guiana Government. £300—£400 per annum.—Crown Agents for the Colonies, Whitehall-gardens, London.

YOUTH.—Surrey County Council.—Mr. A. Dryland, county surveyor, County Hall, Kingston.

MUNICIPAL COMPETITIONS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

MIDDLETON.—July 16th.—Designs for a town hall, the cost of which must not exceed £18,000. Premiums £100, £50, and £25.—Town Clerk.

REIGATE.—July 25th.—Designs for a police and fire station, for the Corporation of Reigate. Premiums 40, 20, and 10 guineas.—Mr. A. Smith, town clerk.

LONDON.—September 7th.—Designs for elementary schools, for the London County Council.—Education Officer, Education Offices, Victoria-embankment, W.C.

MUNICIPAL CONTRACTS OPEN.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

Buildings.

DEVON.—June 29th.—For repairs and alterations at certain schools, for the Education Committee.—The Architect, 1 Richmond-road, Exeter.

FINSBURY.—June 29th.—For structural alterations to the town hall, for the borough council.—Borough Surveyor.

HITCHIN.—June 29th.—For sinking a well, for the rural district council.—Messrs. W. R. and W. Phillips, engineers, Luton.

GAMBRIDGE.—June 29th.—For the erection of a school, for the corporation.—Mr. E. Jenkins, education secretary, Guildhall.

DUNDEE.—June 29th.—For the construction of foundations at generating station, for the corporation.—Mr. H. Richardson, Dudhope-crescent-road.

LANARK.—June 29th.—For the erection of 150 workmen's dwellings, for the Middle Ward District Committee.—Mr. W. R. Young, town planning engineer, District Offices, Hamilton.

BARNSTAPLE.—June 29th.—For the erection of a dining-room at a school, for the Managers of Secondary Schools.—Mr. E. Y. Saunders, borough surveyor.

HINDLEY.—June 29th.—For the erection of a school, for the urban district council.—The Surveyor.

LONDON.—June 30th.—For the construction of two storage reservoirs in the Thames Valley, together with intake works on the banks of the Thames, and certain contingent works, for the Metropolitan Water Board.—Chief Engineer, Savoy-court, London, W.C.

SEAHAM HARBOUR.—June 30th.—For the erection of forty-five houses, for the urban district council.—Mr. W. R. Robinson, assistant surveyor.

EASTBOURNE.—July 1st.—For additions to a school, for the Education Committee.—Building Surveyor, Town Hall.

WARRINGTON.—July 1st.—For the erection of public conveniences, for the corporation.—Borough Surveyor.

BRACKLEY.—July 1st.—For the erection of twelve cottages, for the borough council.—Mr. C. E. Barnes, town clerk.

HOUGHTON-LE-SPRING.—July 1st.—For widening a bridge, for the rural district council.—Mr. D. Balfour, engineer, 3 St. Nicholas-buildings, Newcastle-on-Tyne.

HULL.—July 1st.—For extensions to a hospital, for the corporation.—Mr. J. H. Hirst, city architect.

ABERTILLERY.—July 1st.—For alterations and extensions of a school, for the urban district council.—Mr. W. H. Hiley, architect, Chapel-street, Abertillery.

LINDSEY.—July 2nd—16th.—For additions to a school, for the Education Committee.—Messrs. Scorer & Gamble, architects, Bank-street Chambers, Lincoln.

EAST RIDING.—July 2nd.—For the erection of a new school, and alterations at existing schools, for the Education Committee.—Building Surveyor, County Hall, Beverley.

LEICESTER.—July 3rd.—For the erection of a sanatorium, for the corporation.—Mr. A. H. Hind, 3 Grey Friars, Leicester.

LONDON.—July 3rd.—For the erection of a temporary building, for the Metropolitan Water Board.—The Surveyor, Savoy-court, Strand, W.C.

ILFORD.—July 4th.—For laying wood block flooring at a school, for the Education Committee.—Mr. H. Shaw, engineer and surveyor.

ECCLES.—July 4th.—For cleaning and repairing the town hall and other work, for the corporation.—Borough Surveyor.

ESSEX.—July 4th.—For alterations and additions to a school, for the Education Committee.—County Architect, 73 Duke-street, Chelmsford.

HAMPSHIRE.—July 6th.—For the erection of a class-room, for the county council.—Mr. A. L. Roberts, architect, The Castle, Winchester.

LOWESTOFT.—July 6th.—For the erection of new buildings, and alterations to town hall, for the corporation.—Mr. G. H. Hamby, borough surveyor.

WATFORD.—July 6th.—For the erection of a pumping station, including engine-house, basement, machine shop, boiler-house, filter-house, line store, and softening tank, for the urban district council.—Mr. D. Waterhouse, engineer, Council Offices, High-street, Watford.

MERTHYR.—July 6th.—For school extension, for the Education Committee.—Mr. R. Elias, director of education.

HALIFAX.—July 6th.—For the erection of a public convenience, for the corporation.—Mr. J. Lord, borough engineer.

SWINDON.—July 6th.—For extensions to a school, for the corporation.—Mr. H. J. Hamp, borough surveyor.

WARBLINGTON.—July 6th.—For the erection of a cottage, for the urban district council.—Mr. A. J. Martin, 7 Victoria-street, Westminster.

HALIFAX.—July 6th.—For the extension of the technical college, for the Education Committee.—Mr. J. Lord, borough engineer.

MOUNTAIN ASH. July 7th.—For constructional works at various schools, for the Education Committee.—Mr. W. H. Williams, architect, Town Hall.

NEWARK.—July 7th.—For the erection of handicraft and domestic centres, for the Education Committee.—Mr. H. W. Lockton, architect, Newark.

TONBRIDGE.—July 7th.—For the erection of twenty-five pairs of cottages, for the rural district council.—Mr. Frank Harris, surveyor.

WINCANTON.—July 7th.—For the construction of a reservoir, for the rural district council.—Mr. E. A. Rankin, engineer, Bourton, Dorset.

WESTMINSTER.—July 8th.—For internal and external painting works and repairs at the Marshall-street public baths, for the city council.—City Engineer, City Hall, Charing Cross-road, W.C.

CARLISLE. July 9th.—For the extension of electric lighting station, for the corporation.—Mr. H. C. Marks, city engineer and surveyor.

OSWALDTWISTLE.—July 9th.—For the erection of a public library, for the urban district council.—Mr. F. Q. Farmer, architect, 14 Little Park-street, Coventry.

LAUNCESTON.—July 9th.—For the erection of twenty-four cottages, for the corporation.—Town Clerk.

CROYDON.—July 10th.—For the erection of a school, for the Education Committee.—Education Office, Katherine-street, Croydon.

SUNDERLAND.—July 11th.—For the erection of a training college and hostels, for the corporation.—Borough Surveyor.

HITCHIN.—July 13th.—For the erection of an isolation hospital, for the rural district council.—Mr. A. E. Passingham, clerk.

CROYDON.—July 14th.—For the erection of a covered steel shed, for the corporation.—Borough Engineer.

KESTEVEN.—July 15th.—For additions and alterations to schools, for the Education Committee.—Mr. H. Donaldson, County Education Office, Grantham.

GRANTHAM.—For the erection of two cottages, for the corporation.—Borough Surveyor, Guildhall.

Iron and Steel.

STOCKHOLM.—July 3rd.—For the supply of 15,800 metres of wrought-iron piping, for the Stockholm waterworks.—Commercial Intelligence Branch of the Board of Trade, 73 Basinghall-street, London, E.C.

TIPTON.—July 4th.—For the supply of a Lancashire boiler, for the urban district council.—Mr. S. O. Stephenson, engineer and surveyor.

GOOLE.—July 6th.—For the erection of a 4-ton travelling crane, for the urban district council.—The Clerk.

BELPER.—July 9th.—For laying cast-iron mains, for the rural district council.—Mr. G. Pym, clerk.

ST. PANCRAS.—July 13th.—For supplying and fixing a Cornish boiler at public baths, for the borough council.—Mr. C. H. F. Barrett, town clerk.

CHELMSFORD.—July 13th.—For the supply of cast-iron pipes for water mains, for the corporation.—Mr. G. Melvin, town clerk.

Roads.

COTTINGHAM. June 29th.—For the supply of broken whinstone, granite, and screened chippings, for the urban district council.—Mr. J. H. Hanson, surveyor.

HARROGATE.—June 29th.—For private street improvement works, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor.

BURNLEY.—June 29th.—For making up certain streets, for the rural district council.—Mr. H. Pritchard, surveyor.

ALTOFTS.—June 29th.—For the construction of new footpaths, for the urban district council.—The Surveyor.

RHYL.—June 29th.—For the construction of tarmacadam paving, for the urban district council.—Mr. A. A. Goodall, surveyor.

TOTTENHAM.—June 30th.—For laying creosoted deal paving, and other works, in portion of Turpikelane, for the urban district council.—Mr. W. H. Prescott, engineer, Town Hall, The Green, Tottenham.

WOODFORD.—June 30th.—For road construction with creosoted deal blocks, for the urban district council.—Mr. W. Farrington, surveyor.

BROMLEY (Kent).—June 30th.—For paving the carriageway in the main London road, a portion of High-street, East-street and Market-square with creosoted wood blocks, including the necessary excavation and concrete foundation, approximately 21,100 yds. super., for the corporation.—Mr. Fred H. Norman, town clerk.

HUNSLET.—June 30th.—For making up private streets, for the rural district council.—Mr. W. B. Pindar, clerk.

HOVE.—July 1st.—For paving and other works, for the corporation.—Mr. H. H. Scott, borough surveyor.

BASINGSTOKE.—July 1st.—For steam rolling work, for the rural district council.—Mr. R. Forrester, surveyor.

HASLEMERE.—July 2nd.—For the supply of 600 tons of 1½-in. and 2-in. broken granite, for the urban district council.—Mr. Howard V. Snook, surveyor.

GODSTONE.—July 4th.—For the supply of tarmacadam and bituminous materials, kerbing, channeling, tools, oils and iron goods, and hire of steam rollers, for the rural district council.—Mr. Geo. Crowter, engineer and surveyor.

ILFORD.—July 4th.—For repairing tar-pavings, for the Education Committee.—Mr. H. Shaw, engineer and surveyor.

SAFFRON WALDEN.—July 4th.—For making up a road, for the corporation.—Mr. A. H. Forbes, borough surveyor.

RUISLIP-NORTHWOOD.—July 4th.—For making up Hilliard-street, Northwood (about 600 yds.), for the urban district council.—The Surveyor, Council Offices, Northwood.

RUISLIP-NORTHWOOD.—July 4th.—For making up part of Dene-road, Northwood (about 260 yds.), for the urban district council.—The Surveyor, Council Offices, Northwood.

HARROW.—July 4th.—For the supply of broken granite, granite chippings, tarred granite, and tarred granite chippings, for the urban district council.—The Surveyor.

KEYNSHAM.—July 6th.—For making up a road, for the rural district council.—Mr. H. M. Bennett, surveyor, 36 Corn-street, Bristol.

SEAFORD.—July 6th.—For the supply of 1,000 tons of granite, for the urban district council.—The Surveyor.

BROMLEY (Kent).—July 6th.—For works of private street improvement in Somerset-road, Wiltshire-road and St. John's-road, for the rural district council.—The Surveyor, Maulden House, Sidecup-hill, Sidecup.

LOUGHTON.—July 6th.—For the supply of granite and gravel, and hire of steam roller, for the urban district council.—Mr. H. White, surveyor.

LEWISHAM.—July 7th.—For supplying and laying wood paving, for the borough council.—The Borough Surveyor.

MAESTEG.—July 7th.—For private street improvement works, for the urban district council.—Mr. S. J. Harpur, engineer.

HAMMERSMITH.—July 8th.—For paving the carriageways and footways of Letchford-mews and Willow-vale, for the borough council.—Mr. H. Mair, borough surveyor.

HORNSEY.—July 8th.—For paving works with creosoted deal blocks, for the corporation.—Mr. E. J. Lovegrove, borough engineer and surveyor.

ST. HELENS.—July 13th.—For granite paving work, for the corporation.—Mr. A. W. Bradley, borough engineer.

BROADSTAIRS.—July 13th.—For the supply of a 10-ton steam roller with scarifier, for the urban district council.—Mr. H. Hurd, surveyor.

CHELMSFORD.—July 15th.—For paving Duke-street with creosoted deal blocks, for the corporation.—Mr. P. T. Harrison, borough engineer.

PERTSHIRE.—July 31st.—For the reconstruction of 25 miles of road through Glen Dochart, Glen Falloch and Strath Fillan, in the parish of Killin, for the Western District Committee.—Mr. W. L. Gibson, engineer and surveyor, Post Office Buildings, Dunblane, Perthshire.

Sanitary.

WHITSTABLE.—June 29th.—For the supply and erection upon the sewage disposal works at Swalecliffe of a sludge pump to deliver 4,000 gallons of sewage sludge per hour, and an oil engine to drive the same, together with accessories, for the urban district council.—Messrs. Strachan & Weekes, 9 Victoria-street, Westminster, S.W.

NEWPORT (Mon.).—June 29th.—For the construction of a stoneware pipe sewer, for the corporation.—Borough Engineer.

ELY.—June 29th.—For sewerage works, for the urban district council.—The Surveyor.

MANCHESTER.—June 30th.—For work of re-draining, for the corporation.—Mr. W. Moss, inspector, Town Hall, West Didsbury.

READING.—June 30th.—For sewer construction, for the corporation.—Mr. J. Bowen, engineer and surveyor.

KIRKCALDY.—July 1st.—For the construction of sewers, for the corporation.—Borough Surveyor.

LLANDAFF.—July 1st.—For works of sewerage, for the rural district council.—Mr. J. Holden, engineer, Park House, 20 Park-place, Cardiff.

WALMER.—July 1st.—For the construction of sewers and manholes, for the urban district council.—Mr. H. W. Barker, engineer and surveyor.

BIRMINGHAM.—July 1st.—For the construction of about 1,550 yds. of brick sewers, and 2 miles of stoneware pipe sewer, together with railway and canal crossing and cast-iron and stoneware pipe drains, for the corporation.—Mr. Henry E. Stilgoe, city engineer and surveyor.

SWANSEA.—July 2nd.—For works of sewage, for the corporation.—Borough Engineer.

RUISLIP-NORTHWOOD.—July 4th.—For the construction with iron or earthenware pipes of 362 yds. of 9-in. sewer at Eastcote, for the urban district council.—The Surveyor, Council Offices, Northwood.

PRESTON.—July 7th.—For alterations at sewage disposal works, for the rural district council.—Messrs. Myers, Yeevens & Myers, 15 Chapel-street, Preston.

WREXHAM.—July 9th.—For work of sewer construction, for the corporation.—Mr. J. England, borough engineer.

BELPER.—July 9th.—For the construction of sewage disposal works, for the rural district council.—Mr. R. C. Cordon, surveyor, Duffield, near Derby.

LICHFIELD.—July 9th.—For the construction of sewage purification works, filters, and manholes, also for laying approximately 1,820 yds. of 15-in., 4,860 yds. of 9-in., and 2,000 yds. of 6-in. stoneware socket pipes, and erecting ventilating columns, for the rural district council.—Mr. C. O. Rawstron, engineer.

ASHFORD.—July 9th.—For the construction of an ejection station with pneumatic ejectors and air-compressing plant, 240 yds. of 6-in. rising main, and a set of sewage purification works, for the West London District School Managers.—Mr. Arthur Martin, 7 Victoria-street, Westminster, S.W.

BARROWFORD.—July 11th.—For the construction of sewage disposal works, for the urban district council.—Mr. F. Sutcliffe, surveyor.

SCARBOROUGH.—July 15th.—For a sewage purification installation, for the rural district council.—Mr. J. A. Iveson, surveyor.

BRADFORD.—July 20th.—For the construction of a circular outfall sewer in tunnel, for the corporation.—Mr. J. Watson, Town Hall.

Stores.

ROTHERHAM.—July 8th.—For the supply of requisites, for the Electric Light and Tramways Committee.—Engineer and Manager.

TENDERS FOR MUNICIPAL WORKS OR SUPPLIES.

The Editor invites the co-operation of SURVEYOR readers with a view to making the information given under this head as complete and accurate as possible.

* Accepted. † Recommended for acceptance. ‡ Provisionally accepted.

CHARD.—Accepted for the construction of covered reservoir, well, tunnel, and the laying of 7-in., 5-in., 4-in., 3-in. and 2½-in. cast-iron water mains, valves, hydrants, and other castings, for the corporation.—Messrs. Dodd & Dodd, Birmingham:—

Contract No. 5.—Sheepbridge Coal and Iron Company, Limited, Chesterfield, £3,120.
Contract No. 6.—J. Stone & Co., Limited, London, £278.
Contract No. 7.—E. Ireland, Bath, £8,606.

DEPTFORD.—For work of making up and paving, for the borough council. Mr. John Sutcliffe, borough surveyor:—
A. L. Etheridge, Deptford.—Africa-road, £807; Avignon-road, £290; Revelon-road, £934; St. Norbert-road, £257.
Fry Brothers, Limited, Greenwich.—£779; £287; £997; £249.
J. Mowlem & Co., Limited, Westminster.—£959; £359; £1,265; £303.
W. Pearce, Forest Hill, S.E.—£788; £279; £949; £269.
W. H. Wheeler & Co., Limited, New Kent-road.—£226; £1,075 (Revelon-road).
H. Woodham & Sons, Catford.—£835; £297; £1,030, £263.

EPSOM.—For making up Leigh-road, School-road and Spencer-road, for the rural district council.—Mr. T. E. Ware, surveyor of highways:—

	Leigh-road.	Schools and Spencer roads.
E. Hes, senr., Wimbledon	£461	£967
F. & H. F. Higgs, Cobham	430	762
J. May & Son, Ashted	410	753
H. Farrow	462	743
H. M. Blaker, Leatherhead.	397	717
S. Kavanagh & Co., Surbiton	355	702
J. Mowlem & Co., London	381	672
Streeter Brothers, Croydon	405	624

ESHER AND THE DITTONS.—For laying (No. 1) a 12-in. cast-iron sewer about 730 ft. long, and (No. 2) a 9-in. stoneware pipe sewer about 380 ft. long, for the urban district council.—Mr. H. C. Fread, engineer and surveyor:—

No. 1. EMBER-COURT-ROAD SEWER.	
Kavanagh & Co., Surbiton	£637
Streeter Brothers, Croydon †	630
No. 3. —ALEXANDRIA-ROAD SEWER.	
Kavanagh & Co., Surbiton	£315
May, Mortimer & Co., Hither Green	313
Streeter Brothers, Croydon	196
(None accepted. Work to be done by direct labour.)	

FOOTS CRAY.—For laying Durax or other approved granite sett paving, for the urban district council.—Mr. W. A. Furnham, engineer and surveyor:—

H. Woodham & Son, Catford, S.E.	£220
W. H. Wheeler & Co., Limited, New Kent-road, S.E.	173
Road Armoury, Limited, Cannon-street, E.C.	169
Brookes, Limited, Westminster, S.W.	154
Durax Dustless Roads, Limited, Victoria-street, S.W.*	150

FOREBEE.—For the erection of three pairs of cottages, for the rural district council.—Mr. J. O. Bond, architect, Norwich:—

H. C. Tofts, Hingham	£1,335
Sparkes & Satten, Norwich	1,220
English & Son, Drayton	1,199
E. J. Smith, Bunwell	1,170
C. W. Gunton, Norwich	1,160
W. Palmer, Norwich	1,150
— Watling, Norwich	1,122
A. E. Palmer, Norwich	1,070
E. Collison, Reepham, Norfolk*	1,010

HARROGATE.—For private street works, for the corporation.—Mr. C. E. Rivers, borough engineer and surveyor:—

T. Godfrey, Harrogate	£670
C. H. Dickinson, Starbeck	515
E. Long, Starbeck*	487

ROCHDALE.—For making up a road, for the corporation.—Mr. S. S. Platt, borough surveyor:—

R. Lomax, Eccles.

STAFFORD.—For building two reinforced concrete bridges and retaining walls, and the construction of a new roadway, for the rural district council.—Mr. Frank Idiens, surveyor:—

Lambriek & Co., Burton-on-Trent	£1,365
C. I. Levitt, Limited, Stafford	1,218
Hobrough & Co., Gloucester †	1,176
Childs & Withers, Willenhall	1,126
Sanders & Torrance, Stoke-on-Trent	1,092

SUTTON-IN-ASHFIELD.—For making up twelve streets, for the urban district council.—Mr. W. Burn, surveyor:—

Stubbings & Fell, Sutton-in-Ashfield, £3,068.

MEETINGS.

Secretaries and others will oblige by sending early notice of dates of forthcoming meetings.

JUNE.

27.—Association of Managers of Sewage Disposal Works: Visit to Brentwood.

JULY.

- 2.—Institution of Civil Engineers: Conversazione, 8.30-11.30 p.m.
- 3.—Institution of Municipal Engineers: North-Western District Meeting at Manchester.
- 4.—Association of Managers of Sewage Disposal Works: Annual Summer Meeting at Norwich.
- 4-11.—Royal Sanitary Institute: Annual Congress and Exhibition at Blackpool.
- 6-10.—Institution of Mechanical Engineers: Summer Meeting in Paris.
- 25.—Institution of Municipal and County Engineers: Eastern District Meeting at Tilbury.

SEPTEMBER.

- 19.—Institution of Municipal and County Engineers: Meeting at Cleethorpes.
- 26.—Institution of Municipal and County Engineers: Meeting at Scarborough.

APPOINTMENTS WANTED.

PREPAID Advertisements under this heading are inserted at the rate of ONE PENNY per word, with a minimum charge of 2s. THREE consecutive insertions given for the price of Two.

ASSISTANT desires appointment in Surveyor's Office. Good knowledge of building and road making; neat draughtsman; moderate salary. Free immediately.—Box 1,437, office of THE SURVEYOR, 24 Bride-lane, Fleet-street, E.C. (1,742)

TENDERS WANTED.

OFFICIAL AND SIMILAR ADVERTISEMENTS RECEIVED UP TO 4.30 P.M. ON THURSDAYS WILL BE INSERTED IN THE FOLLOWING DAY'S ISSUE, but those responsible for their despatch are recommended to arrange that they shall reach THE SURVEYOR office by noon on WEDNESDAYS to ensure their inclusion in the weekly list of summaries. Such advertisements may, in cases of emergency only, be telephoned (City No. 1046) subject to later confirmation by letter.

**BOROUGH OF HAMMERSMITH.
TO PAVING CONTRACTORS.**

The Borough Council invites Tenders for paving the carriageways and footways of Letchford-mews (part) and Willow-vale (northern portion), total length, approximately, 650 ft.

Plans may be seen, and Specifications and Forms of Tender obtained, on application to Mr. H. Mair, Borough Surveyor, after Monday, 29th June instant.

Sealed Tenders, endorsed "Tender for Paving Works," must be delivered to me not later than 4 p.m. on Wednesday, 8th July, 1914.

The Council does not bind itself to accept the lowest or any Tender.

LESLIE GORDON,
Town Clerk.

Town Hall, Hammersmith, W.
June 23, 1914. (1,737)

**COUNTY COUNCIL OF PERTSHIRE.
WESTERN DISTRICT.**

Tenders are invited for the reconstruction of 25 miles of road through Glen Dochart, Glen Falloch, and Strath Fillan, in the Parish of Killin.

The construction includes the widening of five Bridges and the erection of a new one; raising levels of roadway and the building of Retaining Walls; also Metalling, Steam Road Rolling and Surface Tarring.

Conditions and Specifications, with Form of Tender and Bill of Quantities, may be obtained on application from the undersigned, at whose office the drawings may be seen, on deposit of a *bonâ-fide* Tender, which will be returned upon receipt of a *bonâ-fide* Tender and the return of all documents issued.

Sealed Tenders, endorsed "Tender for Improve-

ment Work," must be received by Mr. Will Alexander, Clerk to the District Committee, Dunblane, not later than 4 p.m. on Friday, the 31st July, 1914.

The Committee do not bind themselves to accept the lowest or any Tender.

W. L. GIBSON,
Engineer and Surveyor.

Post Office Buildings,
Dunblane, Perthshire.
June, 1914. (1,741)

(Continued on p. xxiv.)

APPOINTMENTS OPEN.**BOROUGH OF LOUGHBOROUGH.****BOROUGH SURVEYOR AND WATERWORKS
ENGINEER'S DEPARTMENT.****APPOINTMENT OF ASSISTANT.**

The above Council invite applications for the appointment of an Assistant in the above Department, at a salary of £120 per annum.

Applicants must have had previous experience in a Municipal Office, be expeditious and neat draughtsmen, and possess a thorough knowledge of Surveying and Levelling, and general routine of office work. Some knowledge of architecture will be an advantage.

Applications, in candidate's own handwriting, stating age, present employment and past experience and qualifications, accompanied by copies of not more than three testimonials of recent date, endorsed "Surveyor's Assistant," to be sent to me not later than Monday, the 6th day of July, 1914.

Canvassing, directly or indirectly, will be a disqualification.

HARRY PERKINS,
Town Clerk.

Town Hall,
Loughborough.
June 22, 1914. (1,735)

There is **ONE**

NONSLIP STONE

and **ONE** only.

THE HARD YORK NONSLIP STONE CO.,

LONDON:
CAXTON HOUSE,
WESTMINSTER, S.W.

(BROOKES LTD.,)
HEAD OFFICES:
HALIFAX.

MANCHESTER:
5 EXCHANGE STREET.

STEREOPHAGUS PUMPS.



The most economical method for the automatic drainage of flat districts, basements, and isolated buildings, for the transport of sludge, and for all cases where liquids containing fibrous matter are to be dealt with.

For all particulars and estimates on application to—

**THE STEREOPHAGUS PUMP
& ENGINEERING CO., LTD.,**
39 Albany Buildings,
Victoria Street, S.W.

A FEW NOTES ON TWENTY YEARS' WORK IN A GREAT CITY.

By T. DE COURCY MEADE, City Surveyor of Manchester.

[In this paper Mr. De Courcy Meade describes some of the Municipal Works of the City of Manchester, the new main drainage works at present in course of construction being dealt with at considerable length. The meeting of the Institution of Municipal and County Engineers at which it was read last Friday is reported elsewhere in this issue.]

It would not be possible within the limits of this paper to refer to all the projects considered and works carried out by the author since he commenced his official duties in the city of Manchester in 1894. He has therefore selected for consideration only a few

further particulars on any item referred to will with pleasure be given to members if they so desire.

It is customary on occasions of this kind to enlarge upon successes, and to touch lightly or to pass over works that have not proved satisfactory, although from such cases the most useful lessons may often be learnt. The author will therefore depart from the beaten track and make reference to some works that fall within the latter category.

MAIN DRAINAGE AND FLOOD PREVENTION.

As this is one of the chief items in to-day's programme, it is presented first. Manchester has suffered from the effects of floods for a long period, and works for flood prevention have been under consideration by the city council for many years. In 1874 Mr. J. G. Lynde, M.INST.C.E. (past-president), then city surveyor, submitted a report and plan dealing with the subject. These proposals were followed by a subsequent report from the same engineer in conjunction with Mr. J. F. Bateman, M.INST.C.E., but their recommendations were not given effect to by the city council.

In 1885 Mr. John Allison, M.INST.C.E., the author's immediate predecessor, prepared for the drainage of the city a scheme which was eventually approved. The area of Manchester at that time was only 5,934 acres.

A description of Mr. Allison's scheme of main drainage will be found in Vol. 19 of the "Proceedings." These works were in progress when the author entered upon his duties here twenty years ago. The city had in the meantime been extended by the inclusion of certain out-townships, and its area was then (1894) 15,369 acres, or nearly three times



DIAGRAM A.

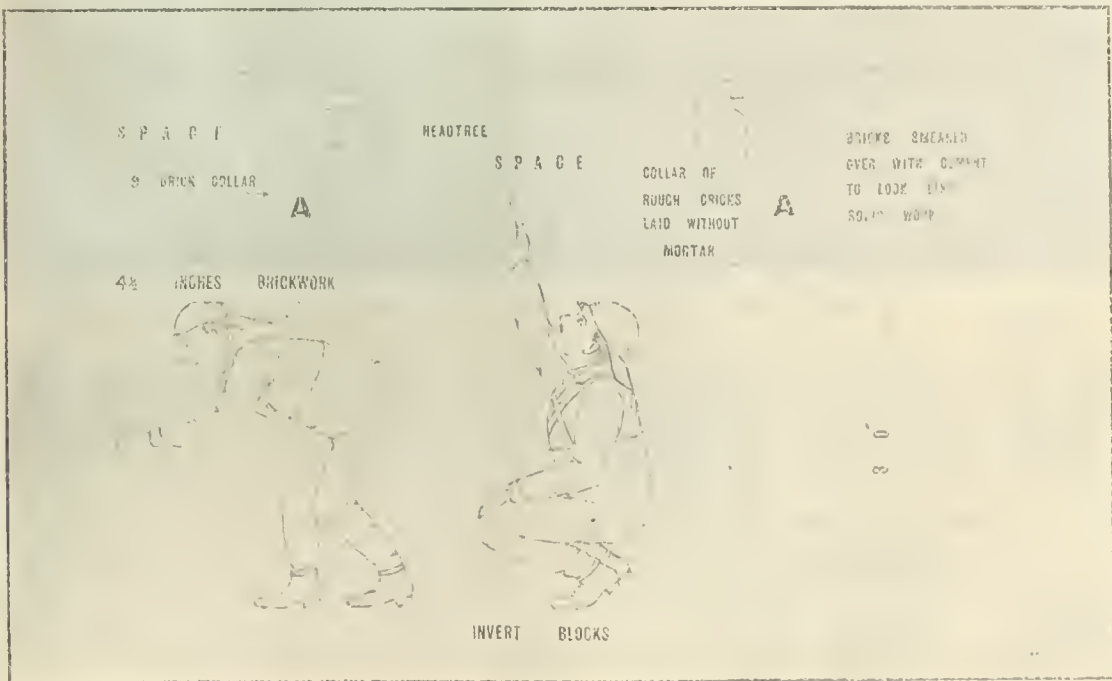


DIAGRAM B.

NOTE.—The rings of dry work (A) occurred about every 3 ft. or 4 ft. Sometimes they were omitted, and boards (B) were placed against the 4½-in. ring of brickwork forming the sewer to support it until the mortar had set.

subjects that are likely to be of general interest to members of the institution. The descriptive matter is necessarily condensed as far as practicable, but

the area that Mr. Allison's sewerage scheme was designed to accommodate. His plans had been submitted to Mr. J. Bailey Denton, M.INST.C.E., for con-

sideration and report, and the latter engineer calculated that the sewers proposed by Mr. Allison would be sufficient to serve a population of 868,522. Before the sewage from 500,000 persons had been coupled up the sewers proved wholly insufficient, and frequent floodings of property resulted. A temporary remedy was therefore found by freely overflowing the storm waters into the rivers and streams, and by this means the existing intercepting sewers have been made partially to fulfil their intended purpose.

It became the author's duty to complete the works which had been designed and largely carried out by his predecessor. All the work was done by contract. Unfortunately, Mr. Allison's health broke down about eighteen months prior to the author's appointment, and during that interval the services of the city engineer were withdrawn from the important works then in progress. Supervision became lax, and as a consequence much of the work was improperly executed or omitted altogether. Wherever timber was left in it was paid for as an extra item under the provisions of the contract. It was therefore to the advantage of the contractors to leave as much timber as possible in the ground, and in every case the amount claimed for extra work of various kinds was

securing competent, thorough, and effective supervision of all work of this nature, much of which is hidden from view during progress, and all is ultimately buried beneath the surface.

With such examples before them the present Rivers Committee, who are charged with the care of the main drainage, have spared no pains to prevent a repetition of the deplorable state of things referred to, and the system they have adopted for supervising the present works and for keeping full control of the payments and liabilities for extra work will be explained later.

The chairman, Alderman Frowde, and the deputy chairman, Councillor West, are, fortunately, engineers, and their committee insist upon the best materials and workmanship.

The existing sewers having been found inadequate, several schemes for flood relief were prepared by the author. In 1895 he commenced a series of gaugings of sewage, rainfall flow in sewers, and observations of the effect of storms upon the rivers and the low-lying and other areas of the city subject to flooding. This work has been continued up to the present time, and all data necessary to ensure a complete scheme of drainage for Manchester has thus been obtained. In July, 1909, the author was instructed to consider and report upon the whole subject of main drainage



VIEW OF INTERIOR OF DEFECTIVE SEWER (FIG. C).

considerable. The greed of one contractor in claiming a large extra sum for concrete packing where it was subsequently found that none had been used, and that only 50 per cent of the proper thickness of brick-work had been supplied, led to a general opening up and examination of the work, and to the disclosure of the fraud.

The typical illustrations (A and B) on the previous page, made from actual measurements at the time, will exemplify the conditions discovered by the author.

In other instances, where contractors had been paid and their liability had ceased, the work gradually failed, and it became necessary, in order to prevent a total collapse, either to renew it or to support it in the manner shown by the above illustration (C).

In this view the portion of the sewer nearest to the observer has been rebuilt, and that more distant has been supported by steel tram rails.

Proceedings were instituted against some contractors, and others who had made default endeavoured to remedy their deficient work. The result, however, was not satisfactory, and shows the importance of

and flood relief works, and the scheme he prepared, which will be described later, was submitted to Sir Alexander Binnie, past-president of the Institution of Civil Engineers, and approved by him. Several volumes of diagrams and other records relating to main drainage and rainfall, which have not hitherto been made public, are, by permission of the Rivers Committee, open to-day for the inspection of members of the institution who may be interested in the subject.

The following diagram (D) is from a much-reduced photograph of a chart that has been constructed from automatic rain-gauge records, and shows the rainfall intensities for the past fourteen years. The curve indicates the provision made in the new main drainage scheme for the reception and removal of storm waters.

The study of rainfall and the resulting floods is usually one of interest to the municipal engineer. The following remarks are intended for the students' section of the institution, but it is hoped that they may induce some of the younger members also to take an active interest in this subject. It is however, unfortunate that so few authentic records of rainfall intensities in this country are available for refer-

ence. The author believes that he established the first modern automatic recording rain gauge in England. It was made by Messrs. Richards, of Paris, and was ordered in 1886 by Mr. G. J. Symons, F.R.S., for his own use at Camden Town. The makers

Replying to an inquiry on the subject by the author, Mr. Carle Salter, assistant director of the British Rainfall Organisation, writes:—

“ In the absence of Dr. H. R. Mill, I have received your letter of February 2nd. So far as I have been

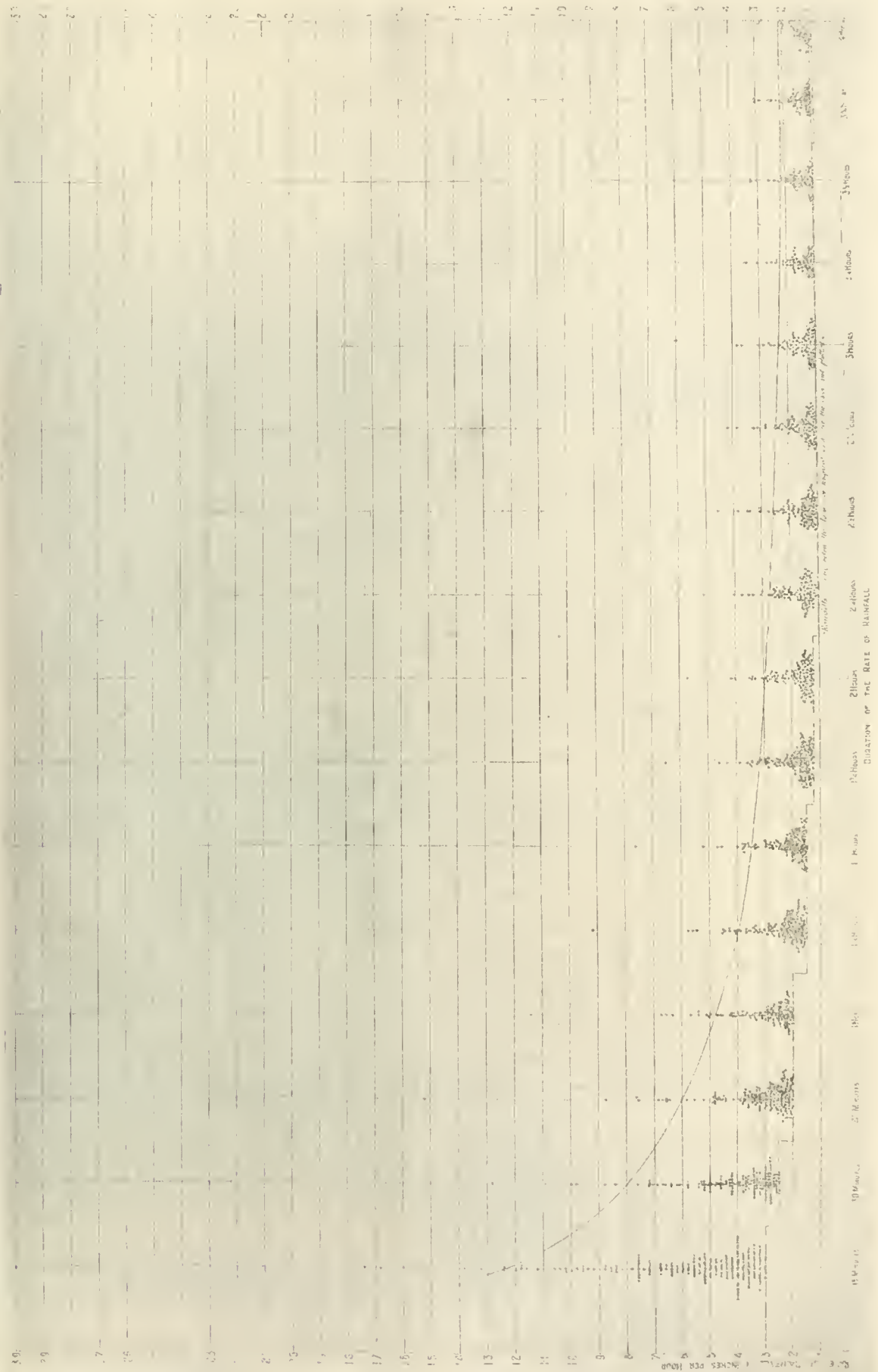


DIAGRAM SHOWING DURATION AND INTENSITY OF STORMS IN SOUTH LANCASHIRE (D).

having forwarded a gauge which gave a weekly instead of a daily record. Mr. Symons was about to return the instrument when the author purchased it, and this automatic gauge was fixed in the following year (1887) near Muswell Hill, in the North of London.

able to ascertain, the earliest recording gauge established in this country was that designed by a Mr. B. Bevan, of Leighton Buzzard, and constructed in 1817. Another recording rain gauge was established at Dublin in 1820, and Osler's rain gauge in 1837.

This latter is still in use at Greenwich Observatory, though I do not think it is the original instrument. The standard Casella recorder which we have in use at Camden-square was set up by Mr. Symons in 1880, and has been under observation continuously from that time. I believe that the gauge to which you refer was the first designed with so low a price as £10, and its maker might therefore possibly be regarded as the pioneer of the modern popular recording rain gauge."

When recording rain gauges are more generally used, and have been studied for a lengthened period, say, of thirty years and upwards, the municipal engineer of the future may be able to determine with some degree of assurance what amount of rainfall should properly come within the doubtful category of "damnum fatale," a line of defence so often pleaded by local authorities, but so difficult to prove. In the author's opinion, an automatic recording rain gauge should, in the public interest, be established in every urban district. The first cost of an efficient instrument is not large—about £15. The records would be of great value to the municipal engineer, and to the public generally, if furnished to the British Rainfall Organisation, or otherwise made available for reference. The selection of the position in which a gauge is to be placed is most important, and should be chosen with regard to the immediate surroundings and surface elevation, so as to obtain, as far as practicable, a fair average record of the rainfall in the locality.

Mr. G. J. Symons considered that 3 in. to 4 in. of rain might fall in one hour in any part of the area covered by his recorded observations of rainfall, and Dr. Mill, the present director of the British Rainfall Organisation, states that a fall of at least 3.50 in. of rain may occur in one hour in any part of the British Isles. Coming from such authorities, the opinion is worthy of careful consideration, as no town in this country has a system of sewerage capable of receiving and removing such a fall of rain if widespread. The author's observations have led him to the conclusion that rainfalls of great intensity affect much more limited areas than is generally supposed; consequently the results are seldom so disastrous as would otherwise be the case. He has many times noticed that intense rainfalls are not stationary; the centre of the

tion of the surface of the ground immediately preceding the fall have also an important bearing on the result. A storm lasting five minutes might not produce a damaging flood, while serious results might follow a rainfall of the same intensity if of fifteen minutes' duration, other conditions being equal. In districts of a semi-urban character, when surface saturation point is reached the available sewer and other conduits are usually heavily taxed, and therefore in the most unfavourable condition for the reception of storm waters. If the run-off from an intense rainfall that followed a period of dry weather be compared with the run-off from a similar rainfall that took place when the ground had reached saturation point (the whole area affected being then practically impervious) it will be found that the resulting floods in the latter case greatly exceeded those in the former. In the first case no flooding of property may have occurred, while in the second considerable damage may have resulted. For example, on January 15, 1910, .570 in. of rain was registered, the greatest intensity being at the rate of .10 in. per hour for forty minutes; the ground was saturated, the seven previous days being wet, and much damage was done by flooding. On the 23rd and 24th of the same month, .989 in. of rain fell in forty-eight hours; the greatest intensity equalled .165 in. per hour for forty minutes. No rain fell on the two previous days, and only .006 in. on the 20th; no damage was occasioned by flooding.

In some instances the conditions that produced floods were reversed, and a storm succeeding a period of dry weather resulted in flooding. This seeming anomaly may be accounted for if the centre of the storm did not pass over the recording gauges, and from indications observed at the time it is believed that this was the case; therefore the quantity registered was less than the actual fall over much of the area affected.

In order to determine the relation between impervious surface and population under the varying conditions to be found in Manchester, ten fully developed areas of 50 acres each, and of similar lengths and breadths, were selected for special survey and comparison. Each area represents a different type of development.

STATEMENT SHOWING THE RATIO OF IMPERVIOUS SURFACE TO POPULATION AND THE APPARENT RELATIONSHIP BETWEEN DENSITY OF POPULATION AND DEATH RATE.

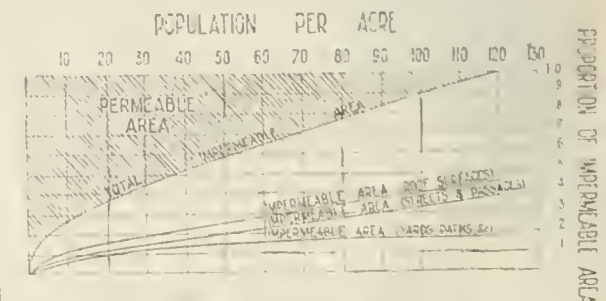
Index letter.	Locality.	Population per acre built upon.	Number of houses per acre.	Percentage of area occupied by buildings and impermeable.	Percentage of area occupied by backyards, gardens and open spaces.			Percentage of area occupied by streets and passages and impermeable.	Total percentage of area impermeable.	Total percentage of area permeable.	Average rentals per week.	Birth rate per 1,000 (1912).	Death rate per 1,000 (1912).	Infantile mortality, number one-year per 1,000 (1912).
					Impermeable.	Permeable.	Total.							
A	Hulme	179	38	42	15.67	43	16	42	49.67	33	s. d.	29.11	21.56	146
B	Ancients and Newton	164	35	36	22	2	14	40	98	33	6 3	28.76	19.13	144
C	Gorton	146	31	29	22	11	33	38	89	11	4 11	26.93	13.20	112
D	Harpurhey	136	29	26	32	11	13	31	89	11	6 10	23.59	15.15	109
E	Moss Side	103	22	33	22	8	30	37	92	8	11 0	14.56	11.77	88
J	Newton Heath	85	18	26	16	26	12	32	74	26	8 4	25.41	15.18	127
F	Withington	66	14	19	13	47	60	21	53	47	9 9	19.06	16.21	68
G	Chorlton-cum-Hardy	52	11	18	79	40	59	21	60	40	10 0	17.00	10.79	69
K	Crumpsall	24	5	12	6	58	64	24	12	58	20 0	18.11	10.43	71
H	Rusholme (Victoria Park)	47	1	7	3	76	79	14	24	76	41 0			

Note.—Each of the ten localities lettered A to K has an area of 50 acres. The population has been ascertained by multiplying the average number of houses per acre by 17, obtained from the Returns compiled by the Registrar-General in the Census of 1911. Where rentals are marked thus * the rates are compounded.

cloudburst generally moves around or across the area affected. August, 1912, was a month of unusual rainfall both in the British Isles and Western Europe, and the author had an opportunity of observing at high altitudes the conditions under which rain fell in Switzerland during that month. Cloudbursts there were frequent, and were in many instances so local in character that the area affected could at times be distinctly traced by the eye and fairly estimated—phenomena seldom visible in England, where the geographical and local conditions are so different, and therefore, to a certain extent, not comparable. The facts, however, remain, and are here stated as matters of interest. They confirm, in a remarkable manner, the author's deductions from observations in this country.

When determining the provision to be made for storm waters in intended works for flood relief, the intensity of rainfall, impermeability of surface, and retardation of flow are important factors; but it should be remembered that storm duration and condi-

tion of the surface of the ground immediately preceding the fall have also an important bearing on the result. A storm lasting five minutes might not produce a damaging flood, while serious results might follow a rainfall of the same intensity if of fifteen minutes' duration, other conditions being equal. In districts of a semi-urban character, when surface saturation point is reached the available sewer and other conduits are usually heavily taxed, and therefore in the most unfavourable condition for the reception of storm waters. If the run-off from an intense rainfall that followed a period of dry weather be compared with the run-off from a similar rainfall that took place when the ground had reached saturation point (the whole area affected being then practically impervious) it will be found that the resulting floods in the latter case greatly exceeded those in the former. In the first case no flooding of property may have occurred, while in the second considerable damage may have resulted. For example, on January 15, 1910, .570 in. of rain was registered, the greatest intensity being at the rate of .10 in. per hour for forty minutes; the ground was saturated, the seven previous days being wet, and much damage was done by flooding. On the 23rd and 24th of the same month, .989 in. of rain fell in forty-eight hours; the greatest intensity equalled .165 in. per hour for forty minutes. No rain fell on the two previous days, and only .006 in. on the 20th; no damage was occasioned by flooding.



A view of each area referred to will be placed on the screen for the information of visitors. The original intention was to ascertain the relationship

between population and impervious surface, but other particulars were added at the request of a committee.

With the object of estimating the probable time taken by rainwater to reach the sewers, many typical areas throughout the city were placed under observation. In those covered with the best class of property the time of entry was found to vary from 1½ minutes to 4½ minutes, according to the average distance of the houses from the roads. In areas covered with second-class property the time of entry varied from 1 minute to 5 minutes.

In cottage property areas under favourable conditions, where houses abut on streets in line of the main sewer, the time of entry was as low as half a minute, and where opposite conditions prevailed as high as 7½ minutes.

From a number of like observations it was found that the time rain water took to reach the main sewers varied from a minimum of half a minute to a maximum of ten minutes, to which must be added the additional time occupied in reaching the intercepting sewer or other point of concentration.

No rule can therefore be laid down for general application, as the results are dependent on so many circumstances which vary in almost every locality. Each local drainage area within the town or district under consideration should therefore be segregated for this purpose, and the time of run-off determined by observation on the spot.

As soon as the rain ceases, or the intensity of fall materially lessens, the quantity of run-off begins to decrease in volume, but the diminution is gradual, and this "tailing out" of the run-off is one of the troubles at sewage works, and increases the normal dry-weather flow for many hours after the rain has stopped.

The drainage from buildings and streets in the city of Manchester was originally discharged into the rivers by means of numerous local sewers. There was no attempt at sewage treatment previous to the

During the past twenty years 82,269 water-closets have been substituted for dry-closets.

The dry-weather flow of sewage was ascertained by gauging, to average 53·4 gallons per head per day. A considerable volume of spring water passes into the existing sewerage system from ancient watercourses which were covered over in former times and converted into sewers. The old local sewers of the city were constructed with open joints, with the object of lowering the level of the ground water. These also add largely to the volume of water mingled with the sewage. Generally speaking, the sewers are under a head of subsoil water which percolates into the old

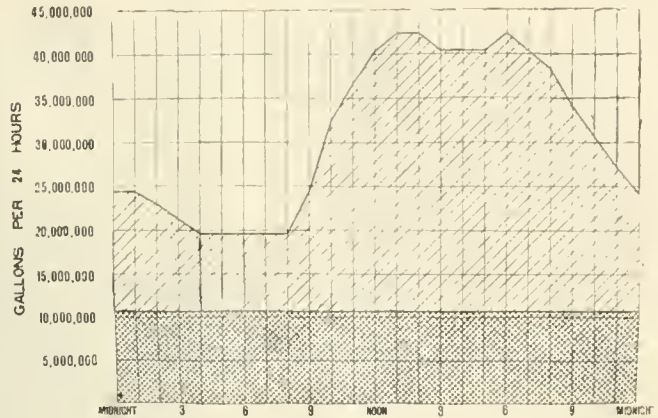


DIAGRAM F, SHOWING THE FLOW OF SEWAGE AFTER A PERIOD OF DRY WEATHER.

NOTE. The portion hatched represents the gauged flow of sewage for the 24 hours. The portion cross-hatched represents the continuous flow of water from streams, watercourses, and subsoil water admitted through open joints of sewers.

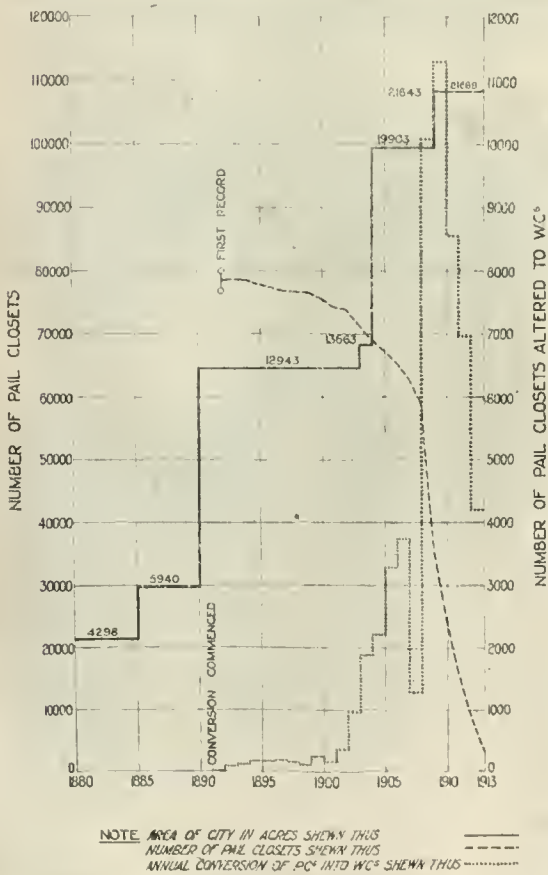


DIAGRAM E.

opening of the Ship Canal in 1894. At that date a small percentage only of the houses were provided with water-closets.

The above diagram shows the progress that has been made during the past twenty years by the Sanitary Committee in converting the dry system into the water-carriage system.

sewers in considerable quantities. There is, however, one advantage in this in addition to the lowering of the ground water—namely, the reduction of the temperature of the sewage, which is at times unduly raised by the admission of condensing water. The flow of sewage in the Manchester main outfall sewer has been continuously gauged for many years. The gaugings and analysis of the sewage show that during long periods of dry weather there is a large and very dilute flow between midnight and 6 a.m. This is indicated by the diagram which fairly represents the dry-weather flow from part of the drainage area.

The Manchester Corporation Act, 1911 (an Act which sanctioned the main drainage works), provides that the Manchester water supply shall be the basis for determining the dry-weather flow of sewage for the purpose of storm overflow. The present water supply is 30 gallons per head per day, and upon this basis the sewers would provide for the dry-weather flow of sewage to the outfall works at Davyhulme from a population of 2,498,408. A margin, however, must be allowed for an increase in the water supply, as the quantity now being supplied is 50 per cent more than that given in 1886.

Diagram G indicates very approximately the relative positions of the outfall sewers, the intercepting sewers, the proposed new sewers, and the rivers Mersey, Irwell, Irk and Medlock. The proposed new sewers are shown thereon by broken lines, and the existing outfall and intercepting sewers are indicated by thick black lines.

Within the city the existing intercepting sewers branch off in various directions. One passes in a northerly direction along the valley of the Irk; another follows the valley of the Medlock in a north-easterly direction; another passes in an easterly direction to Openshaw, and one diverges towards the south with a short branch sewer to the south-east.

Although the existing sewers are relieved by storm overflows, they work under a head of water in times of storm. Many local and tributary sewers also become surcharged during periods of heavy rain, chiefly owing to the insufficiency of the main sewers into which they discharge.

In Manchester there are upwards of 200 storm overflows, and no two of these are exactly similar in construction. As the main drainage work proceeded and the old sewers were exposed, an accurate survey was made and detail drawings prepared to meet the conditions found in each case.

It was necessary to ascertain the character of the diluted sewage passing over the sill of each overflow

at the beginning of a storm. In a town where there are a number of overflows it is obviously impossible to take the samples by hand. A simple and cheap arrangement for securing these samples was therefore devised and successfully used for several years in Manchester.

The figures H and I show a plan and section of a typical storm overflow chamber for small sewers,

overflows in this city, arranged in order of grains of chlorine per gallon, this being considered an index of the putrescibility. The percentage of organic matter in the total suspended matter is also indicated on the diagram. It will be observed that only a comparatively small percentage of the samples taken have high chlorine figures or a high percentage of organic matter.



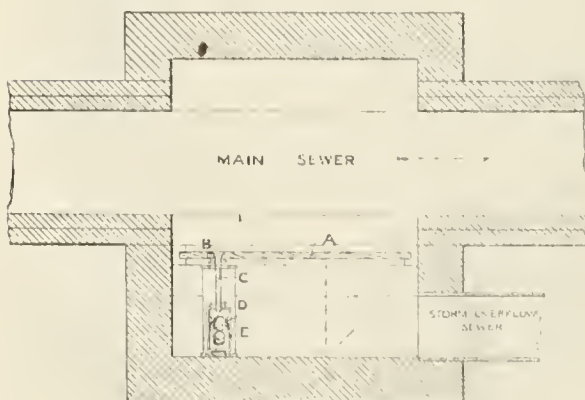
DIAGRAM G.

with the automatic sampler in position. The arrangement consists of—

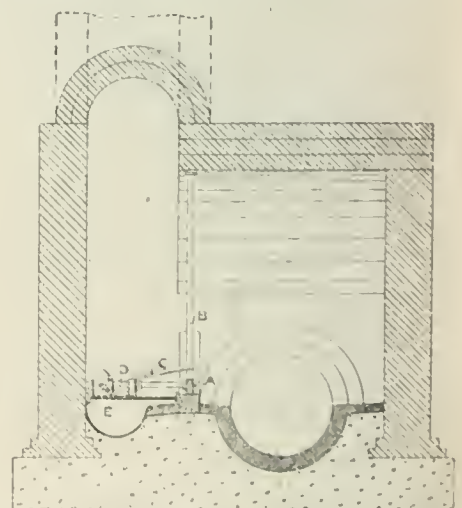
An overflow cill (A), an upright wooden post (B), a leaden gutter or channel (C), leading the storm water to the sampling apparatus, which consists of a re-

ceiver (D), fitted with a heavily-weighted lid; from the back of the latter a wire projects to which is attached a cork; the whole apparatus is placed in a strong wooden box or cistern (E).

For the purpose of obtaining accurate particulars of flood levels in sewers, the arrangement shown by Fig. K, has been successfully employed in Manchester. The device consists of a board (A) placed vertically in the manhole shaft to support a number of small



— PLAN —



— SECTION —

FIGS. II AND I.

ceiver (D), fitted with a heavily-weighted lid; from the back of the latter a wire projects to which is attached a cork; the whole apparatus is placed in a strong wooden box or cistern (E).

The receiver (D) is closely covered with an airtight joint when the lid falls. The cost of this sampling appliance, fixed complete, is under a sovereign.

The following diagram (Fig. J) shows the putrescibility of the samples taken at the cill level of the storm

tins (B) placed at regular intervals. These vessels fill as the water rises and record the height to which the sewers have been surcharged. The tins are protected from roof drippings by the hood (C).

As many of the largest sewers in the city have of necessity to be laid with very flat gradients, experiments were carried out in an existing brick culvert of similar construction to ascertain the transporting power of water flowing at different velocities on the

materials most likely to find their way into the sewerage system. The results of these experiments were as follows:—

Material.	Depth of flow.	Minimum velocity to move.
Cinders about 3½-in. gauge	3 in.	0.73 ft. per sec.
Sandstone screenings ¼-in. gauge	2 in.	1.46 " "
Pebbles ½-in. gauge	3 in.	1.64 " "
Flat broken sandstone 1½-in. gauge	4 in.	1.79 " "
Pebbles 1½-in. gauge	3 in.	1.86 " "
Broken granite 1½-in. gauge	1½ to 2½ in.	1.93 " "
Powdered cinders	2½ in.	1.93 " "
Sandstone chippings	4 in.	2.19 " "

By the kind permission of Prof. Petavel, F.R.S., further experiments were conducted at the Whitworth Laboratory of the Manchester University. A lining of brick-

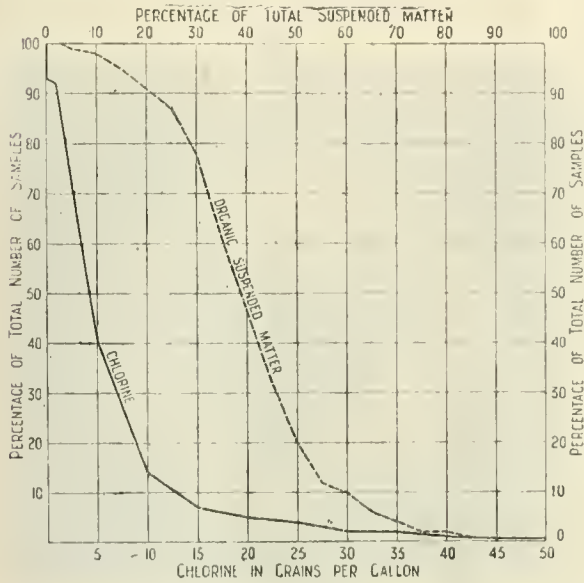


FIG. J.

work similar to that used in the sewers was placed within the flume, and a series of tests were made with the materials named in the following table:—

Material.	Minimum transporting velocity.
Fine cinders	1.42 ft. per sec.
Grit screenings	1.57 " "
Large cinders	1.60 " "
½-in. pebbles	1.67 " "
1½-in. pebbles	1.74 " "
¾-in. gritstone	1.90 " "
1½-in. " "	2.5 " "
1½-in. granite	2.55 " "

The results of the latter experiments are believed to be more accurate than those of the former series, as a greater depth of water could be obtained in the laboratory tests, as shown by diagram 1.

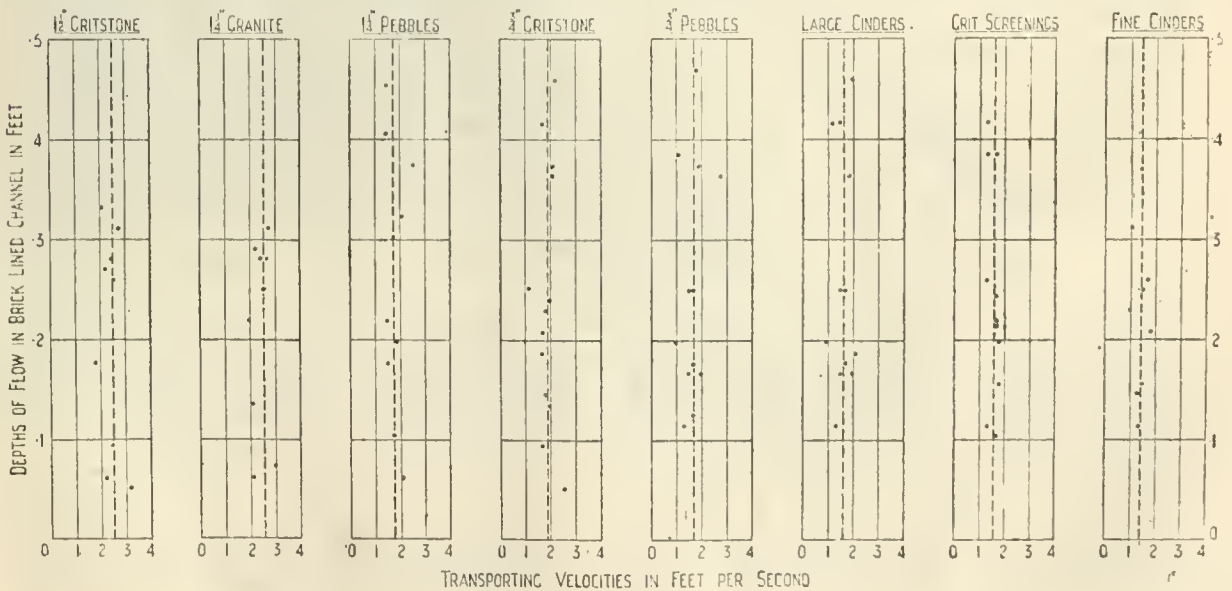


FIG. L.

PITOT TUBE.

A modified arrangement of the Pitot tube has been used for ascertaining the velocity of the flow in sewers. Considerable difficulty was at first found in the use

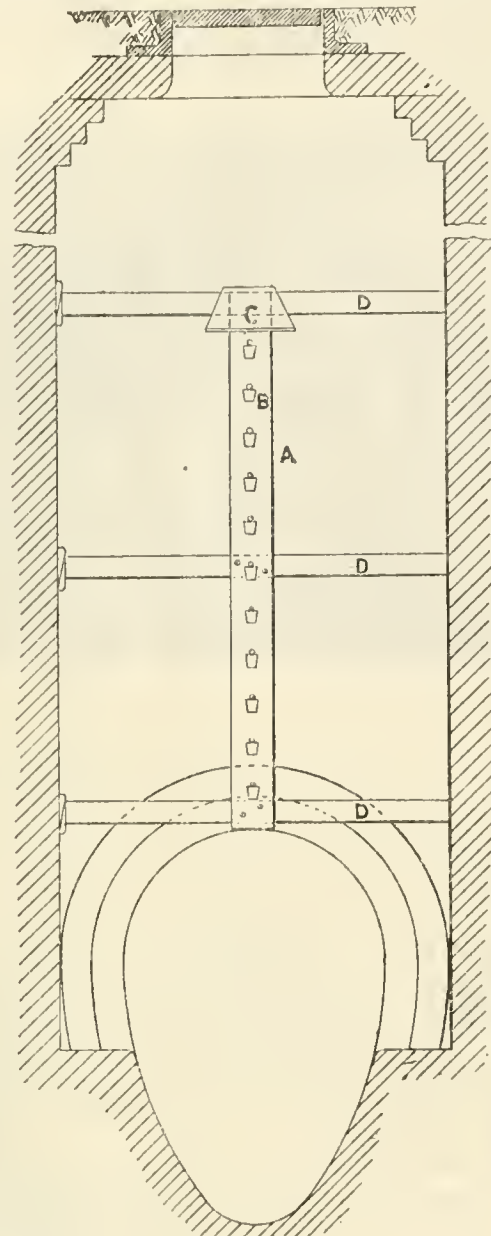


FIG. K.

of this instrument, owing to the large amount of fibrous and soapy matter in the sewage, which clogged the orifice of the instrument immediately it was submerged. The difficulty has, however, been overcome to a large extent by the modified type of instrument

which will be submitted for the members' inspection. A funnel-shaped mouth was provided at the top of the manometer, but it was found better to fill the tubes by suction with clean water, there being no practical difference between its specific gravity and that of ordinary sewage. The instrument was calibrated by timing it against floats in smooth, straight channels of uniform section. The "calibration constant" was found to be nearly unity for the particular type of instrument referred to.

The nozzle is made of copper, which appears to stand the Manchester sewage best; it is the easiest metal to work to the required shape. The tubes con-

meter tubes, and so allows the instrument to reset itself automatically.

EXISTING MAIN SEWERS.

The existing scheme of drainage (described in vol. xix. of the "Proceedings") consists of an outfall sewer from the city, which passes through the townships of Stretford and Davyhulme, and terminates at the Manchester sewage works in the latter township, about 5 miles from the city. This sewer, from the city boundary to "Waters-meeting," in Trafford Park, is elliptical, 11 ft. wide and 10 ft. 6 in. high. The workmanship is good, but wire-cut bricks inferior to those now in use were employed, and the crown has become

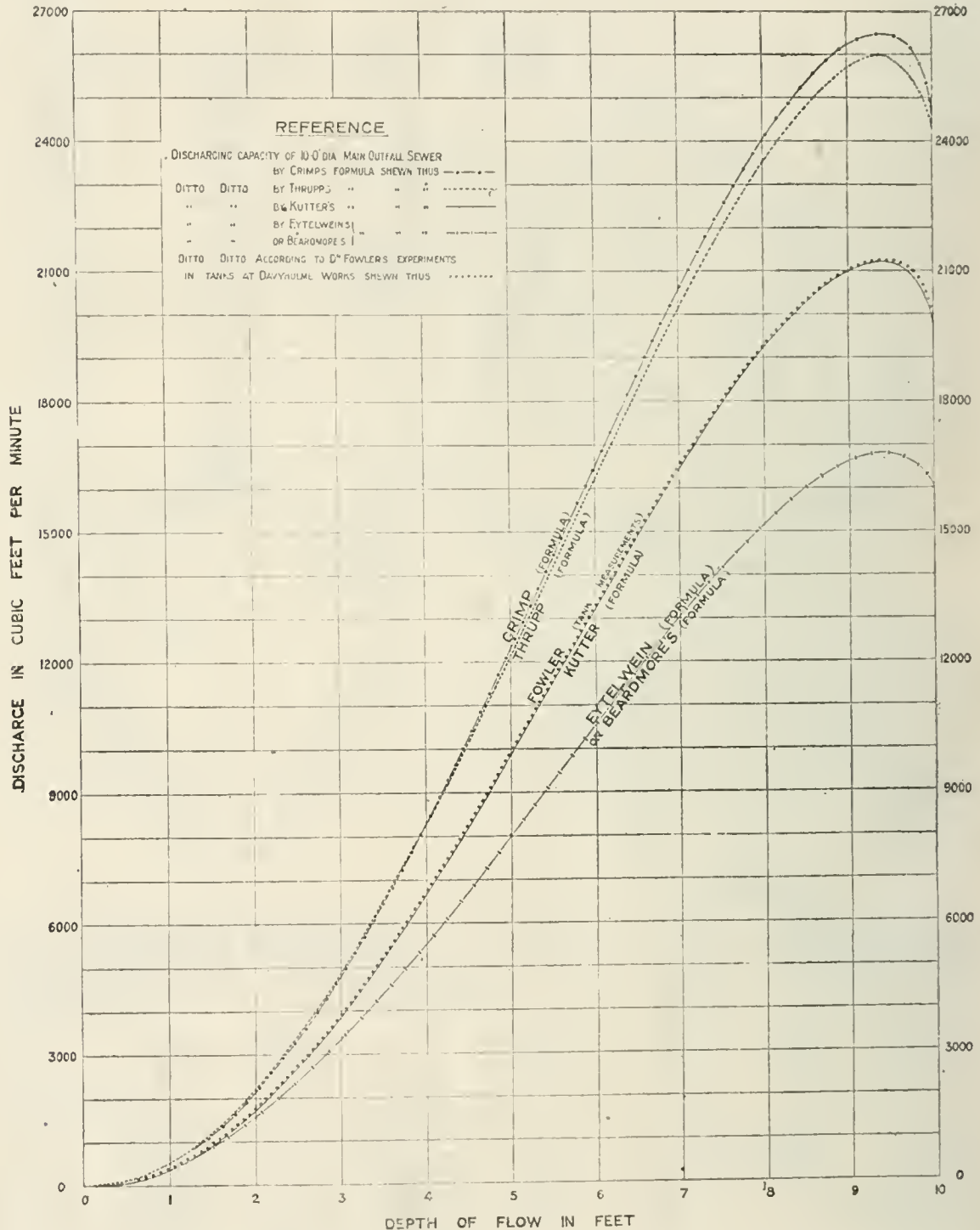


FIG. M.

necting the nozzles to the manometer gauge are made of vulcanised rubber, with an internal layer of cotton cloth similar to that used for steam gauges. Pure rubber tubes were at first tried, but they perished almost immediately. It was found necessary to have rubber connections, as the nozzles had to be inserted in positions which did not admit of the instrument. The twin tap is believed to be a novel arrangement. By turning this tap when the reading is taken the record is fixed, and the instrument may be removed and read in a better light outside the sewer. The second tap connects and disconnects the two man-

depressed in places. The new outfall sewer, now in progress, which is circular, is being placed as far away from the elliptical sewer as practicable, and where parallel streets are available they have been utilised as the route for the new outfall.

The existing sewer from "Waters-meeting" to Davyhulme is circular, 10 ft. in diameter, and the excess of storm water is run off by a storm overflow which passes from "Waters-meeting," in a northerly direction, into the Ship Canal below Mode Wheel Locks.

At the last meeting of the institution in this city, in May, 1893, reference was made by Mr. Santo Crimp

and by Mr. Allison to the discharging capacity of this outfall sewer. Fig. M is therefore interesting.

It was found by experiment that the correct coefficient of roughness to be used with the formula of Kutter was .012 for pipe sewers in good condition, and .015 for brick sewers of average construction and in good condition. It will be seen that these results are fully borne out by the tank measurements at Davyhulme, which agree closely with the results obtained by the formula of Kutter with the coefficient .015.

The formula of Santo Crimp does not give a variable coefficient for friction, which, under some conditions of surface, so largely affects the discharge.

NEW DRAINAGE SCHEME.

The main drainage scheme prepared by the author was approved by Parliament in 1911. It provides for the drainage of the whole city and certain adjoining districts. The new sewers will be of sufficient capacity to meet the estimated requirements of Manchester and



NEW SEWER IN COURSE OF CONSTRUCTION (FIG. N).

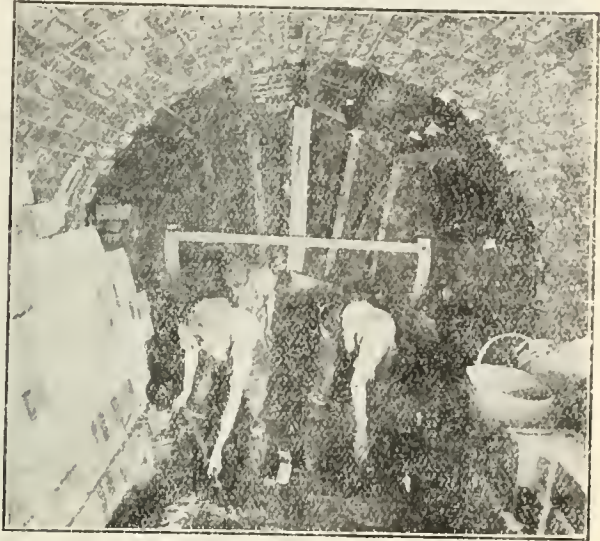
neighbourhood for fifty years. The total area included in the scheme is 39,100 acres.

The sewers are circular, and vary in size from 2 ft. 3 in. diameter to 15 ft. 3 in. diameter. They gravitate to the sewage works at Davyhulme.

The number of rings of brickwork range from two

In bad ground the sewers are strengthened by the addition of concrete. The diagram shows the standard sections that have been used.

The specification provides that compressed air, with or without a shield, shall be employed where the nature of the ground warrants this method of construction, and in some cases it has been found necessary to use compressed air in order success-



MEN WORKING IN A NEW SEWER (FIG. P).

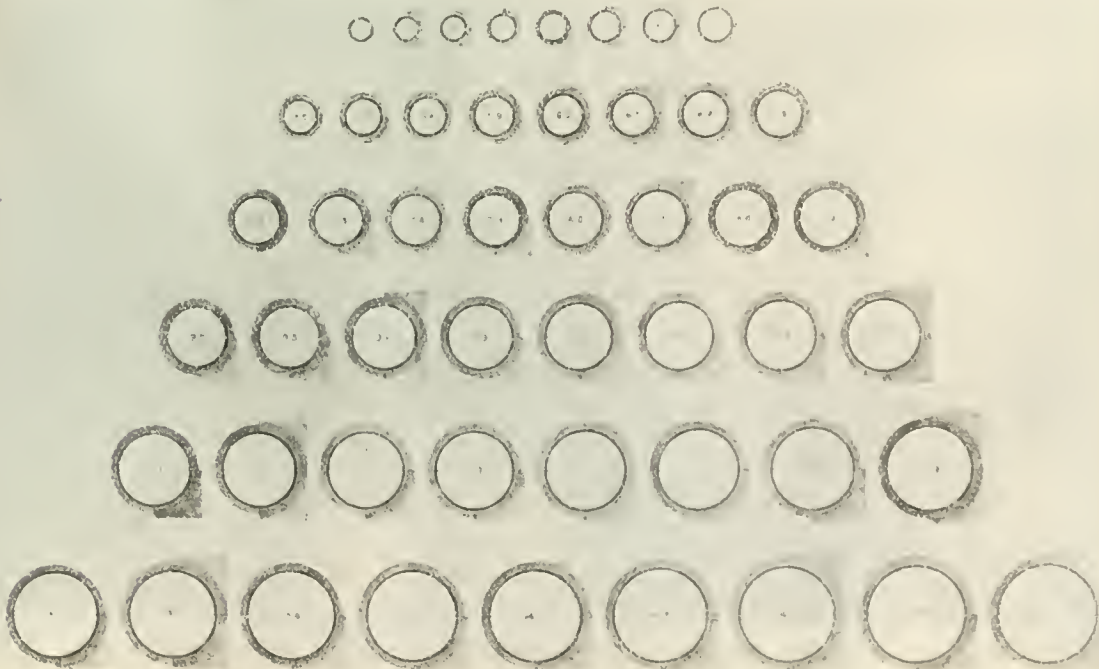
fully to accomplish the work. Cast-iron segments of the usual type, as shown by the view, were used in two places in lieu of brickwork in cement.

Extreme care is taken in setting out the work.

Records, progress plans of the work and geological sections of the strata met with on each contract are kept, and these documents are brought up to date weekly.

SUPERVISION.

To ensure proper supervision an assistant engineer is employed on each section of the work, and he is allowed as many competent clerks of works as are necessary for complete supervision both night and day. Each clerk of works enters in a book daily the particular length of sewer built under his immediate supervision during that day or night, as the case may be. The progress-drawings and record



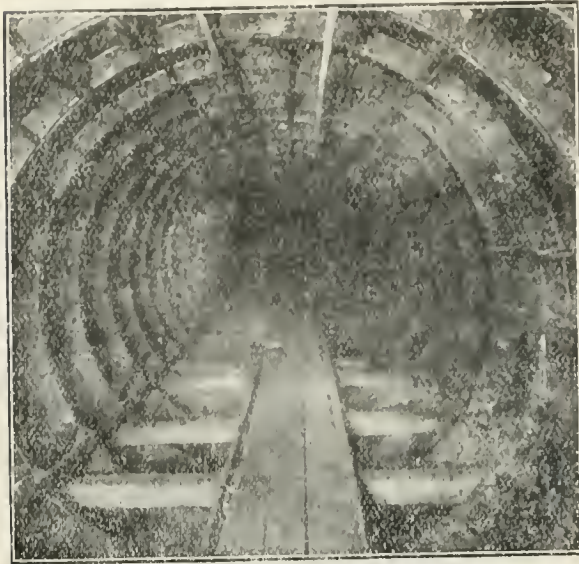
STANDARD SECTIONS (FIG. O).

to four. The inner ring is composed of red engineering bricks, in the remainder of the work hard shale-bricks are used. All brickwork is set in Portland cement mortar.

identify each length of work completed with the official who supervised it.

After the work is finished, or (if required) during its progress, the contractors are bound to cut into it

at any points indicated to them by the city surveyor for the purpose of examination. If the exposed work is found to be satisfactory, the corporation pay the cost of cutting and restoring the work.



CAST-IRON SEGMENTS BEFORE LINING (FIG. Q).

A complete series of photographs are taken of the works during their progress.

The whole of the work is under the general supervision of the resident engineer, Mr. C. O. Bullough, who reports daily to the city surveyor. A final and searching inspection is made before the expiration

of the period of maintenance, which is two years from the date of completion.

the referee, unless such work shall have been done under an order in writing on the form provided for the purpose signed by the city surveyor, and furnished to the contractor before such extra work has been commenced, and the contractor is required to furnish a return of extra work done every week, giving the details and the number and date of the order authorising the work. If no weekly return is sent in, it is to be deemed an admission that no extra work was done during that week.

The contractor's prices include the cost of any timber left in, and of strengthening foundations as may be required.

These provisions have been found to work well, and have reduced the extras to a minimum, in fact, those contractors who cut their tenders fine, and rely upon extras for their profits, now give Manchester a wide berth.

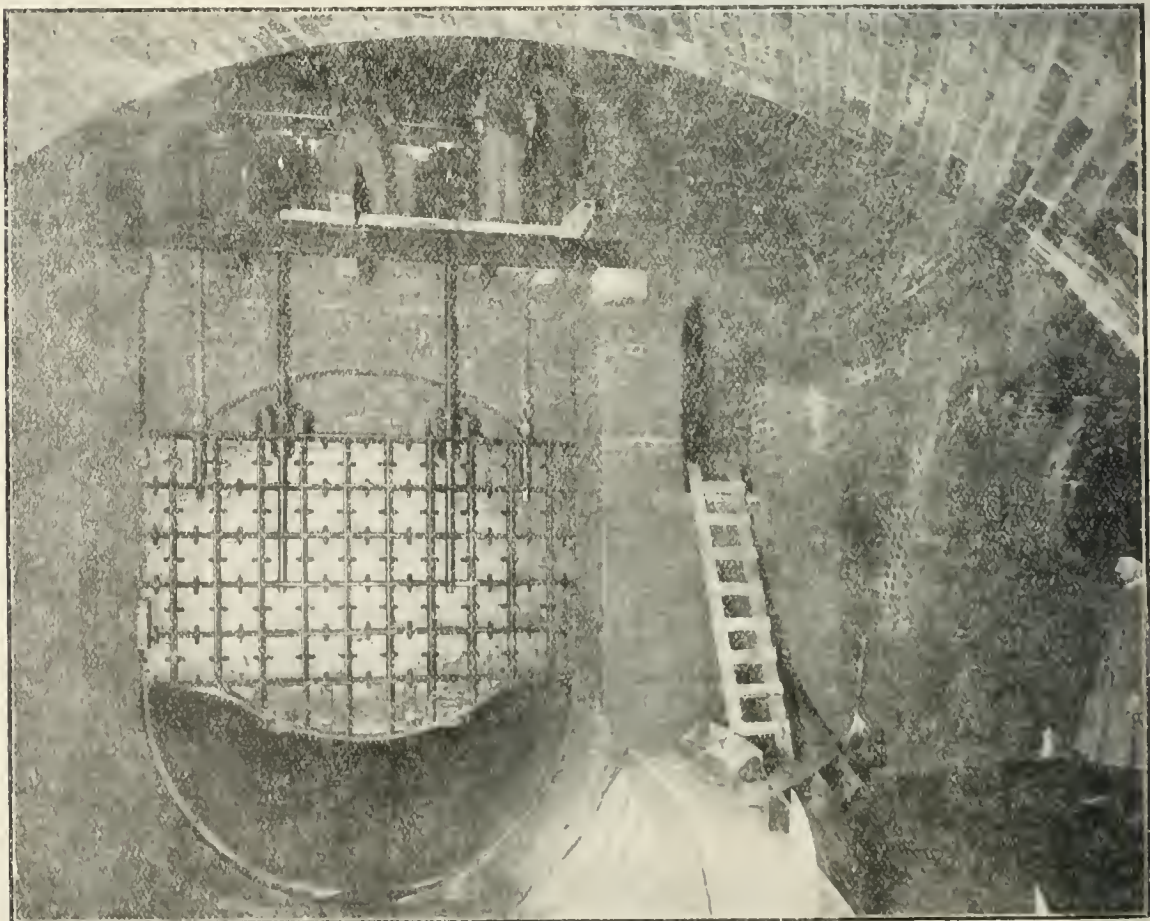
PENSTOCKS.

Provision has been made, by means of penstocks, for regulating or transferring the flow from the old sewers to the new, or *vice versa*, as occasion may require. This arrangement has many advantages, and it enables the workmen to enter the large sewers with safety during the day for the purpose of repairs, &c.

Messrs. Glenfield & Kennedy, Kilmarnock, and Messrs. Blakeborough, Brighouse, are sub-contractors for the large penstock work.

The penstocks on the sections of the main drainage scheme under construction vary in size from 6 ft. 9 in. diameter to 14 ft. by 10 ft. 6 in. They are of cast iron, fitted with gunmetal faces scraped watertight. The lifting spindles are made of mild steel, and are protected from the action of the sewage by wrought-iron tubes. These tubes are filled with lubricant in which, under normal conditions, the screws are submerged.

The dead weight of the penstock gates varies from 3 to 8 tons; they are counterbalanced by cast-iron weights. Worm gearing is fitted to each penstock,



VIEW OF PENSTOCK IN COURSE OF ERECTION (FIG. R).

of the period of maintenance, which is two years from the date of completion.

EXTRA WORK.

The contract provides that no charges whatever for extra work shall be claimed by the contractor or allowed by the corporation, or by the city surveyor or

with a velocity ratio of 5.654 to 1, so that a force of a few pounds applied at the handle will operate the penstock. With this mechanical advantage the largest of these penstocks could be operated by hand in four hours if the motor should fail or break down. Electric motors, fitted with limit switches, and capable of running at 1,000 revolutions per minute, will be installed.

The penstocks can then be opened or closed in about eight minutes.

The motors will be of the submergible type, with gaslight starters, so arranged that in the off-positions the field coils on the motor are on half current. The wiring will be of sheathed cable run on porcelain insulators. Hydraulic power is not available in the locality, otherwise it would be used in preference to electricity, owing to the moist atmosphere in the chambers.

DESCRIPTION OF SOME OF THE WORKS PROPOSED TO BE INSPECTED.

Manchester is a city which is intersected by numerous canals, rivers and railways. The crossing of these has been a matter of no little anxiety to those concerned.

Many miles of work are now in progress, and the value of contracts let, including the work which is being carried out by the corporation staff, amounts to upwards of £500,000.

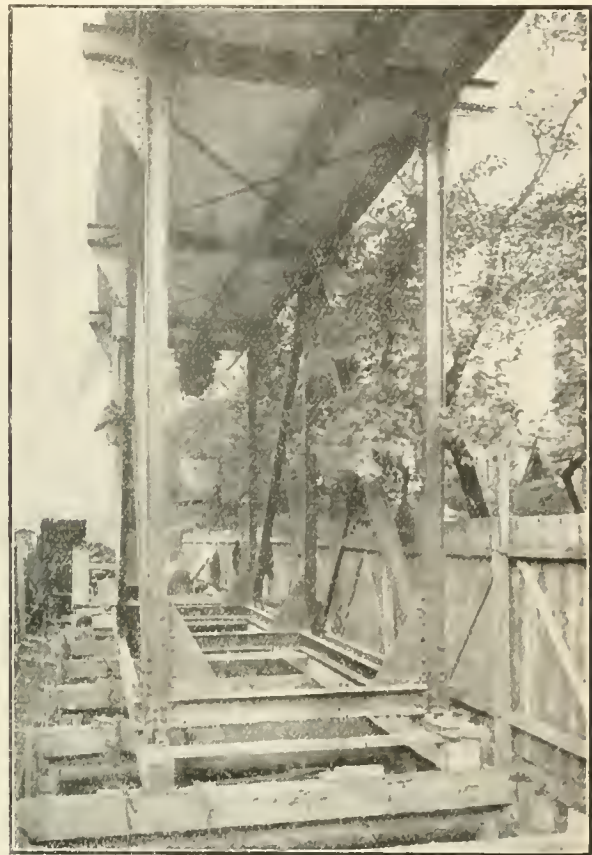
Work known as No. 8¹ (Messrs. E. Nuttall & Co., Contractors) comprises about 1,960 yds. of circular brick sewer of 9 ft. 3 in. internal diameter; this sewer is now practically finished, but it is not yet brought into use.

The work was carried out in "cut-and-cover," and the space between the tram rails and the building line was very little in excess of the actual width of excavation. The use of ordinary jib cranes was found to be impracticable. The contractors therefore employed four transporters of their own design and of the type shown (Fig. S), by means of which they performed the work expeditiously and with the minimum amount of traffic obstruction, vibration, and cost.

The transporter works longitudinally over the trench, and discharges or receives the material at either end. Each machine consists of a steel framework on travelling wheels and supporting a steel girder which carries an electric crab controlled from the ground level. The girder is 50 ft. long, with an effective travel of 43 ft.; the height is 16 ft. 9 in., total width of frame 11 ft., and the length of supporting framework 28 ft.

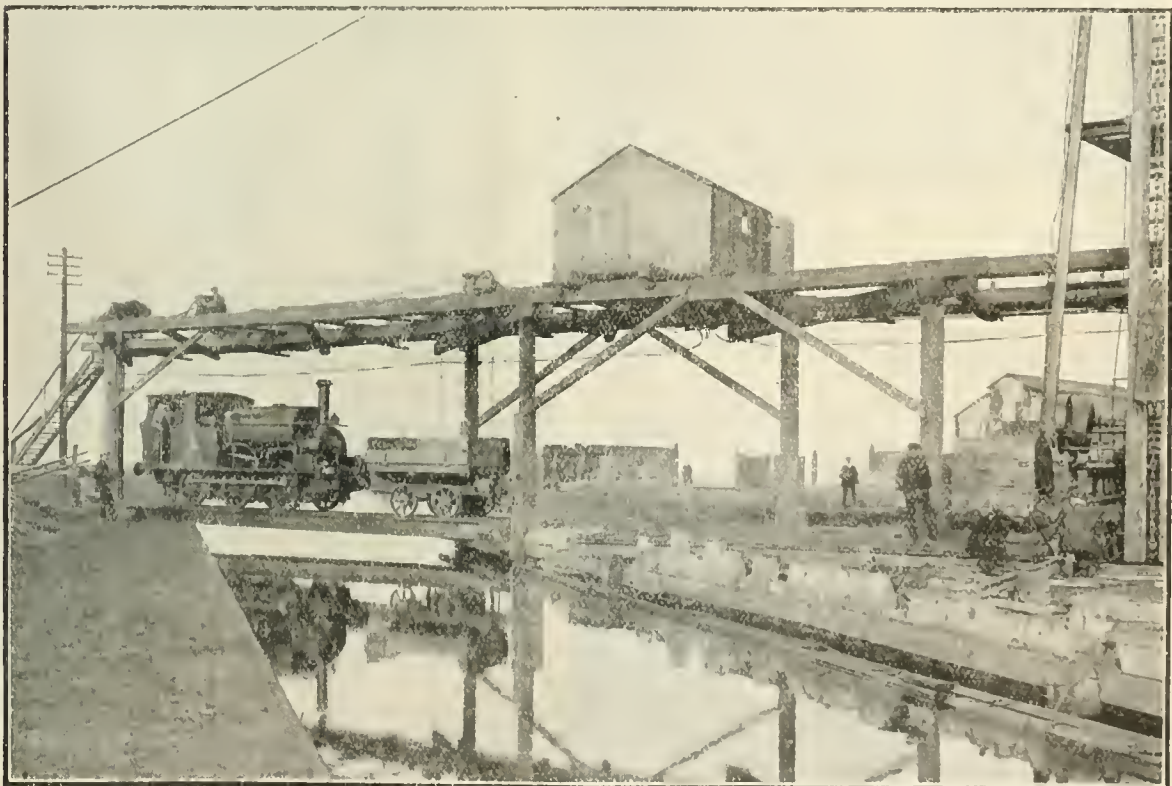
The only moving part consists of the crab, which with its full load represents only about 25 per cent of the travelling load of a jib-crane of equivalent capacity. Much of the vibration which would have

Each crab is capable of raising a load of 25 cwt. at a speed of 48 ft. per minute, and of travelling with this load at a speed of 150 ft. per minute.



END VIEW OF TRANSPORTER (FIG. S).

Electrical energy was supplied by the corporation through a twin cable 250 yds. long wrapped on a drum, the extreme end of the cable being passed



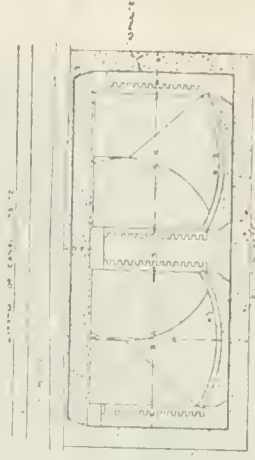
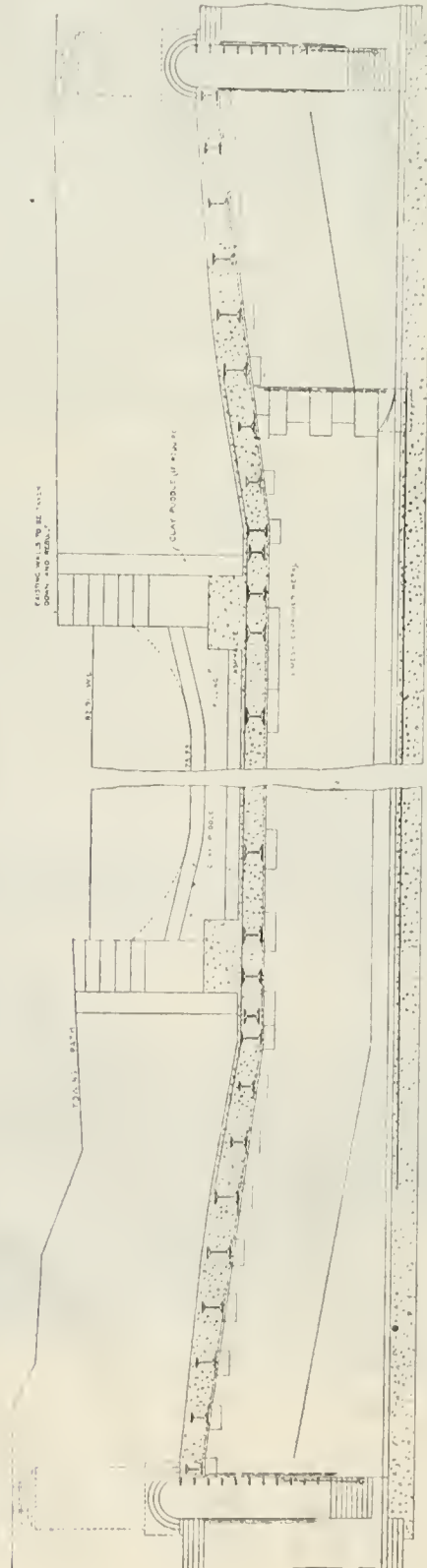
BRIDGEWATER CANAL CROSSING (FIG. T).

been caused by the latter was therefore obviated: this was important, as the excavation was close to buildings. The girder carrying the crab has a lateral movement so that pipes or other obstructions in the trench may be avoided and the skip adjusted to miss them.

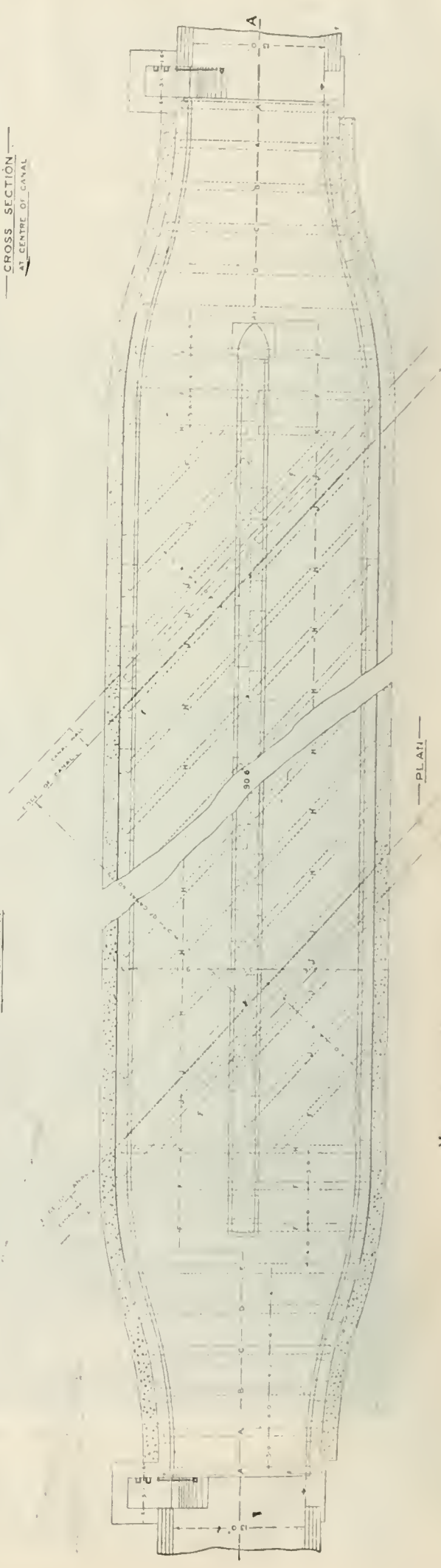
through the side of the drum and attached to a plug-box, from which a flexible cable was carried to the crane. The contractors state that this special plant effected a large economy in working expenses, and enabled them to execute the work with the least amount of inconvenience to persons on the line of

GIRDERS

R.S.	PLATES	WEIGHTS
1	12 6 54	4 5.1
2	12 6 54	4 5.1
3	12 6 54	4 5.1
4	12 6 54	4 5.1
5	12 6 54	4 5.1
6	12 6 54	4 5.1
7	12 6 54	4 5.1
8	12 6 54	4 5.1
9	12 6 54	4 5.1
10	12 6 54	4 5.1
11	12 6 54	4 5.1
12	12 6 54	4 5.1
13	12 6 54	4 5.1
14	12 6 54	4 5.1
15	12 6 54	4 5.1
16	12 6 54	4 5.1
17	12 6 54	4 5.1
18	12 6 54	4 5.1
19	12 6 54	4 5.1
20	12 6 54	4 5.1
21	12 6 54	4 5.1
22	12 6 54	4 5.1
23	12 6 54	4 5.1
24	12 6 54	4 5.1
25	12 6 54	4 5.1
26	12 6 54	4 5.1
27	12 6 54	4 5.1
28	12 6 54	4 5.1
29	12 6 54	4 5.1
30	12 6 54	4 5.1
31	12 6 54	4 5.1
32	12 6 54	4 5.1
33	12 6 54	4 5.1
34	12 6 54	4 5.1
35	12 6 54	4 5.1
36	12 6 54	4 5.1
37	12 6 54	4 5.1
38	12 6 54	4 5.1
39	12 6 54	4 5.1
40	12 6 54	4 5.1
41	12 6 54	4 5.1
42	12 6 54	4 5.1
43	12 6 54	4 5.1
44	12 6 54	4 5.1
45	12 6 54	4 5.1
46	12 6 54	4 5.1
47	12 6 54	4 5.1
48	12 6 54	4 5.1
49	12 6 54	4 5.1
50	12 6 54	4 5.1
51	12 6 54	4 5.1
52	12 6 54	4 5.1
53	12 6 54	4 5.1
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64	12 6 54	4 5.1
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66	12 6 54	4 5.1
67	12 6 54	4 5.1
68	12 6 54	4 5.1
69	12 6 54	4 5.1
70	12 6 54	4 5.1
71	12 6 54	4 5.1
72	12 6 54	4 5.1
73	12 6 54	4 5.1
74	12 6 54	4 5.1
75	12 6 54	4 5.1
76	12 6 54	4 5.1
77	12 6 54	4 5.1
78	12 6 54	4 5.1
79	12 6 54	4 5.1
80	12 6 54	4 5.1
81	12 6 54	4 5.1
82	12 6 54	4 5.1
83	12 6 54	4 5.1
84	12 6 54	4 5.1
85	12 6 54	4 5.1
86	12 6 54	4 5.1
87	12 6 54	4 5.1
88	12 6 54	4 5.1
89	12 6 54	4 5.1
90	12 6 54	4 5.1
91	12 6 54	4 5.1
92	12 6 54	4 5.1
93	12 6 54	4 5.1
94	12 6 54	4 5.1
95	12 6 54	4 5.1
96	12 6 54	4 5.1
97	12 6 54	4 5.1
98	12 6 54	4 5.1
99	12 6 54	4 5.1
100	12 6 54	4 5.1



SECTION A-A
CROSS SECTION AT CENTRE OF CANAL



MANCHESTER MAIN DRAINAGE: CROSSING UNDER BRIDGEWATER CANAL (BARTON BRANCH). (FIG. U.)

route, especially in front of shop property where room was limited.

Work No. 8² (Messrs. Kinnear, Moodie & Co., Contractors).—This main intercepting sewer, 8 ft. 3 in. in diameter, is a continuation of work No. 8¹. It is mainly constructed in tunnel at an average depth of about 28 ft.

The total length is 2,510 lin. yds.

Work No. 8³ (Messrs. Griffiths & Co., Limited, Contractors).—This sewer is a continuation of work No. 8². The total length of the work is 2,863 lin. yds., and it varies in size from 8 ft. 3 in. diameter to 5 ft. 9 in. diameter, with an average depth of about 36 ft. It is being constructed in tunnel, and work under compressed air is in progress.

A few visitors only can be admitted at a time to this work, as the space within the air locks is limited.

Work Nos. 3b and 4¹ (Messrs. Kinnear, Moodie & Co., Contractors).—In these works there are some large penstocks which are now being fixed in position, and preparations are being made for working under air pressure owing to the nature of the substrata.

Contracts Nos. 1 and 2a (Messrs. E. Nuttall & Co., Contractors).—These works comprise about 3,181 yds. of 13 ft. circular brick sewer. The contractors have laid a line of railway across the Bridgewater Canal from the dock system on the Trafford Park estate to the westerly end of the works. By this means they are enabled to run trucks from the railway company's system direct to the job.

The temporary crossing of the Bridgewater Canal (Fig. T) has been effected by a lift-bridge, operated by electricity, which enables the canal traffic to be continued without interruption. The construction of the outfall sewer under the canal is now in progress. Half the width of the canal is enclosed by a cofferdam (Fig. U) constructed with Ransome (type D) interlocking steel piles, 26 ft. long, and weighing about 28 lb. per square foot. The cost delivered is about 2s. 4d. per square foot. They have been driven without difficulty through sand and clay into marl, and the joints are watertight. The sewer is to be carried under the canal by a twin culvert roofed with steel joists and concrete.

Some of the works now in progress are within the township of Stretford, and the author desires to record his indebtedness to Mr. Ernest Worrall, the engineer and surveyor of Stretford, who, while carefully guarding the interests of Stretford, has given all reasonable facilities for, and assistance in, carrying on the work.

The following table may be found useful for reference:—

NUMBER OF BRICKS PER LIN. YARD OF SEWER.

Diameter of sewer.	1st ring, engineering bricks.	2nd ring, common bricks.	3rd ring, common bricks.	4th ring, common bricks.
ft. in.				
4 6	*237	*253	—	—
5 0	*254	*271	*310	—
6 3	277	316	340	—
7 0	316	366	391	—
7 3	332	371	411	—
7 6	340	379	419	—
7 9	356	395	431	—
8 0	371	407	442	—
8 9	403	480	567	—
12 0	511	573	612	651
13 6	624	656	687	719

* Radiated bricks.

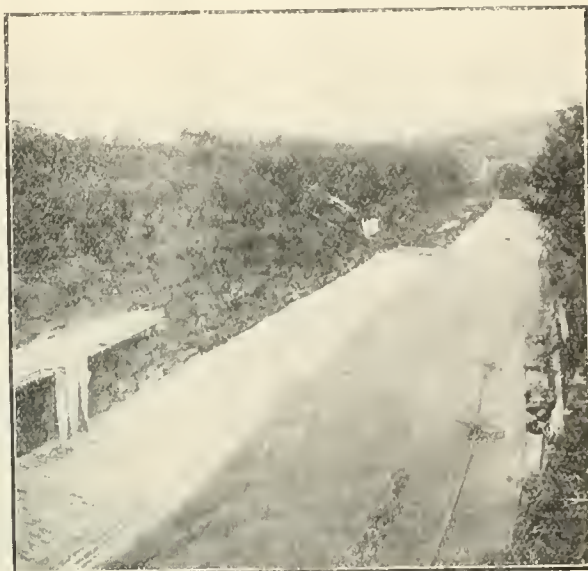
These figures were obtained by counting the bricks built in the sewers in many places, and taking the averages.

Contract No. 16 (Messrs. Moffatt, Contractors).—This work comprises about 1,716 yds. run of inverting the river-bed, and the erection of new retaining walls and the underpinning and repair of the existing walls. Maximum gradient of the invert is 1 in 219, and the minimum gradient is 1 in 500. The invert is constructed with red engineering bricks laid on edge, resting on a foundation of 6 to 1 concrete 12 in. in thickness. The centre portion is dished and of segmental section, 12 ft. by 2 ft. 9 in. The parts between the dishing and the river walls are laid to an inclination of 1 in 12.

RIVER CLEANSING.

The subject of river cleansing is an important one in cities like Manchester, where some of the rivers and streams are of small volume during periods of

dry weather, and the quantity of refuse which finds its way into them is considerable.



VIEW OF RIVER IMPROVEMENT (FIG. V).

The system of inverting the river beds has been largely carried out in Manchester, and while it does



VIEW OF RIVER BEFORE IMPROVEMENT (FIG. W).

not aim at the source of the nuisance, it enables the corporation to maintain the rivers in a much better



VIEW OF RIVER AFTER IMPROVEMENT (FIG. X).

sanitary condition during hot weather than would otherwise be the case; it also facilitates the cleansing

of the river beds and prevents the accumulation of offensive matter therein.

The foregoing views show a portion of the river before and after the improvement respectively.

SETTLING POND.

The section for the protection of the Manchester Ship Canal Company in the Manchester Corporation Act, 1911, provides that a settling pond is to be constructed in the Clayton Valley to prevent *débris* being washed down the river Medlock into the Ship Canal. The following view shows this pond, which has an area of $\frac{1}{2}$ acre.

Since it came into use it has intercepted a much larger quantity of material than was anticipated. Much of the *débris* brought down consists of gravel, sand and ballast, which can be utilised by the paving department; therefore the cost of keeping the pond clear from obstruction is reduced. A valve is provided in the weir, and when the pond is being cleaned the water is lowered for the purpose. The bottom is paved with 6-in. setts on a foundation of cement-concrete 8 in. thick.

SEWAGE DISPOSAL.

In 1896 the author recommended the construction of an outfall sewer to convey the sewage to the tidal

Canal, and sludge sent mainly to sea. Small proportion sold.

Gorton. Sewage precipitation tanks. Total capacity about 1,200,000 gallons. Contact filters, 3 ft. deep. Total capacity 958,320 gallons. Effluent discharged into Gore Brook. Sludge pressed and mainly tipped.

Withington. Two sewage sedimentation tanks, total capacity 781,000 gallons. Twenty-four contact filters, total capacity 2,356,000 gallons. No stand-by storm-water tanks. Effluent discharged into Ouzel Brook and river Mersey. Sludge trenched into land.

Moss Side.—Four sewage precipitation tanks, total capacity 630,000 gallons. Capacity of irrigation area (20 acres), 800,000 gallons. Portion of storm water allowed to settle in lagoons. Sludge pressed and cake sold. The sewage of these works has just been intercepted by one of the new sewers, and it is now conveyed to Davyhulme. The Moss Side works will be retained for the treatment of excess storm waters.

SEWER VENTILATION.

This subject has engaged the attention of a Special Committee of the Manchester City Council for many years. In April, 1901, the city surveyor presented a report on the matter, and recommended the substitution of upcast shafts for surface ventilation.

In the following year the city council appointed a



VIEW OF SETTLING POND (FIG. Y).

waters. His scheme was twice approved by the city council, and twice rejected by a statutory meeting of ratepayers. Since that time he has not been associated with the sewage treatment, which is under the direction and supervision of Dr. Gilbert Fowler. The following statement, showing the quantities dealt with at the different works, may be of interest:

	Total present d.w.f., including subsoil water.	Maximum quantity reaching works (6 times d.w.f.).	Quantity treated as sewage (3 times d.w.f.).
	Gallons.	Gallons.	Gallons.
Davyhulme	30,100,000	109,000,000	64,500,000
Gorton	1,900,000	6,760,000	2,880,000
Withington	3,000,000	14,076,000	7,038,000
Moss Side	1,000,000	1,806,000	2,103,000
Total	35,000,000	133,642,000	66,821,000

SEWAGE TREATMENT.

Davyhulme.—Twelve open septic tanks of total capacity 16,000,000 gallons; 110 acres of contact filters, 2 ft. 6 in. to 4 ft. deep, and total capacity 18,360,000 gallons. Four stand-by storm-water tanks, total capacity 4,500,000 gallons. Effluent discharged into Ship

Special Committee to consider the subject. Prof. Delepine was appointed to undertake the bacterial work, Dr. Fowler the chemical work, and the author the supervision of the experimental installations and the investigation of air currents, &c.

Experiments were conducted on an extensive scale for many years. The investigations show that the air of sewers situated at a depth exceeding 10 ft. does not contain more carbonic acid than the worst street air, and that the proportion of carbonic acid in sewers increases as the depth of the sewer increases, and becomes considerable when the sewers are unventilated. Ventilation by upcast shafts fixed in suitable positions has been adopted with good results; tramway standards are used for this purpose in many cases.

Experiments were made on four proprietary systems designed for the purpose, but the results were not such as to induce the corporation to adopt any of those systems. On private lands near to one of the public sewers a station was provided, where bacteriological and chemical work was conducted on an extensive scale for a considerable period; this showed that the passage of sewage bacteria into the sewer air did not, in itself, prove that sewer air was necessarily a source of material danger, and that in the air of an efficient sewer carrying ordinary domestic sewage the number of sewage bacteria is very small.

Animals exposed to large amounts of that air for lengthened periods did not appear to suffer from the exposure. It was also observed that the discharge of a considerable amount of sewer air passing through ventilating shafts had not caused any special outbreak of disease in the houses surrounding the ventilators.

TRADE EFFLUENTS.

There are many chemical and other works in Manchester whose trade wastes were formerly admitted into the sewers. Several explosions occurred; some with fatal results to men working in the sewers. In 1892 Parliament gave the corporation special powers under which the city council may by order absolutely prohibit any such matters being permitted to flow or be washed into any sewer, either directly or indirectly. The corporation also obtained power in their discretion of constructing within any manufacturing premises, at the cost of the corporation, and without any liability on their part for compensation in respect thereof, an inspection chamber or chambers accessible to corporation officials at all times for the purpose of ascertaining the nature of the discharge from such premises into the sewers. These powers have been put into force, and explosions in the sewers have since ceased.

Since the introduction of motor cars, a new element of danger has been occasioned by waste petrol finding its way into the sewers. In July, 1912, the corporation issued a special order declaring that the intro-

duction of manufacturing or trade refuse containing petrol or allied spirits into a sewer, whether alone or in combination with other matter or liquid, and whether directly or through any drain or channel communicating therewith, involved danger to the health of persons entering the sewers, and prohibited any such matters being caused or permitted to fall, flow, or enter, or to be carried or washed into any sewer either directly or indirectly.

recorded, and a value assigned. In ascertaining the value the original cost has been taken wherever known, and in other cases where the sewers were constructed by private individuals an estimate of the value was made.

The whole of the Manchester sewers are now brought into assessment by the various rating authorities through whose districts they pass.

TREATMENT OF OLD RETAINING WALL.

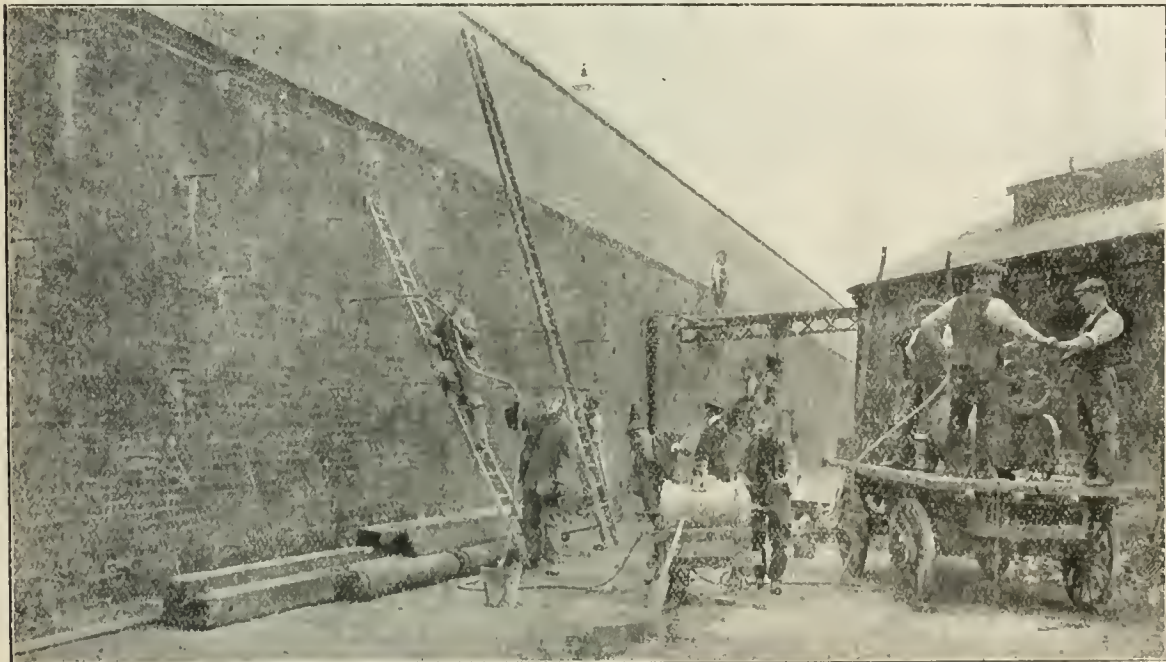
The accompanying view of this wall (Fig. Z) shows the method adopted for strengthening it. The face of the wall had been pointed and defective bricks cut out before the photograph was taken.

The wall was built in 1886, and is constructed of local bricks, with a face batter of 1 in 12. Its length is about 226 yds., and it supports the street, which is about 18 ft. above the level of the adjoining ground.

In 1902 it was found that an overturning movement was taking place, and observations from time to time showed that this movement was increasing.

In 1911 cracks were visible, and the parapet wall was leaning over to a dangerous extent. Trial openings were made, and a careful examination revealed that—

- (1) The wall was deficient in thickness.
- (2) The bricks were of inferior quality, and the mortar and concrete were perished.
- (3) The footings for the greater part rested on ash-bin rubbish.



VIEW OF OLD RETAINING WALL DURING REPAIRS, &c. (FIG. Z).

duction of manufacturing or trade refuse containing petrol or allied spirits into a sewer, whether alone or in combination with other matter or liquid, and whether directly or through any drain or channel communicating therewith, involved danger to the health of persons entering the sewers, and prohibited any such matters being caused or permitted to fall, flow, or enter, or to be carried or washed into any sewer either directly or indirectly.

ASSESSMENT AND RATING OF SEWERS.

In consequence of the decision in the House of Lords that sewers where overground or underground are rateable wherever the occupation of them is "valuable," for the purpose of deciding whether the occupancy is "valuable" or not, the Manchester Corporation are advised that the public authority sought to be rated may be regarded as possible hypothetical tenants of the sewers from year to year.

This decision practically abolishes the exemptions which under case law the sewers have enjoyed, and places them in the same position as water mains, gas mains, and similar underground works.

The valuation of the whole of the sewers in the city of Manchester has recently been completed by the author. It was an undertaking of great magnitude, as will be seen by an inspection of the record. This volume shows the system adopted. The particulars of each individual sewer had to be ascertained and

The following remedial measures were adopted—viz.:—

Concrete backing was placed behind the wall, the parapet was taken down and rebuilt, the perished bricks were cut out of the face, and the wall was pointed in cement: 579 holes were drilled at distances of about 6 ft. apart, and cement grouting was forced in under pressure to fill the interstices in the brickwork; 42 tons of cement were thus used.

The soft concrete under the footings, and dust-bin rubbish, were removed in short lengths, and the wall was underpinned down to the solid.

The total cost of strengthening and repairing the wall amounted to £2,931. Much of this money might have been saved had the work not been scamped in the first instance, as the original cost of the deficient wall was £3,794, at a period when labour and materials were much cheaper than at present.

RIVER COVERING.

A section of the covering of the river Medlock is an example of partial failure in a case where there is an ample margin of strength in design combined with good workmanship and materials. The structure is close to coal mining operations, and a large quantity of water is abstracted from the subsoil by pumping. Shortly after completion, and before the embankment which it was to carry was finished, several transverse cracks which passed right round the structure, and

through the invert appeared at intervals of about 50 ft. (Fig. AA). Sir Benjamin Baker was consulted, and recommended that a strong lining of brickwork and concrete, strengthened by the insertion of old tram rails, should be carried out. At the same time he reported that he had to deal with a work under somewhat similar con-

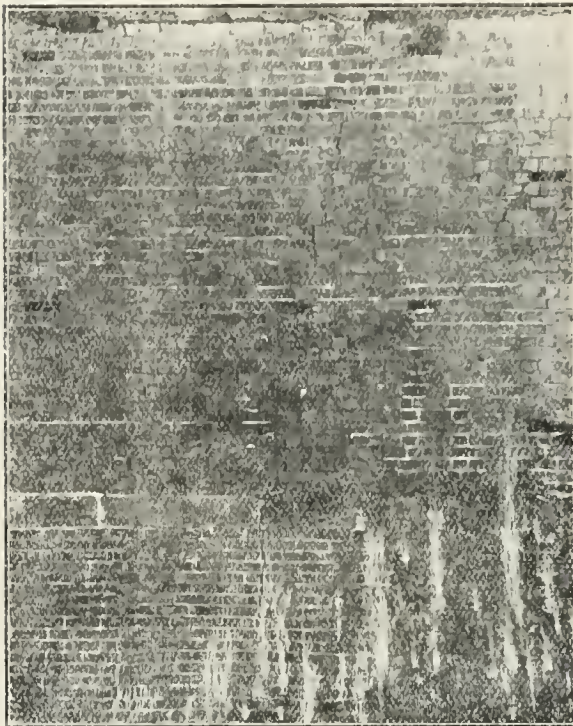


FIG. AA.

ditions within 10 miles of London, and from past experience there and elsewhere he came to the conclusion that, if his surmise as to the cause of the cracks was correct, the lining suggested by him, and which under ordinary conditions was in itself more than sufficient for the purpose, would in time also crack

acting upon the structure, and was causing the arch and abutments (which, with the lining, are more than three times the theoretical thickness required in such structures) to crack in this way. The new cracks were watched for many years, and as they did not increase or extend they have been repaired and grouted under pressure.

The only building near to the site is a chapel in the corporation cemetery, which is 153 yds. away. The tower of this building has gone over as much as 19 in. to the south, showing that the settlement and drawing of the subsoil was regular and was continued over a considerable area. The movement also is manifest in a bridge about 150 yds. from the culvert.

RETAINING WALL AT A BRIDGE APPROACH.

This is an example of first-class material and scamped workmanship. The wall is constructed of 6 to 1 Portland cement concrete, faced with brickwork built to a batter of 1 in 12.

It is about 120 yds. long, and retains a street approach to a bridge. It varies in height from 21 ft. to 10 ft. above the adjoining land.

Owing to the treacherous nature of the sub-stratum and charged with water—the wall was reinforced by three tiers of old tram rails overlapped 4 ft. at the ends, built in longitudinally with transverse rails 3 ft. apart under the lowest tier (Fig. BB).

Some months after the completion of the work, and during the period of maintenance, several irregular cracks appeared in the face of the wall. The contractor failed to cut into it for examination or to remedy the defects. The corporation therefore took the work out of his hands and executed the repairs.

Subsequently the contractor brought an action against the corporation to recover the full amount of retention money, but on the trial it was held that the corporation were entitled to deduct the amount that they had expended in repairing the wall, and they also recovered upwards of £400 in costs from the contractor.

The case is interesting, as the work was completed and certified prior to the appearance of the cracks or to the discovery of the improper workmanship. The cause of the failure was due to the want of packing around the steel reinforcement, which therefore formed an element of weakness, instead of strength



RETAINING WALL (FIG. BB).

in each place where the original fracture had appeared, but without affecting the stability of the structure. Time has proved the correctness of Sir Benjamin Baker's opinion, as at each of the old cracks a new crack appeared subsequently in the new lining, showing that an enormous force was

as was intended. A clerk of works was wholly engaged in the supervision of this work and of an adjoining bridge; both works were in progress at the same time by the same contractor. The foundations of the bridge were also on bad ground. The clerk of works appears to have given almost his whole atten-

tion to the latter, thus neglecting to supervise the work in the wall, and this the contractor's men evidently took advantage of.

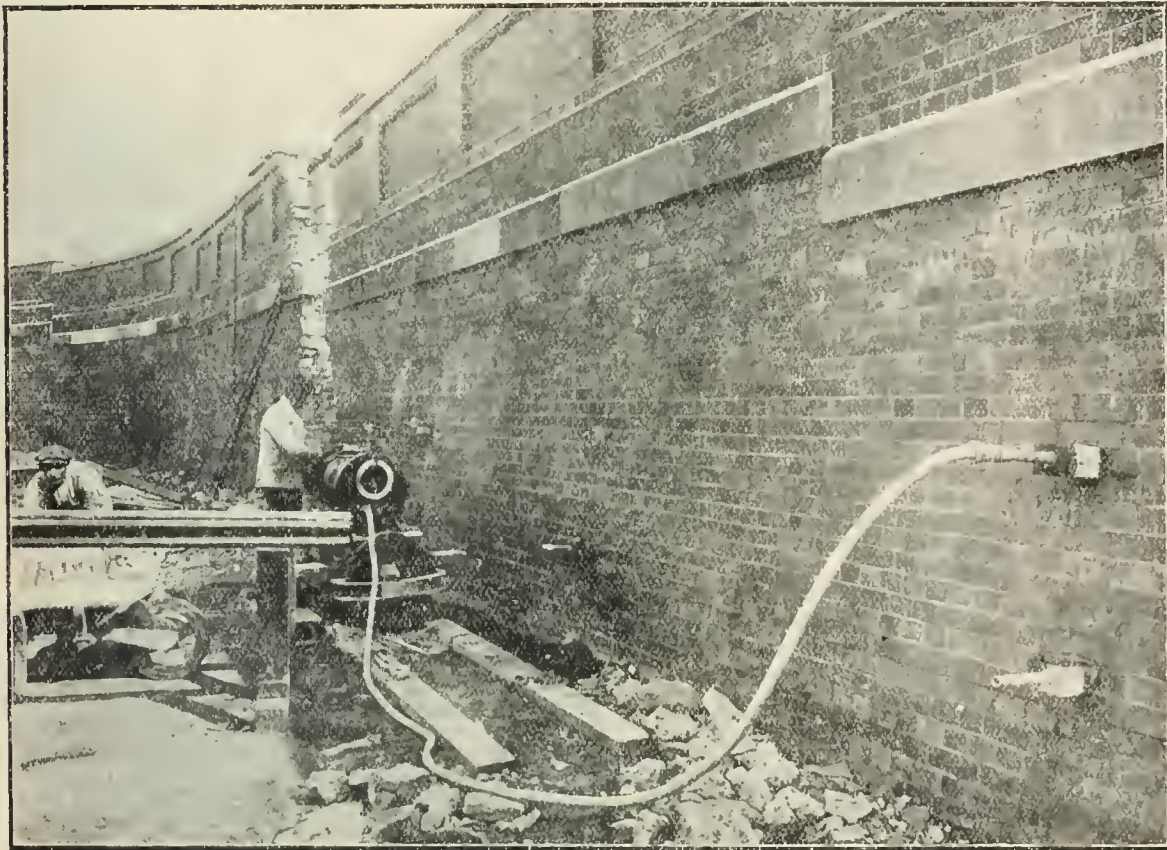
In restoring the work, the wall was cut through at each crack. It was then found that a 2-ft. rule could be passed easily along the web and lower flange of the rails in most places, owing to the concrete not being properly packed around the steelwork.

Seventy-eight 2-in. holes were drilled into the wall immediately under each tier of rails, and at distances of about 10 ft. apart. These holes extended from the face of the wall to the inner line of tram rails; 22 tons of cement in the form of grout were forced into the interstices in the wall, and the want of packing was thus, to a large extent, remedied (see Fig. CC).

The Effects of Certain Oils on Cement.—Table A (which will be exhibited at the meeting) and the following diagrams 1 and 2 show the results of 630 tests of nine kinds of oil, mixed with neat Portland cement in the proportion by weight of 10 per cent and 5 per cent respectively, compared with briquettes of similar cement mixed with water in the usual manner.

The tests were made with two specific objects—namely, to determine the value of a proposal for—
(a) A dustless concrete pavement, and
(b) A non-absorptive pavement.

The figures show that mineral oils in small quantities have the least injurious effect on cement, while vegetable oils, such as linseed and colza, are the most harmful. Briquettes gauged with boiled linseed oil



VIEW OF WALL AND GROUTING PLANT (FIG. CC).

The sections of the wall cut into were then carefully rebuilt.

It is probable that in course of time the cracks will reappear, but will not affect the stability of the structure.

MATERIALS.

The following is a synopsis of the specification which has been in use in Manchester for many years—viz.:

Portland Cement.—Cement is tested for tensile strength, fineness, soundness, specific gravity, time of setting.

Tensile Strength.—Minimum 420 lb. per square inch after seven days in water. No ramming allowed in filling moulds. Two types of machine are used (Bailey's and Adie's). The second is of the steelyard type, and the load is applied by a jockey weight.

Fineness.—On a 76 by 76 mesh sieve, the residue not to exceed 3 per cent.

Soundness.—Pats, 1/2 in. thick, submitted when first made to a temperature of 90 deg. to 100 deg. Fahr. After setting, placed in a hot bath, 110 deg. to 120 deg. Fahr., for forty-eight hours. Chatelier's expansion test is also used.

Specific Gravity.—Not less than 3.15 or 3.10 if cement has been ground for not less than four weeks.

Time of Setting.—A 300-gramme needle, with a point of 1 sq. mm., lowered into pat 4 c.m. thick by automatic regulator of the "dashpot" type. "Initial" set estimated to begin when needle fails to completely penetrate, and "ultimate" set when needle makes no impression.

The specification admits of the substitution of the "standard" specification should the contractor so desire. The testing-rooms are in the basement of the Manchester Town Hall, and may be viewed by members, and specimens may be examined.

break quite easily in the fingers, even three months after they are made. The results are what might have been expected, as, of course, all vegetable and animal oils react chemically with the constituents of the cement, and produce a secretion of soap.

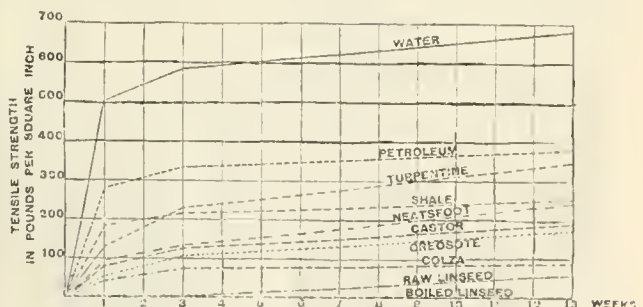


DIAGRAM 1 PORTLAND CEMENT BRIQUETTES MIXED WITH 10 PER CENT OF OIL.

Under favourable conditions the process of saponification is rapid. Under no circumstances, however, could a combination of such substances as vegetable or animal oil with Portland cement be of any practical value to the municipal engineer, but the results may be of some interest to him. The admixture of a small percentage of some mineral oils with Portland cement mortar or concrete may produce a mortar or concrete suitable for use under special conditions, but their durability and permeability have yet to be determined.

Concrete made with Furnace Cinders.—Experiments

with clinker concrete have extended over a considerable period, as the Manchester Corporation have a large and annually accumulating accumulation of this residual. The clinker is, however, too fine, and not sufficiently sharp for the purpose of a good aggregate

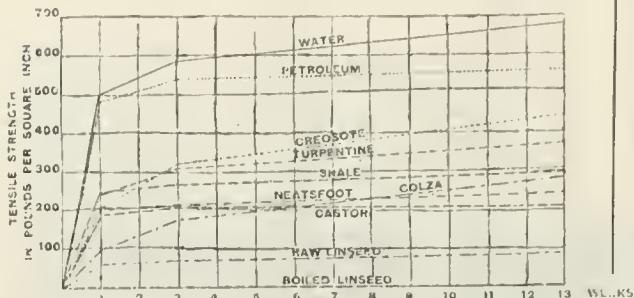


DIAGRAM 2. PORTLAND CEMENT BRIQUETTES MIXED WITH 5 PER CENT OF OIL.

for concrete, and its capacity to resist crushing is therefore proportionately lower than that made in the ordinary way with broken stone or brick. A specimen may be seen during the visit.

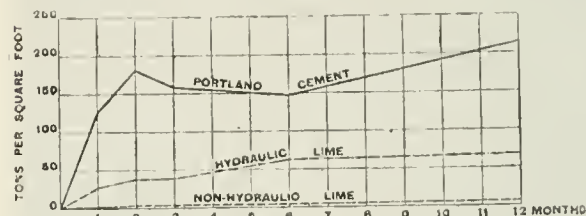


DIAGRAM 3. CRUSHING STRENGTH OF 5-IN. CUBES GAUGED 1 TO 1.

Cement and Lime Crushing Tests.—The following experiments to determine the comparative strengths of cement concrete and lime concrete were made for the information of a committee.

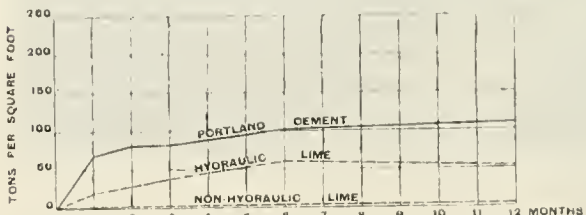


DIAGRAM 4. CRUSHING STRENGTH OF 5-IN. CUBES GAUGED 2 TO 1.

Table B, which will be shown by a slide, gives the crushing strength of 135 5-in. cubes composed of—

- (1) Portland cement,
- (2) Hydraulic lime,
- (3) Non-hydraulic lime,

gauged with standard sand in the proportions of 1 to 1, 2 to 1, and 3 to 1 respectively.

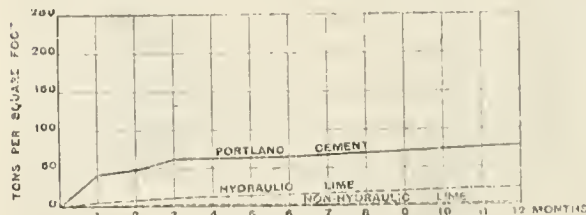


DIAGRAM 5. CRUSHING STRENGTH OF 5-IN. CUBES GAUGED 3 TO 1.

It was found necessary to spread and thoroughly to aerate the lime for at least seven days before admixture. After this treatment the cubes set well in water.

These tests indicate, approximately, the crushing resistance of each material. Had it been practicable to make a larger number of experiments better results might have been obtained.

BRICKS.

The usual tests are applied to bricks for use in main drainage work—namely, the crushing, absorption, and specific gravity tests.

The specification provides:—

(a) Engineering bricks when immersed in water for twenty-four hours shall not weigh more than 3 per cent in excess of their weight when taken from the kiln.

(b) Common bricks shall not absorb more than 10 per cent of their weight of water after being completely dried and then immersed for twenty-four hours.

(c) Blue bricks when immersed in water for twenty-four hours shall not weigh more than 3 per cent in excess of their weight when taken from the kiln.

SAND.

Every new parcel of sand is sampled and tested (both washed and unwashed) by admixture with Portland cement. In some cases the results do not justify the opinion that might be formed from the feel and appearance of the specimen.

The specification provides:—

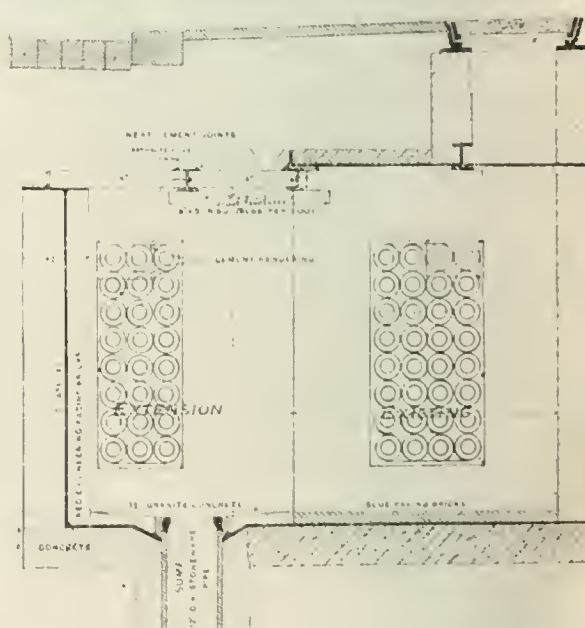
(a) Briquettes made with sand and cement in the proportion of 1 part of cement and 2 parts of sand, shall, after being exposed to the air for twenty-four hours in a humid atmosphere at a temperature of 60 deg. Fahr., and subsequently immersed in water for six days, bear a tensile strain of not less than 70 per centum of the tensile strain of briquettes made with standard sand and cement from the same bag or specimen, and mixed and tested in the same manner and under similar conditions.

(b) Specimen bags of sand for testing, filled and sealed on the works by the city surveyor's representative, containing 10 lb. weight of sand per bag, at the least, shall be delivered at the town hall by the contractor.

In many cases sands containing a small proportion of loam gave satisfactory results, while others, apparently good, clean samples, did not give such good results, showing that a small percentage of loam is not necessarily harmful.

UNDERGROUND TELEPHONES.

In order to obviate the danger and unsightly appearance of overhead telephone wires crossing the streets, the corporation entered into an agreement with the National Telephone Company which provided for pipes being placed in the public streets for the conveyance of cables. The company paid a rent to the city council for the wayleave and repaid the cost of laying the underground pipes.



TYPICAL MANHOLE (FIG. DD).

Fifteen contracts were let for this work at different times by the corporation.

The main thoroughfares were avoided as far as possible, in order to minimise inconvenience to the general public and disturbance of business. The pipes are of cast-iron, 3 in. in diameter, with socketed lead joints. The cables contain from 50 to 350 pairs of wires.

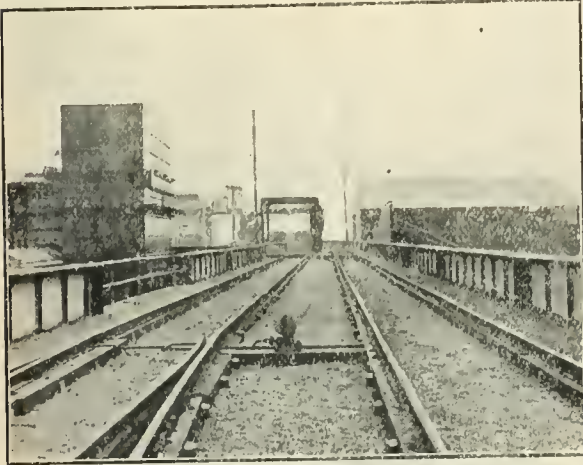
From the typical manhole (Fig. DD) it will be seen that in some cases a large number of pipes are laid in the same trench, and to these additions have been made, as shown.

Each nest of pipes is supported by bands of Portland cement concrete at intervals. The intermediate spaces are filled in with fine dry packing, and there has been no trouble from settlement, breakage of pipes from the heavy traffic, or otherwise.

The total length of pipes laid is about 141 miles, and the length of the route traversed about 76½ miles.

STUART-STREET ELECTRICITY WORKS.

Coal Railway.—The generating station at Stuart-street is situated on the north-easterly side of the

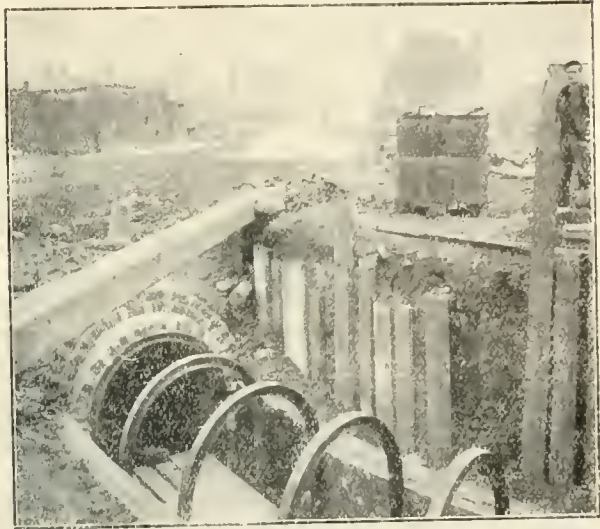


VIEW OF ELEVATED RAILWAY (FIG. EE).

city, and is bounded on one side by the Manchester and Ashton-under-Lyne Canal.

A railway designed by the author, 980 yds. in

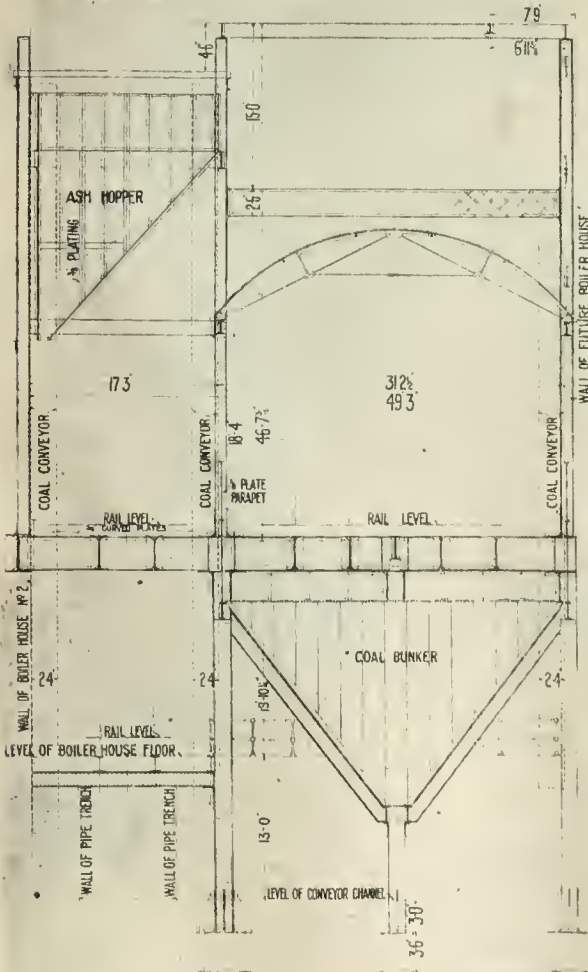
generating works, and consists of a brick viaduct, two high embankments, and a steel bridge and viaduct (Fig. EE). It is used for conveying coal and heavy machinery. The coal is tipped from the trucks on the high-level railway into hoppers, and thence it is carried by electrically-driven conveyers to the 5,000-ton bunkers over the boilers. The ashes are re-



STUART-STREET CABLE SUBWAY (FIG. GG).

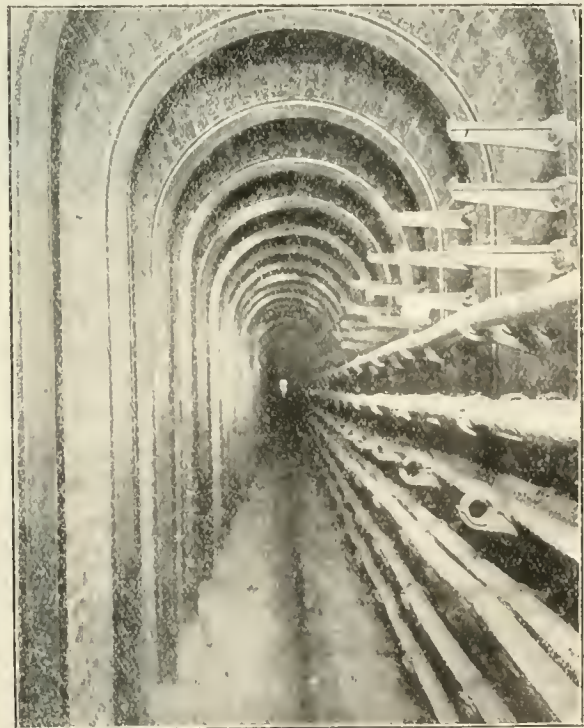
moved by the same conveyers and loaded into the empty coal trucks, or as an alternative the ashes can be removed by barges.

There are four hoppers, each having a capacity of 275 tons. The trucks are run over the hoppers. Either bottom or side-tipping wagons can be used. The slope of the sides of the hoppers is 1 in 14. The fuel falls to the bottom as it is drawn off by the conveyer, and the hoppers automatically clear themselves. Fig. FF is a view through one of the hoppers.



STUART-STREET GENERATING STATION: CROSS-SECTION OF ASH HOPPER AND COAL BUNKER (FIG. FF).

length, has been constructed across Clayton Valley. It connects the L. and Y. Ry. with the Stuart-street



QUEEN-STREET SUBWAY, SHOWING CABLES (FIG. HII).

The portion of the coal railway within the generating works consists of a steel viaduct 365 yds. long, of which 260 yds. is double track and the remainder triple-track. The rail level is 21 ft. above the floor of the station. The decking consists of Hobson's curved flooring, 2 ft. 6 in. wide by 1 ft. 3 in. deep and 3 in. thick. The coal bunkers are below and the ash hoppers above the rail level. The coal when discharged into the bunkers is weighed automatically.

By reversing the conveyers, ashes are brought back and discharged into the high-level hoppers which feed wagons on the railway.

The total capacity of the low-level coal hoppers is 1,050 tons, and of the ash hoppers 150 tons.

The space beneath the elevated railway is utilised for storage and other purposes.

Cable Subway.—The cable subway from Stuart-street is upwards of 800 yds. in length: it passes under the Manchester and Ashton Canal. The internal dimensions are 9 ft. 8 in. high by 4 ft. 4 in. wide. The subway is of brickwork in cement mortar, with an asphalt collar joint. The cables are carried on malleable-iron brackets fixed to 4-in. by 3-in. steel joists bent to the section of the subway, and resting on pad stones (Figs. GG, HH, and II). The brackets can be readily attached to or removed from the supporting joists. They carry the high and low tension cables. The side walls are vertical, covered by a semi-circular brick arch three rings thick, the extrados of which is about 3 ft. below the surface of the street; the foundation of the subway consists of 18 in. of cement concrete.



ANOTHER VIEW OF CABLE SUBWAY (FIG. II).

The street sewer is divided into two sections, one of which is placed on each side of the subway. It is composed of cast-iron pipes supported on concrete, with manholes built close to the sides of the subway. The depth of the existing sewer and its outlet did not admit of the new sewer being placed under the floor of the subway.

Sub-stations.—Fifteen sub-station buildings were designed by the author in connection with the extensions of the electricity undertaking.

The buildings are somewhat similar in character.

In most cases they are arranged for both lighting and traction purposes.

HOUSING.

The corporation of Manchester, under the provisions of sec. 41 of the Manchester Waterworks and Improvement Act, 1867, have for many years dealt with insanitary property. From 1885 to 1913 24,775 houses have been ordered to be closed as unfit for human habitation. Of this number 14,823 have been reopened after satisfactory alterations and repairs; proceedings were suspended in 2,175 cases, the owners having undertaken to carry out satisfactory alterations, and the remaining 7,777 houses were discontinued as dwellings or demolished to form yard space for adjoining houses or for other improvements.

Plans of typical examples of insanitary houses before and after alteration, and the approved schemes for their alteration will be exhibited. In each approved scheme there is a separate yard and water-closet and an internal water supply for each house. A large number of buildings have been

erected by the Manchester Corporation for housing the working classes, and several sites have been acquired for future extension of working-class dwellings.

GENERAL STATISTICS.

Area of city, 21,645 acres (census return). Of this 8,612 acres are unbuild upon, and 2,483 acres (parks, railways, &c.) cannot be built upon.

Number of houses within the city, 158,060, of which 151,254 are inhabited; 55 per cent of voids are working-class houses. Number of back-to-back houses, 259. Average number of new houses built per annum (last ten years), 2,070.

Number of new streets in last ten years, 1,079. Total length, 64½ miles. Number of houses not connected to sewers, 175. All houses have piped water supply.

Sanitary conveniences, 160,787 water-closets (cistern flushed), 788 privies, 4,671 pail closets, 50 cesspools, no earth-closets. Average conversion of privies 2,111 pail closets 9,420, in the last three years.

Ashpits 1,078 dry, 273 combined.

Refuse disposal, 310,200 tons collected per annum. Tips at Harpurhey and Clayton. Six destructors, total cost (land, &c.) £575,460. Nightsoil from privy ashpits, cesspools and half pail closets sent to Chat Moss and Carrington estates; remainder of refuse from pail closets made into concentrated manure and sold.

TOWN PLANNING.

The Town Planning Special Committee of the City Council have given much thought and consideration to this subject. The city has been divided for the purpose into three areas—the Northern, Central, and Southern. Cartoons can be seen in No. 3 committee-room in this town hall.

The Northern area includes about 2,695 acres within the city and about 557 in the adjoining district of Chadderton. Most of this area is hilly (see topographical plan), and the planning of roads with suitable gradients is therefore a matter of some difficulty.

The Central area includes the commercial centre of the city, and is covered with warehouses, shops, mills, works, congested areas and very old buildings occupied by the poorer classes; it therefore cannot be dealt with as a whole under the provisions of the Town Planning Act, but a costly process of street improvement, demolition of unhealthy areas and remodelling has been in progress for a long period. The city council have spent a sum (approaching £4,000,000) on works of this character.

The Southern area comprises about 5,157 acres. Preliminary plans and particulars have been prepared, and conferences have been held with the owners, lessees and occupiers.

Several main roads converging on the centre of the city are in contemplation. Manchester occupies a unique position with respect to street traffic. The city is surrounded by a large urban area. The following figures show how Manchester stands with relation to other large towns in this respect:—

STATEMENT OF POPULATION WITHIN 15 MILES RADIUS OF THE CENTRE OF THE FOLLOWING CITIES (CENSUS 1911).

City	Centre.	Population.
London	Charing Cross	7,251,169
Manchester	Royal Exchange	2,618,759
Birmingham	Municipal Buildings	1,800,764
Glasgow	Town Hall	1,685,934
Liverpool	St. George's Hall	1,476,502

STREET TRAFFIC AND WIDTHS OF STREETS.

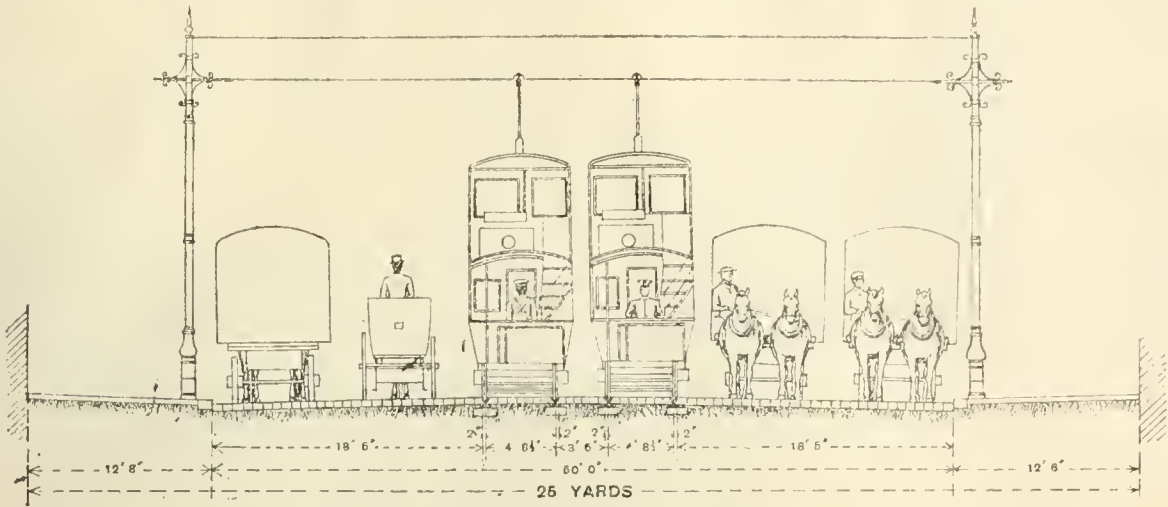
A census of the traffic entering the centre of the city—i.e., the area included within a radius of two-thirds of a mile from the Royal Exchange—was taken on April 4, 1911, and shows that a total of 1,072,667 persons and 99,747 vehicles entered and left that area of 1 square mile within the day of twenty-four hours. Of this total 351,183 persons entered and left by trams, 187,745 by railways, 70,503 by taxi-cabs and other vehicles, and 463,236 on foot.

There are no records to show that any statistics of the quantity and character of traffic in the streets were available when their widths were originally determined by the city council and their predecessors, nor can any estimate be found of its probable future growth. To this may be attributed in some measure the insufficiency of former street improvements, which has led to so large an expenditure in recent times.

Cross-street, which has been widened three times, is

perhaps one of the best examples of this kind. Since the street was first widened the property there has increased in value by upwards of 1,300 per cent. This enhanced value is, in a large measure, due to public

Measurements have been taken of a number of heavy vehicles in use in this city, and it is found that the width varies from about 6 ft. 6 in. to 7 ft. 6 in. This would make a maximum width of load, allowing



TRANSVERSE SECTION OF STREET (FIG. JJ).

improvements in that street and in the streets leading thereto.

The Advisory Board of Engineers in their report to the Royal Commission on London traffic state that

for the hubs, of about 8 ft. 9 in., but such widths are exceptional, and 8 ft. only has been allowed as the width for each line of ordinary traffic, including clearance space, and 15 ft. for a double line of traffic.



PLAN OF PLATT FIELDS PARK (FIG. KK).

“in second-class streets there should be space for two lines of standing vehicles and two lines of moving vehicles, and a double line of tramway.” Those, with footways 16 ft. wide, would give a total width of 80 ft.

Fig. JJ shows the minimum* statutory width
 * The Manchester General Improvement Act, 1851, sec. 6, provides that all streets shall be made with a footway on each side of not less than one-sixth the entire width of the street.

of footways in Manchester, with double lines of side traffic and two tramway tracks in the centre.

Street improvements should be designed to serve the probable requirements of the increasing traffic for a period at least equal to that allowed for the repayment of moneys borrowed for the purpose of purchasing the properties needed for the improvement.

PARKS AND RECREATION GROUNDS.

In the year 1894 the city council owned twenty-three parks and open spaces, with a total area of 222 acres. During the past twenty years eighteen parks and recreation grounds have been acquired, making a total of forty-one, with an area of 1,054 acres. Boating lakes have been constructed at the three principal parks—viz., Platt Fields, Heaton Park, and Boggart Hole Clough.

Platt Fields. In the autumn of 1903 the city council were urged to start public works in order to find employment and relieve the acute distress which then

is 6½ acres; the depth of water is 3 ft., diminishing to 15 in. at the sides. The 19,000 tons of water required to fill it were supplied from the town mains and by land drainage.

The best clay found on the site was used for puddle to form the watertight layer at the bottom and sides of the lake. The bottom of the lake was covered with old bricks laid flat and pressed into the puddle to protect it from damage and to enable the lake to be periodically cleansed and freed from deposit. Quite recently the lake was emptied for this purpose.

The lake is used for boating, which in the summer is a very popular form of recreation, indulged in by large numbers.

Boggart Hole Clough. Boggart Hole Clough lies on the north side of the city, and covers an area of about 90 acres. The construction of a boating lake in that park was decided upon by the city council with a view of finding work for the unemployed, as in the case of Platt Fields. The lake at Boggart Hole Clough



SITE OF LAKE: RELIEF WORKS (FIG. LL).

existed in the city. The Local Government Board sanctioned works of inverting a brook, the construction of public walks and bridges, land drainage, levelling and returfing, and the construction of a lake. These works found employment during the winter of 1903-9 for 720 men, who were engaged from the corporation employment registry, preference being given to married men and those with a large number of dependents. Most of the men were unused to this class of work and had to be closely supervised.

The distress works were closed in April, 1903, and Platt Fields were left in such a condition that they could not with safety be used by the public, and therefore on May 14th following the Parks Committee gave instructions for tenders to be obtained for completing the works by contract.

Platt Brook Improvement.—This work consists of 705 yds. run of paved invert, with new retaining walls on each side of the stream. The maximum gradient is 1 in 222.14, and the minimum gradient is 1 in 350. The invert is constructed with red engineering bricks laid on edge on a foundation of 6 to 1 concrete 12 in. in thickness. The section is segmental, 11 ft. 3 in. by 1 ft. 9 in., with vertical sides 2 ft. in height.

The area of Platt Fields lake, including the island,

covers an area of 5½ acres, and the method of construction was similar to that at Platt Fields.

Heaton Park.—Heaton Park, formerly the residence of the Earl of Wilton, was purchased by the Manchester Corporation in 1902, the area being about 691 acres, of which 39 acres are reserved for building purposes and 41 acres have been acquired by the Waterworks Committee for the construction of a reservoir, leaving 608 acres of park. It is used by large numbers of people during the summer months, and as there is no natural boating water in the north of Manchester the city council decided to construct an ornamental boating lake within Heaton Park, having a total area of 12½ acres, which includes three small islands. The net water area is 11½ acres, and the depth 3 ft. 6 in.

The lake was opened in March of last year; there are eighty-four boats, including a motor launch and a dinghy launch. Since the opening of the lake up to January 13th of this year, £1,886 has been received for the hire of the boats, &c., which were provided by the corporation at a cost of £1,465; the wisdom of the city council in providing such a form of recreation is thus clearly manifested.

The dinghy referred to is worked by a 1½-h.p. Evin-

rude detachable motor, and has been found a great attraction.

BRIDGES.

During the past twenty years forty-nine bridges have been built, renewed, strengthened or widened, the largest of which is Prince's Bridge over the river Irwell.

Princes Bridge and approaches were originally constructed in 1863 under the provisions of the Manchester Improvement Act, 1855, which enabled the corporation to make a new street from Manchester across the river Irwell into the adjoining borough of Salford.

In 1900 an examination of the old bridge was made, and the ironwork was found to be much corroded and the bridge of insufficient strength for the traffic then using it.

The present steel girder bridge, which was erected in 1905, has a clear span of 156 ft., and a nett width between the parapets of 54 ft.

It is composed of two Linville-truss girders, each 18 ft. deep and 167 ft. 3 in. long, with flanges 3 ft. 4 in. wide. Each of these main girders weighs about 140 tons, and rests upon the old stone abutments; the Manchester ends of the girders are fixed, and the Salford ends rest on roller bearings.

each capable of holding fifty cattle. Each pair of compartments is fitted with brick divisions and sliding doors for the purpose of isolating the cattle in lots of 100. An auction-room with seating capacity for 140 buyers is provided at the end of the lairs. The pens are near the slaughter-houses, and admit of the cattle being driven direct from any lair to any pen. Two pens are provided for each slaughter-house. A chilling-room is placed opposite the slaughter-houses and connected with them by a covered roadway. The room is capable of holding 500 "sides." Chill-rooms were erected on the east side of the cooling-room; each room is capable of chilling 174 "sides" at a time. The cooling-tank and fans are placed over the chill-rooms.

The engine and boiler houses are opposite the chill-rooms, and form a rectangular block of buildings 150 ft. by 62 ft. The engine-house contains engine, compressor, and circulating pump for the refrigerating machinery; two 50-horse power pumping engines for lifting the whole of the sewage of the wharf to a height of 17 ft. and discharging it into the corporation outfall sewer—which is situated at a distance of nearly a mile—and two 50-horse power engines and two dynamos for generating electricity for lighting the premises. These premises have been leased



VIEW OF PLATT FIELDS LAKE (FIG. MM).

Provision was made to allow of all exposed metal-work being accessible for painting.

The bridge is capable of carrying loads of 30 tons on four wheels, and 60 tons on eight wheels, and the total weight of the steelwork in the structure is about 560 tons.

The work was carried out by Manchester under the supervision of the author, a moiety of the cost being contributed by the borough of Salford.

Many of the corporation bridges span canals where the headroom is limited, and in such cases it has been found that the most convenient and cheapest type of construction consists of steel girders and jack arches with pipe bays under the footways.

There are 377 bridges of various kinds in the city under the supervision of the city surveyor.

Particulars of each bridge will be found in the Bridge Records, which are open for inspection.

FOREIGN ANIMALS' WHARF.

In 1896 the corporation provided lairages for the reception of foreign cattle at Manchester. Up to that time foreign cattle had been slaughtered at Birkenhead, and it was anticipated that with the provision of city lairages a cheaper supply of meat would be available and better facilities provided for distribution in the outlying districts.

A wharf was constructed on the side of the Manchester Ship Canal at Mode Wheel. There is a frontage of 265 yds., with a landing stage and three jetties, where most approved arrangements for landing cattle have been provided. Buildings to accommodate 1,000 head of cattle were at that time erected, and space left for future extensions. Lairages of substantial buildings of brick were constructed close to the canal, these being divided into compartments,

to the Ship Canal Company, and have been considerably extended to meet the increasing traffic.

COLD STORAGE.

At the Manchester Meat Market, Elm-street, cold storage has been provided. The works were nearly completed when the author commenced his duties here in 1894. Subsequently, cold storage was provided under the Smithfield Markets, existing vaults being utilised for the purpose.

The system adopted in both places is the ammonia compression system of the Linde British Refrigerator Company.

Should any members be sufficiently interested in this subject, arrangements might be made for them to visit the Smithfield Market early on Saturday morning.

ARCHITECTURAL WORK.

The architectural work was carried out by the city surveyor for many years. In consequence of the large increase in the business of his office, he was relieved of that portion of his work in 1902, when the present city architect, Mr. Henry Price, was appointed.

REMOVAL OF HUMAN REMAINS.

An unpleasant part of the business which comes under the supervision of the city surveyor is the exhumation and removal of human remains from disused burial grounds in the centre of the city and their reinterment in one of the city cemeteries.

In one case upwards of 6,200 bodies were removed, the average cost per body, including reinterment, amounted to 4s. 5d.

Many of the sites of the old burial grounds were quite unsuited for the purpose of interment, the substrata being of clay or other retentive soil.

The conditions found were such as cannot be

publicly described. They point to the advantages of cremation as a mode of disposing of the dead in the future. Detail drawings of the Manchester crematorium, especially the construction of the furnaces, which have been obtained through the courtesy of the secretary of that institution, Mr. A. E. Piggott, will be on view during the meeting.

CORPORATION ESTATES.

The corporation properties (exclusive of the Waterworks Committee's properties) amount to an aggregate value of upwards of 12½ millions sterling, and extend to a total area of about 6,800 acres, an area approaching one-third of the whole area of the city, which is 21,645 acres.

He hopes that a useful discussion may follow, as the exchange of views by those engaged in like pursuits makes for progress.

The author has pleasure in recording the fact that he is assisted by a loyal, able and hard-working staff. The moral to be drawn from the experiences referred to in these notes is that good work and value for the money expended can only be assured by obtaining and retaining the services of a capable and thoroughly reliable staff. It would be invidious to here refer to any members of his staff individually, when all have proved themselves so willing. He cannot, however, omit to mention the special assistance he has received



VIEW OF PRINCES BRIDGE (FIG. NN).

These properties lie largely outside the city, although the most valuable portions are in Manchester.

The Estate Books, which will be open for the inspection of visitors, show the history of each property from the date of its purchase, and all easements and other matters affecting it. The system of estate record was designed by the author; it has proved most useful.

ORDNANCE SURVEY.

The ordnance department having decided not to reproduce any further plans on the 1/500 scale, the city council obtained permission from the Board of Agriculture and Fisheries to resurvey and publish the maps, and also to sell copies at a fixed charge; 142 sheets have already been resurveyed and published, and it is interesting to note that a Government department are purchasers of copies.

In conclusion, the author feels that an apology is due to members of the institution for these disjointed notes, and for the delay in issuing them, which, however, was unavoidable. They have been dictated at intervals snatched from strenuous work, and he regrets that he has not had sufficient time to properly revise them. Many small matters have been referred to in detail, while larger and more important works have been omitted, his object being to select those which contained matter most likely to be of general interest.

from his secretary, Mr. A. E. Bradburn, and others who devoted several evenings to transcribing, reading and checking these pages.

Road Board Grants to Ireland.—In the House of Commons on Monday the Secretary to the Treasury stated that since May last the Road Board had definitely indicated to county councils in Ireland grants amounting in the aggregate to £114,862.

The Civic Engineer's Who's Who, compiled by the editor of THE SURVEYOR AND MUNICIPAL AND COUNTY ENGINEER, for a second annual issue is remarkably complete. The biographical matter is full and methodically arranged. The book is published by the St. Bride's Press, Limited.—*Liverpool Courier*.

Main Roads Expenditure.—The President of the Local Government Board, replying to a question in the House of Commons on Thursday of last week, stated that the expenditure of county councils in England and Wales on the maintenance, repair, improvement, and enlargement of main roads (exclusive of expenditure out of loans) had risen, year by year, from £2,487,000 in 1904-5, to £3,356,000 in 1911-12. Complete figures could not yet be given for the year 1912-13.

The Main Sewerage and Sewage Disposal Works, and other Recent Municipal Works, Southend-on-Sea.*

BY E. J. ELFORD, M.INST.C.E., M.I.MECH.E.,
BOROUGH ENGINEER.

In preparing this paper the author has endeavoured, as far as possible, to eliminate matters of local interest only, and to give prominence to those likely to be of some interest to members of the institution.

It is desirable, however, in the first instance, to give some local statistics which have had an important bearing upon the schemes referred to hereafter. As will be seen from the following table, the exceptionally rapid growth of the population has been one of the

retention of the sewage in the tanks during the flood tide, and its discharge during the first four hours of the ebb tide only, no provision being made for screening or other treatment. Each tank was provided with two overflow weirs, so arranged as to cause the first overflow of storm water to discharge into the main outfall, and any excess into storm-water outfalls across the foreshore. The population at this time was 23,000, and the system was designed to deal with the sewage from a population of 40,000, which it was estimated would be reached in about thirty years.

It was soon found, however, that this estimate was quite unreliable; but, as will be seen by reference to the table, the subsequent growth of the population was very much greater than the engineers could have reasonably anticipated; in fact, the provision they made was considered by many to be excessive. Within six years the population had reached the maximum number for which the scheme was intended, and just about this time the corporation were served with a writ, at the instance of the owner of certain oyster layings some 3½ miles up the river, under which damages were claimed for alleged pollution by sewage from the corporation outfall. The litigation which followed resulted in a verdict for plaintiff, who was



MARINE PARADE, SOUTHEND-ON-SEA.

most important factors in some of the problems which have had to be faced by the corporation:—

Year.	Population.	Increase per cent.	Rateable value.
1881	7,979	—	—
1891	12,333	54.56	£68,000
1901	28,793	133.46	£196,000
1911	62,723	117.84	£431,746
1914 (est.)	84,000*	—	£548,587

* Including population of added area of Leigh-on-Sea, 10,000.

Year.	Occupied houses.	Unoccupied	
		Number.	Per cent.
1901	5,596	417	7.45
1911	12,488	229	1.83
1914 (est.)	16,181	273	1.68

MAIN SEWERAGE AND SEWAGE DISPOSAL WORKS.

Before describing the new works it is desirable to state briefly the circumstances which necessitated their construction.

The first comprehensive and effective drainage system was designed by the late Mr. James Mansergh, M.INST.C.E., and was inaugurated in 1898. The scheme comprised main sewers, two small pumping stations and two storage tanks in the eastern and western parts of the town respectively, which were connected to a common outfall, discharging into the estuary at a point about 600 yds. east of the pier and a short distance below low-water mark. The eastern storage tanks had a capacity of 540,000 gallons, and the western tank 225,000 gallons. The scheme provided for the



SOUTHEND'S NEW OPEN-AIR SWIMMING BATH.
(Water area 300 ft. by 70 ft.)

awarded £1,500 damages, and an injunction restraining the corporation from discharging sewage from this outfall. In the Court of Appeal the injunction was dissolved, but the corporation had to pay the damages and costs, which amounted, in the aggregate, to about £8,000.

It was, of course, impossible to provide other means for dealing with the sewage without considerable delay, and as the plaintiff at once threatened another action for further pollution, the corporation had no alternative but to endeavour to come to an agreement with him. Ultimately they were able to do this, on undertaking to pay him the sum of £500 per annum until they were able to complete new works.

This paper is not the place in which to discuss the merits of the case, but the author might, perhaps,

* Paper read at the Meeting of the Institution of Municipal and County Engineers at Southend-on-Sea, on Saturday last.

be allowed to say that, having, probably, as full a knowledge of the facts as anyone, he still holds the opinion, which has been confirmed by subsequent experience, and which was shared by many others, that it was impossible for the oyster beds in question to have been affected by Southend sewage.

There is no doubt the corporation was prejudiced by the fact that the existing sewerage system had reached the limit of its capacity, and by evidence for the plaintiff that discharge from the outfall was not discontinued at the proper times—viz., one hour before low water. This evidence undoubtedly carried much weight with the Court, and appeared to be honestly given, although the corporation records, which were made with the greatest care and under close supervision, showed that the outlet valves from the tanks

boundary of the borough, and apparatus for screening the sewage before discharge, and for preventing the discharge of "tailings" at improper times, would meet all reasonable requirements. For dealing with the "tailings" he proposed to provide upon the foreshore, in connection with and near the head of each outfall, a tank to be filled with sea water, so that by closing the outlet valves of the sewage tanks half an hour earlier, and discharging through the outfall a large quantity of sea water, it might be cleared of the sewage "tailings."

The complete scheme was to be capable of serving a residential population of 60,000, with allowance for visitors, and the estimated cost was £115,000. The corporation adopted the scheme, which was embodied in a Bill promoted in Parliament in the Session 1907.



MAP SHOWING POSITIONS OF SEWAGE DISPOSAL WORKS, MAIN SEWERS, PUMPING STATIONS AND OUTFALLS, SOUTHEND-ON-SEA.

(Plate No. 1)

had been opened and closed well within the stipulated times. The explanation was ultimately found to lie in the fact that, under certain tidal conditions, the sewage remaining in the outfall after the valves were closed continued to discharge during the last hour of the ebb tide, at an apparently rapid rate, owing to the quick drop of the sea from the level of the top to the level of the invert of the long length of flat pipe across the foreshore.

The extension of the sewerage system had now become very urgent, and the corporation instructed the late Mr. R. Strachan, M.INST.C.E., who had been a partner with Mr. Mansergh when the existing system was carried out, to report fully upon the subject. He reported that, in his opinion, an extension upon the lines of the present system, by providing a third storage tank with a separate outfall near the eastern

The corporation's proposals met with strenuous opposition before the House of Lord's Committee from the Kent and Essex Sea Fisheries Committee, the Essex County Council, and other bodies, and the Bill was rejected on the grounds that the scheme did not include any means for the effective purification of the sewage before discharge.

Following this, the author received instructions to prepare a report upon the subject. This report was presented to the corporation in July, 1907. After reviewing the whole of the circumstances, he summarised his conclusions in the following words:—

"My own view, after hearing the subject discussed in the Law Courts before the Parliamentary Committee and elsewhere, is that the discharge of Southend's crude sewage during the first four hours of the ebb tide into the enormous volume of water contained in

the Thames Estuary constitutes one of the most effective and least objectionable methods of disposal, and is certainly the most economical. The water of the estuary, teeming with life of various kinds, and satu-

ing power of sea water is that furnished in connection with the disposal of London sewage.

"During the year 1904 the average daily flow of sewage contributed by a population of nearly 6,000,000

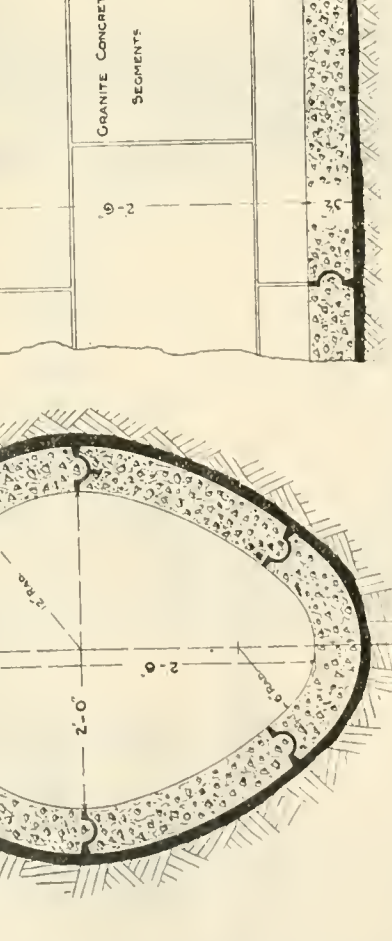
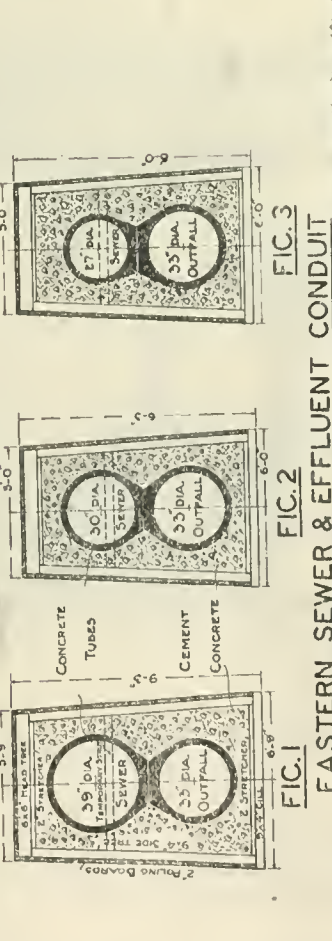
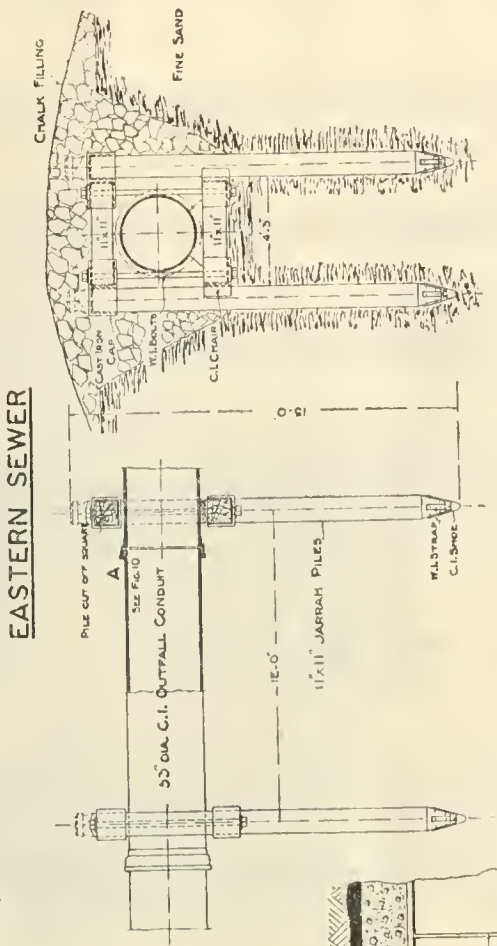
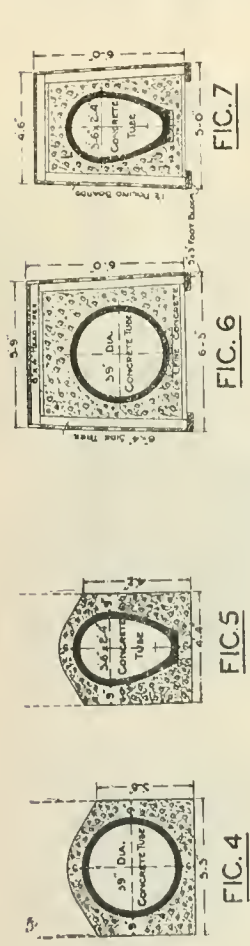


FIG. 8. WESTERN SEWER

FIG. 9. PILING TO OUTFALL CONDUIT

FIG. 10. TURNED & BORED JOINT AT A

SOUTHEND-ON-SEA MAIN SEWERAGE WORKS: SEWER AND OUTFALL CROSS-SECTIONS AND DETAILS. (Plate No. 2.)

rated with oxygen, quickly changes the form of the waste organic matter discharged by the sewers, and reduces it to harmless and inoffensive compounds.

"Perhaps the most striking evidence of the purify- was 232,000,000 gallons. It is true that the sewage is, before discharge, subjected to a meagre system of treatment by chemical precipitation, but this results only in about one-sixth of the total suspended and

dissolved matters being removed, leaving the effluent almost as foul as the crude sewage. The effluent is at times equal in dry weather to about one-sixth part of the total volume of the river at the point of discharge, and contains 100,000 B. coli per cubic centi-

all evidence of its presence has practically disappeared."

One of the conclusions of the Royal Commission, given in their fourth report, is expressed in the following words—viz., "That the waters of a tidal river

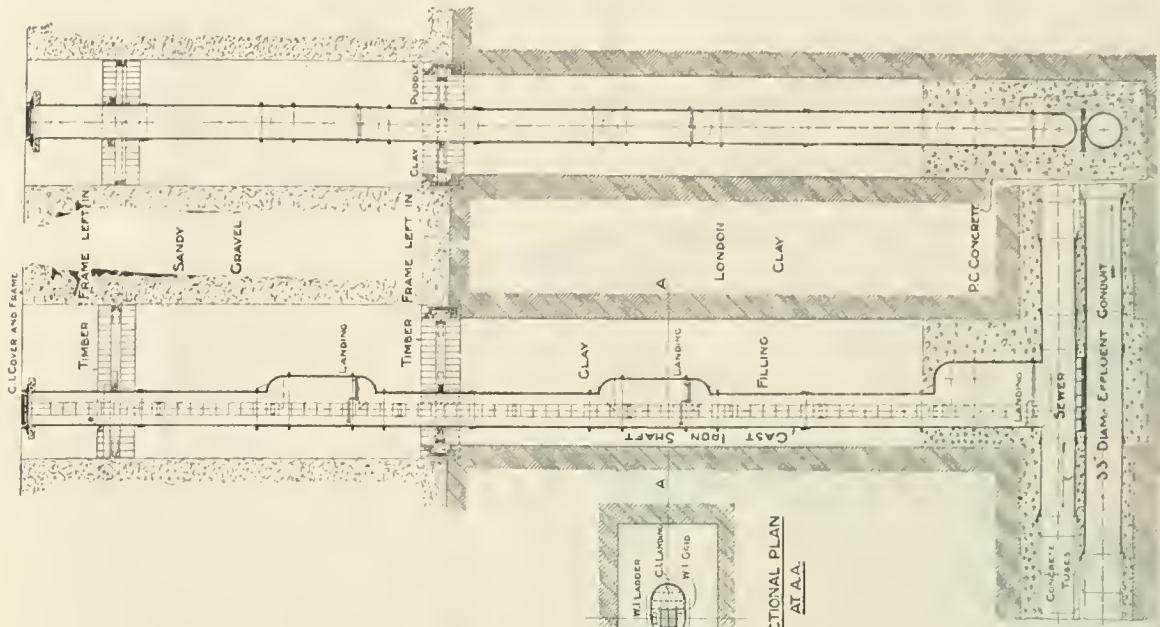


FIG. 3

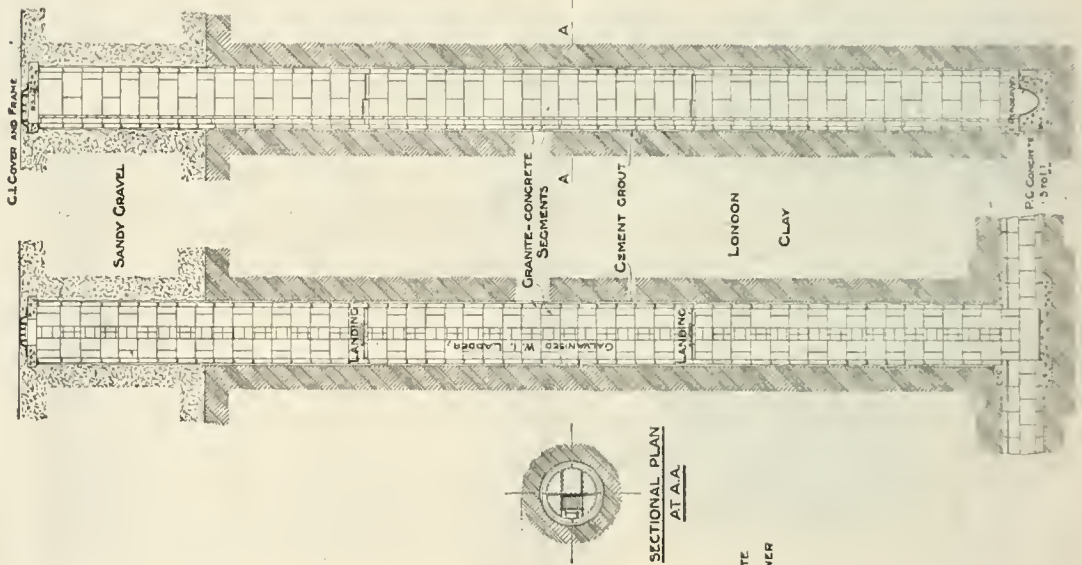


FIG. 2

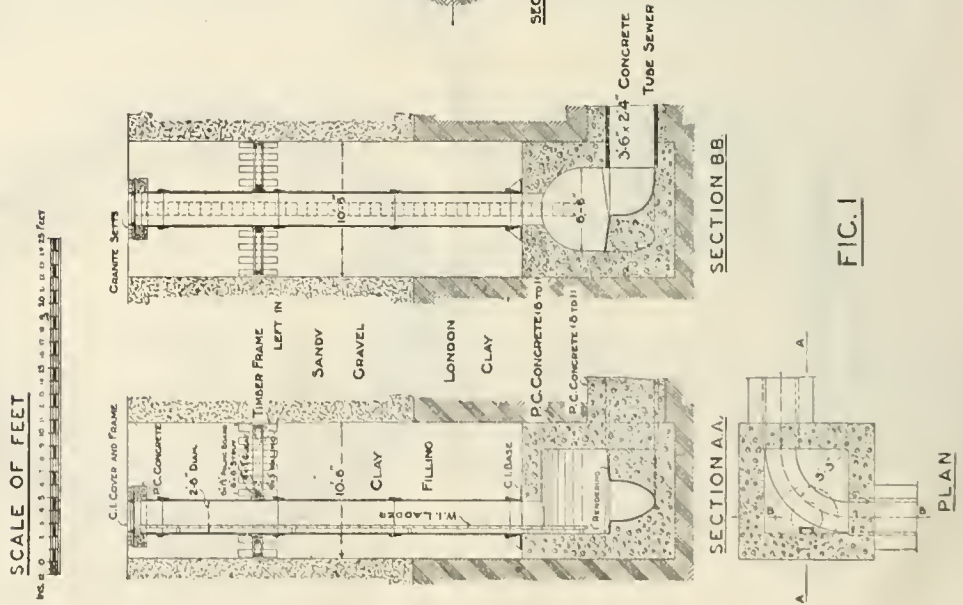


FIG. 1

SOUTHEND-ON-SEA MAIN SEWERAGE WORKS: SECTIONS OF TYPICAL MANHOLES. (Plate No. 3.)

metre; but, notwithstanding the vast volume of this pollution, discharged day by day and year by year, the purifying power of Nature is so effective that by the time it has travelled some 25 miles down the river

grossly polluted in its lower estuarial reaches may, after a flow of some 25 miles, become so far purified by sedimentation, dilution, and the operation, presumably, of bactericidal agencies, as to become seem-

ingly as little objectionable, or, in some respects, less objectionable, bacteriologically, than certain of our water supplies."

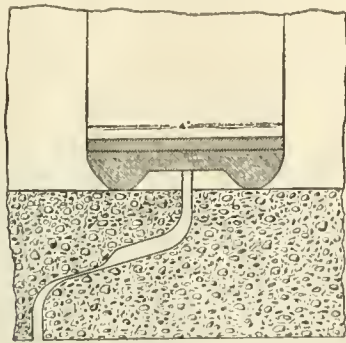
"When referring to the disposal of sewage sludge in the Barrow Deep, amounting to some 50,000 tons per week, or 2,600,000 tons per year, the commissioners say: 'The ultimate fate of this vast horde of microbes

sewage into such waters does not, according to present knowledge, cause any harm, and to require purification in all cases would lead to the waste of large sums of money.'

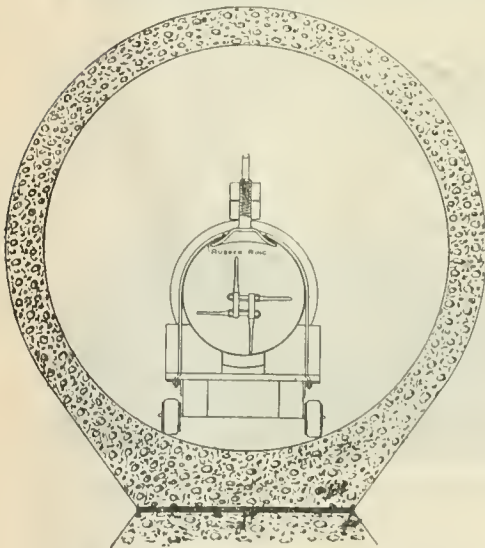
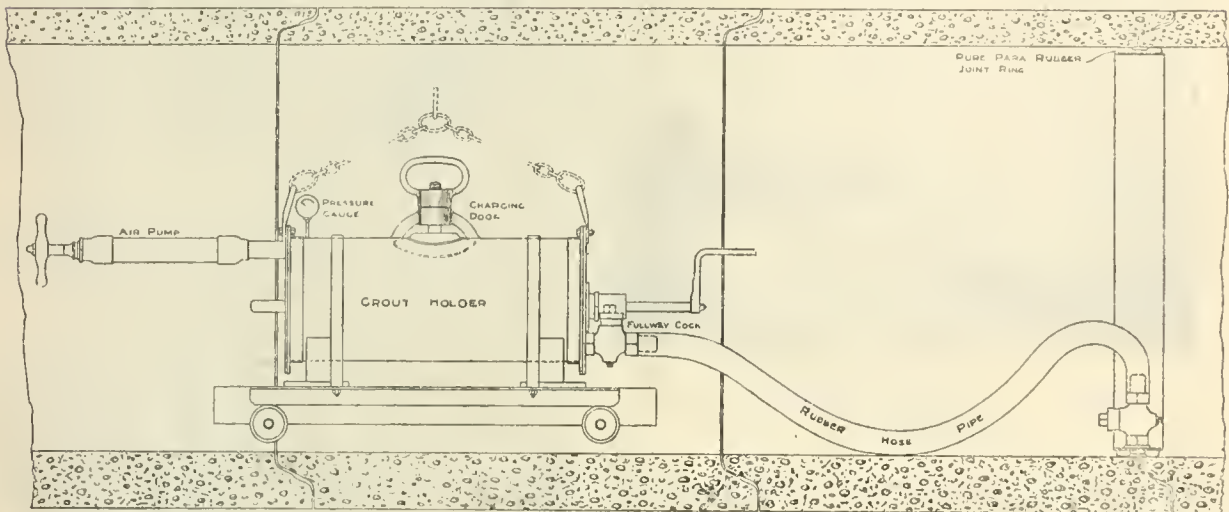
"'And even where shellfish have to be considered such an alteration of the law would not always meet the necessities of the case.'

"'After considering the whole of the evidence, together with the results of our own investigations and local inquiries, we are strongly of opinion that the only way in which this evil can be effectively dealt with is by placing tidal waters under the jurisdiction of some competent authority, and conferring on that authority power to prevent the taking of shellfish for human consumption from any position in which they are liable to risk of dangerous contamination, and to enforce restrictions as regards pollution, and as regards waters, foreshores, pits, ponds, beds and layings in which shellfish are fattened or stored, as and when required.'

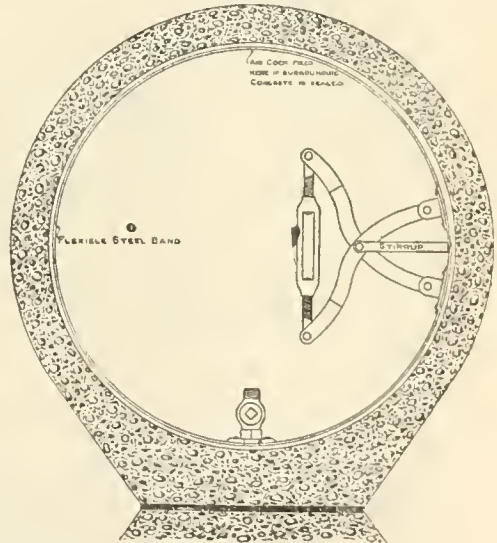
"'In view, however, of the judgment of the Courts in *Hobart v. Southend-on-Sea Corporation*, of the opposition to the corporation's sewage Bill and its subsequent fate in the House of Lords, and having regard to the provisions of the by-laws of the Kent and Essex Sea Fisheries Committee, I feel that I have no alter-



SECTION OF RUBBER RING AND STEEL BAND BEFORE COMPRESSION



Typical Cross-section of Heading.



SOUTHEND-ON-SEA MAIN SEWERAGE WORKS: TUBE JOINTING APPARATUS.

(Plate No. 4.)

is a matter for conjecture, but the actual result is, beyond question, most satisfactory.'

"The Royal Commission deal directly with the subject of 'The Pollution of Tidal Waters,' with special reference to 'Contamination of Shellfish,' in their fourth report, dated December, 1903. The following extract from this report indicates the views of the commissioners on the subject:—

"'It has been suggested that the evils would be removed if the law were altered so as to require that all sewage should be purified before its discharge into the tidal waters. We do not consider that any such sweeping alteration of the law would be justified. There are, undoubtedly, many cases where shellfish are not concerned, in which the discharge of crude

native but to advise the corporation to adopt some means to purify the sewage before discharging it into the estuary.

"The proposals I am about to lay before you will therefore include the construction of treatment works. Those of us, however, who hold the views to which I have given expression may, perhaps, find some consolation in the hope that the expenditure, which, in our judgment, appears to be unnecessary, may find some justification in an enhanced reputation of the borough as a health resort, and that this, by increasing the town's prosperity, may have the effect of relieving the present ratepayers of much of their additional burden."

He then dealt with a number of alternative pro-

posals, and outlined the scheme which, with slight modifications, has now been carried out.

After prolonged consideration, and after obtaining a favourable report upon the proposals from Mr. J. D. Watson, M.INST.C.E., the corporation decided to apply to the Local Government Board for sanction to the raising of a loan to cover the cost of the scheme, and the author was instructed to prepare the drawings, estimates, &c., to accompany the application.

After holding a local inquiry, the board suggested to the corporation that they should obtain special statutory authority for the execution and subsequent operation of the works, so that they might avoid any risk of further litigation. The corporation adopted this suggestion, and a Bill was promoted in the Session 1908-9. The proceedings before the Parliamentary Committees were strikingly different from those on the previous occasion. Those who had then attended to curse the corporation proposals were now there to bless, and the Bill received sanction of Parliament without amendment. The effect of the Act is to give the corporation full security so long as they comply



TEMPORARY SUSPENSION BRIDGE ERECTED IN TWO DAYS AFTER A HULK HAD DRIFTED THROUGH SOUTHEND PIER.

with its provisions. The Act fixes a definite standard of purity for the effluent, the requirements of which are briefly as follows:—

Solid Matter.—Each gallon shall not contain more than 4 grains of solid matter in suspension.

Odour.—The effluent shall have no offensive odour, and when kept for three days at a temperature of 98 deg. Fahr., in a full stoppered bottle, shall not develop a putrefactive odour.

Impurity Figure.—To ascertain the impurity figure the albuminoid ammonia in grains yielded by 1 gallon of the effluent shall be multiplied by fifty, and the amount of oxygen in grains absorbed from permanganate of potash in three hours by 1 gallon of the effluent shall be multiplied by five, and the sum of the two figures so obtained shall be the "impurity figure." This shall not exceed 16.

The Act also prescribed the method of taking samples and of examination.

Such a provision in a local Act appears to be without precedent, and, in the author's opinion, the standard was more stringent than is necessary, having regard to the conditions under which the effluent is discharged. This view has been confirmed by the recommendations as to standards contained in the Eighth Report of the Royal Commission on Sewage Disposal, published in 1912. Notwithstanding this, however, it must be of advantage to the corporation to know exactly what they have to do, instead of being left to the tender mercies of some authority, which might change its requirements from time to time.

General Description.—In preparing the new scheme the author had in mind the following main considerations:—

(a) The production of an effluent of such a character, and its discharge in such a position, as to prevent any risk of suggested pollution.

(b) The securing of a suitable site of ample area and at a low price for the construction of the necessary purification works, in such a position as to be as unobjectionable as possible to any residential property, and at the same time as near to the outfall as practicable.

(c) The utilisation, as far as possible, of the works comprising the existing system.

(d) Provision for storm-water settlement and discharge.

(e) A scheme which would involve the pumping of the sewage at one central pumping station only, preferably at the site of the treatment works, and the avoidance of twice pumping, except in respect of the small existing pumping areas.

(f) The utilisation, if practicable, of steam from the proposed refuse destructor for sewage pumping.

The scheme provided for the purchase of a site of about 40 acres at the rear (north) of the town (Plate No. 1), and for the construction of two main sewers to intercept the bulk of the sewage immediately before it entered the eastern and western storage tanks respectively, and convey it to the pumping station and works to be constructed on the site, pumping plant sufficient to deal with at least three times the dry-weather flow, sedimentation tanks to retain as large a proportion as practicable of the suspended matter, roughing filters, bacteria beds, humus tanks, facilities for sludge disposal, and a main outfall conduit to discharge the effluent at a point in the Thames Estuary far removed from the land and shell fisheries.

In addition the scheme provided for the allocation of a portion of the site for the construction of a refuse destructor adjoining the proposed pumping station.

Arrangements were made for the utilisation of the existing tanks as settlement tanks for storm-water overflow, to be discharged through the existing outfalls, and for the useful retention of all the existing works, except a short length of outfall sewer.

The sewers and outfall were designed for a maximum residential population of 150,000, with allowance for visitors, and the treatment works for a population of 100,000.

The estimated cost of the scheme was £160,000.

Following this brief general description the author proposes to deal with each part of the scheme in greater detail, and particularly to refer to any points which may be of some special interest to the members of the institution.

Site of Disposal Works (Plate No. 1).—The selection of a site for sewage treatment works is generally a subject of some difficulty, especially in connection with a seaside town or health resort. The only land in any way suitable, and near the sea, into which, under any circumstances, the effluent must discharge was a low-lying area situated in the east of the town. At that time very little had been done in regard to the development of this area, and the site was strongly



SOUTHEND DESTRUCTOR AND SEWAGE PUMPING STATION.

advocated by some on account of its proximity to the point of discharge of the effluent. The author, however, felt that the selection of such a position for works of this character would be detrimental to the best interests of the town, and after careful examination of every possible area he recommended the acquisition of the site already mentioned. This is near the northern boundary of the borough, and is bounded on the west by a railway, on the north by agricultural land, on the east by a cemetery, and on the south by agricultural land.

Before presenting his report he secured an option upon 20 acres, at the price of £200 per acre. After the adoption of the scheme the corporation acquired an additional area of about 19 acres.

The ground has a fairly regular slope from south to north, the subsoil being of sand and gravel, varying in thickness from 40 ft. to 20 ft., and overlying the London clay. The surface level at the highest

point (south-east) is 75 ft., and at the lowest point (north-west) 47 ft. above ordnance datum.

On obtaining possession of the land, the author had trial holes sunk in various positions, from which it was found that a valuable bed of sand and gravel covered the southern part of the land, but that there was a considerable quantity of water in the sand immediately overlying the clay, particularly in the north-west corner, where it was proposed to construct the pumping station.

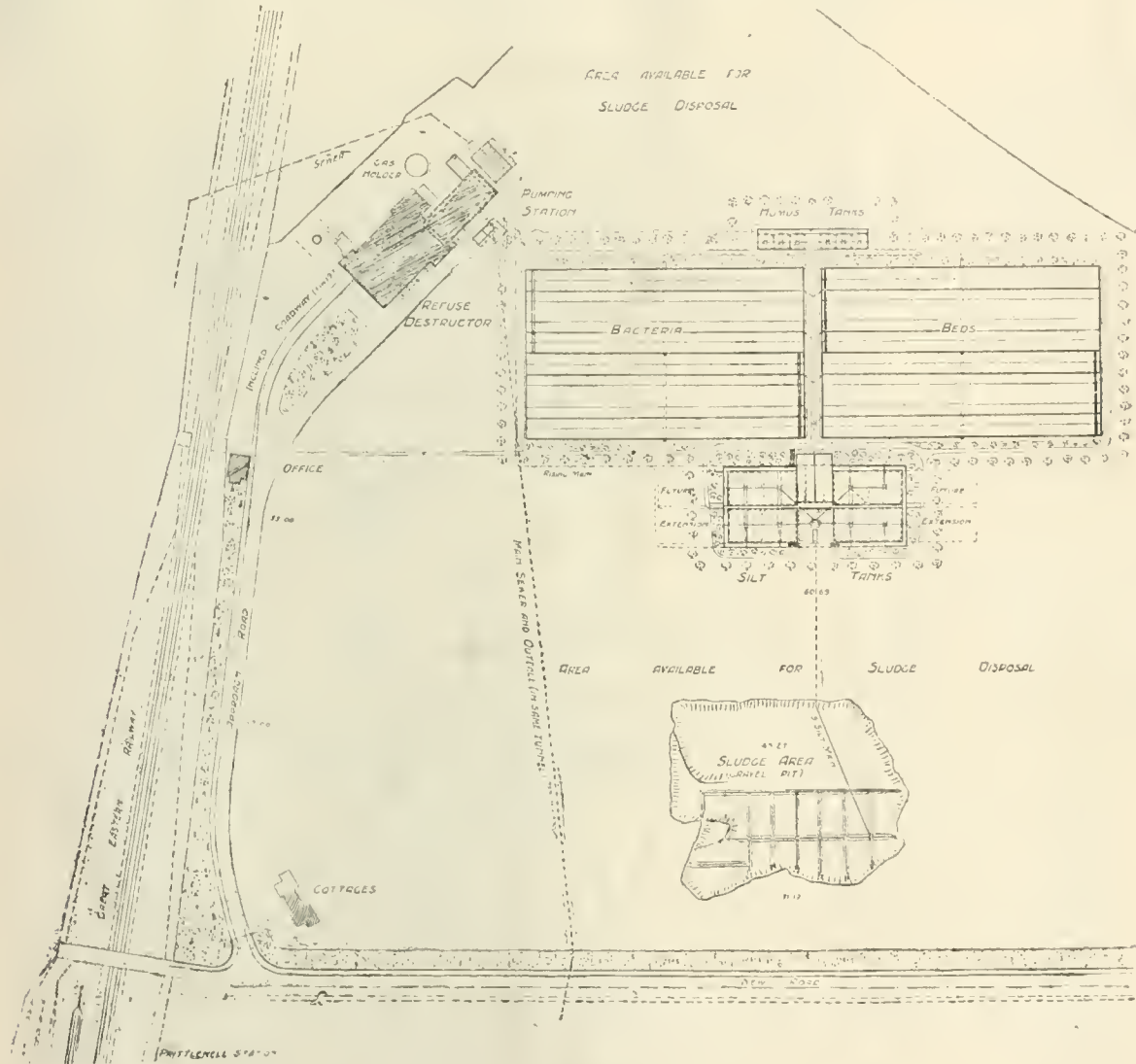
During the progress of the works about 50,000 cub. yds. of sand and gravel have been excavated, of which about 22,800 yds. have been used for concrete in the sewer tunnels, pump well walls, sedimentation and humus tanks, bacteria bed floors and walls and other parts of the works, resulting in a saving of over £2,500.

On the other hand, a considerable sum has been expended in pumping water from the excavations,

the surface by a steam winch and run by gravitation to a platform above the washers. After being tipped the trucks were hauled back by the steam winch. The cost of the washed gravel was 3s. 3d. per cub. yd., divided as follows: Excavating and loading into trucks, 1s.; winding up full trucks and returning empty trucks, 9d.; washing, 1s.; and 6d. royalty debited to the works.

A well was constructed of concrete tubes outside the wall of the pump well, and it is now proposed to pump and convey the water to the corporation electricity works for use in the boilers, and thereby effect a saving of over £400 per annum, a sum which is more than sufficient to cover the annual loan charges in respect of the land forming the site of the works, after allowing for the value of the sand and gravel already obtained from the site.

Sewers and Outfall Conduit.—The two intercepting sewers are laid in tunnels in London clay at depths



SOUTHEND-ON-SEA SEWAGE DISPOSAL WORKS: GENERAL PLAN.

(Plate No. 5.)

the pumping, during the construction of the pump well, first by the contractor, and afterwards by the corporation, having been carried on continuously for over two years. Part of the cost of the pumping was recovered by using the water for washing gravel and sand for the reinforced concrete, cement rendering, &c., and generally for the construction of the works, in lieu of water costing 1s. 6d. per 1,000 gallons. The gravel washers used were of simple design, and constructed on the works. They were rectangular in form, 14 ft. by 6 ft. by 5 ft. deep, and made of timber, with a perforated false bottom, through which water was forced from below. The gravel was tipped into the washer upon the false bottom, and the water passing upward carried with it the clay and loam, thoroughly washing the gravel and overflowing into a channel surrounding the upper edge of the washer. Each batch contained 3 cub. yds., and after washing was removed through doors at the front of the washer. The gravel was loaded into trucks in the pit, which were hauled to

varying from 40 ft. to 100 ft. At this depth the water-bearing sand overlying the clay escaped except at the shafts, where it was easily dealt with. The eastern sewer and outfall conduit are laid one above the other in the same tunnel for a distance of about 3,000 yds., the former gravitating to the works and the latter discharging under hydrostatic head. The sewers are constructed of concrete tubes, those for the outfall being laid below, and having flat tops to carry the gravitating sewer, which was constructed with a flat base and bedded on cement mortar. The conduit is 33 in. diameter throughout, and the gravitating sewer from 39 in. to 27 in., and laid at gradients varying from 1 in 1,400 to 1 in 1,100. (Plates Nos. 2 and 3.)

The specification for concrete tubes included the following conditions:—

Manufacture.—The concrete to be of three parts washed granite chippings up to 3-in. gauge (equal to sample to be submitted with tender), and one part slow-setting Portland cement complying with the

British Standard Specification. The concrete to be filled into moulds immediately after mixing and consolidated by ramming or vibration. The tubes on being removed from the moulds to be immersed in a solution of silicate of soda having a specific gravity of 1.10, and allowed to remain therein for at least seven days.

Testing.—Transverse Stress.—The tube shall be placed on a hard flat surface, and a steel joist of sufficient strength to resist bending, and not more than 4 in. in width, shall be placed on the top of the tube parallel with the axis, and extending the whole length of the tube. Wooden wedges, ½ in. in depth, may be used to keep the tube in position. The load hereafter given for each size of tube shall then be gradually applied through the steel joist by means of a lever, and no sign of fracture shall appear in any tube when the maximum load is reached.

Size of tube.	Test load.
39 in. diameter...	28 cwts.
36 in. " " " " " " " " " " " "	25 "
33 in. " " " " " " " " " " " "	27 "
30 in. " " " " " " " " " " " "	30 "
27 in. " " " " " " " " " " " "	21 "
2 ft. 8 in. by 4 ft., egg-shaped ...	55 "
2 ft. 4 in. by 3 ft. 6 in., " " " " " " " " " " " "	46 "
2 ft. 2 in. by 3 ft. 6 in., oval ...	41 "
1 ft. 8 in. by 2 ft. 6 in., egg-shaped ...	36 "

These test loads were designed to obtain a safe tensional stress in the concrete of 3 cwt. per square inch.

Appearance.—On being fractured the interior of the concrete shall present a clean, homogeneous appearance, free from all air holes or other defects.

Absorption.—Sample pieces of the tubes supplied, weighing about 20 lb., shall, after being dried to constant weight, be submerged in water for a period of forty-eight hours. They shall then be wiped with a cloth and again weighed. The increase in weight by absorption shall not exceed 1 per cent of the dry weight.

Marking.—Each tube shall have legibly marked upon its internal and external surfaces the date of its manufacture, the internal dimensions, and the name of the maker.

It is obvious that it was of vital importance that each pipe should be perfectly watertight, as any leakage from one to the other would be fatal to the efficiency of the scheme. In addition it was important that the space in the headings surrounding the pipes should be well and solidly filled with concrete. Those who have been responsible for work of this kind know how difficult it is to ensure effective supervision, and these questions gave the author much anxious thought. The method finally adopted to secure these results was as follows:—

The spigot and socket of the concrete tubes were so designed as to provide when placed together an annular space within the joint of about ¼ in., and the specification required the contractor to lay the tubes with dry, clean joints, fill in solidly with concrete on the outside, and afterwards to make the joints by first sealing the interior with an expanding steel and rubber ring (Plate No. 4), and then forcing liquid cement into the annular space through a hole in the ring at the side or invert. A second hole was to be provided at the top of the ring as an air vent, and this was to be left open until the cement began to flow out, after which it was to be plugged and the cement forced in until the joint was solid.

The contract for this work and the construction of the pump well was let to a limited company, and at first the works progressed fairly satisfactorily, but difficulties subsequently arose, apparently due largely to financial trouble.

The contractors excavated a considerable length of heading, for which they had good prices, and after some pressure proceeded slowly with the laying of the concrete tubes, for which their prices were not so profitable, but delayed for a long time the jointing. They were warned of the extra cost and difficulty of executing this part of the work if it was not carried on simultaneously with the tube laying, owing to the trouble of conveying the necessary materials and plant for long distances through the confined space afforded by the tubes, and after much pressure they obtained a few rings and bogeering apparatus and made a start. The packing of the concrete had been watched as carefully as practicable by the inspectors, but the author had been afraid that when the jointing was commenced some imperfections would be found. He expected, however, the

contractor would early realise that perfect consolidation of the concrete would prevent waste of cement when bogeering, and therefore be to his advantage. If properly put together and sealed inside with a ring and outside with concrete, each joint in the 33-in. tubes should have taken less than half a gallon of liquid cement, but the first few joints attempted were found to take as much as two bags of cement each. Thereupon the contractors alleged that the specified method was impracticable and declined to proceed with the work. Ultimately, in the hope of ending the dispute, the author offered to lay a short length of sewer and demonstrate the practicability of complying with the terms of the specification. The contractors accepted this offer, and the experiment was carried out with quite satisfactory results, the joints being easily and perfectly made without waste of cement. Notwithstanding this, they continued delaying the work, and ultimately the author was compelled to serve them with a notice of discharge from the contract. Litigation ensued, but while the hearing was proceeding the contractors suggested a settlement, which was agreed upon terms very favourable to the corporation.

In the meantime the works had been standing for some months, and were in a deplorable condition. Tenders were obtained from other contractors for clearing up the mess and completing the contract, but as the acceptance of the lowest price would have involved serious loss to the corporation, they instructed the author to carry out the work by administration. This has been done at a cost to the corporation less than the original contract sum.

The concrete filling was composed of 8 parts natural gravel to 1 part Portland cement. As the work proceeded portions of the joints were cut out for examination at frequent intervals, and in every case were found to be satisfactory; some of these sections will be on view when the works are visited.

Both the sewer and outfall conduit are quite sound and watertight throughout.

The manholes are of cast iron of somewhat unusual design, and were adopted as being more quickly and easily constructed, cheaper and more likely to be watertight than brick shafts. It will be seen (Plate 3, Fig. 3) that they are built upon a heavy cast-iron base forming part of the sewer, and consist of 12-ft. lengths of 30-in. pipes having turned and bored (parallel) joints, a ring of soft lead ¾-in. pipe being placed in the bottom of the socket to form a cushion for the spigot, and the socket outside run with bitumen. Each landing is constructed of three castings, the centre oval in form, and the cap and base of one pattern. The manholes are provided with galvanised-iron ladders, and each landing with a galvanised-iron grating, half of which is hinged. They were found simple and economical to construct, and quite watertight and satisfactory.

After leaving the heading the outfall is continued in cast-iron pipes across the foreshore to the point of discharge, about 2,000 yds. beyond high-water mark and 1,000 yds. east of the pier head. The pipes have turned and bored socket and spigot joints.

At the sea end a length of about 100 yds. is carried on Jarrah wood piles. The design for this part of the works was prepared with a view to simplifying as much as possible the construction and adjustment of the underwater structure (Plate 2, Fig. 9).

The western intercepting sewer (Plates Nos. 2 and 3, Figs. 8 and 2) is egg-shaped, 30 in. by 24 in., has a total length of 3,600 yds., and is constructed on the McAlpine system of concrete segments in tunnel. This system can only be adopted where the ground is comparatively free from water and fairly stable in character. Its advantages are that no timbering is required, as the tunnel is lined with segments as excavated, and the quantity of excavation is very much reduced. The excavation is slightly larger than the external diameter of the sewer, and the top segments are provided with holes through which the annular outside space is completely filled with cement grout, forced in under a pressure of about 10 lb. per square inch. This part of the work was carried out under contract by Messrs. Robert McAlpine & Sons, at a price much below the cost of ordinary tunnel construction.

Pumping Station Buildings (Plates Nos. 6, 7 and 8).—The main building is 103 ft. by 35 ft., and, except at the southern end, the walls are carried upon the concrete walls of the pump well. At the rear of this building is the workshop and stores, the gas-generator house, coal store, mess-room, &c. The pumping station and refuse destructor adjoin, and form one building,

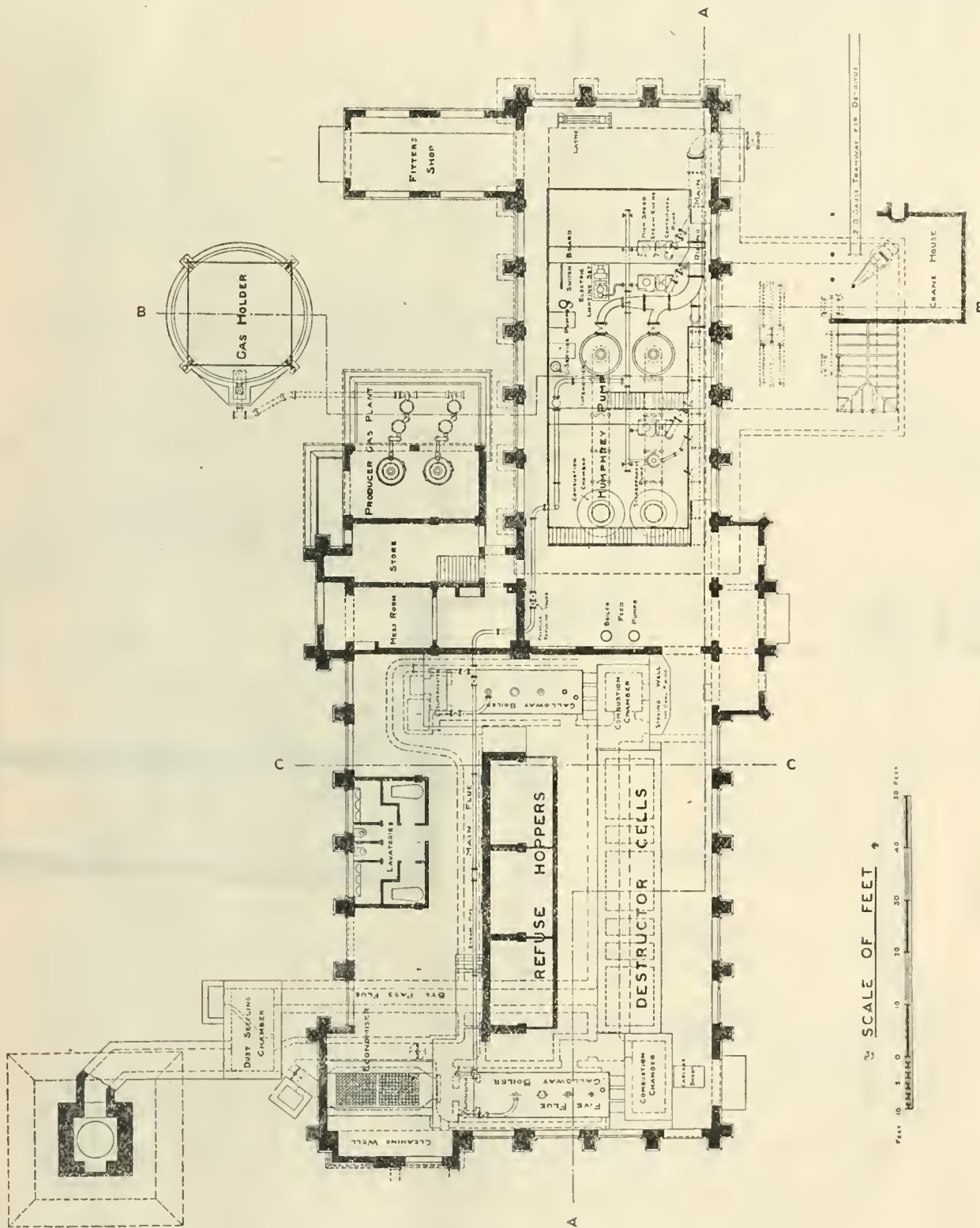
having a total length of 200 ft. The walls have a red-brick plinth, and above this are of Fletton bricks, covered externally with rough-cast. Internally the walls are faced with glazed bricks from ground level upwards. The pump floor is 30 ft. below ground level, and has a surface of mosaic. This material is also used for the upper floors. Large windows are provided on each side. The roof is of match boarding carried on iron principals and covered with tiles.

Pumping Station.—The invert level of the gravitating sewer at its outlet is 2.45 ft. above ordnance datum,

the screens twice in each complete revolution, and to make one revolution per minute.

The rakes and elevators are operated by electric motors, and both the detritus and screenings are delivered into trucks at pump-floor level and lifted to ground level by an electric crane.

The pump well is 80 ft. by 30 ft. by 50 ft. deep, a floor being provided at 30 ft. below ground level, upon which is carried the pumping and other machinery. The pump well proper has a maximum capacity of 170,000 gallons, and is also divided into two parts, each served



SOUTHEND-ON-SEA REFUSE DESTROYER AND PUMPING STATION: GENERAL PLAN.
(Plate No. 6.)

and of the pump well 1 ft. below ordnance datum. Before entering the latter, the sewage passes through a detritus and screening chamber, which is divided into two parts, each containing a detritus pit, elevator and screens. The combined capacity of these pits is 9,300 gallons during normal flow (1 dry-weather flow) and 12,700 gallons during maximum flow, and will reduce the velocity of flow to 4 ft. per minute during dry weather and 7.5 ft. per minute at times of maximum storm-water flow. The silt is removed by bucket elevators. The screens are of the fixed type, cleared by rakes attached to endless chains, these being so arranged as to clear

by one part of the detritus and screening chamber, and so arranged that the whole can be worked together or each part separately. The walls are of concrete, 5 ft. 6 in. to 6 ft. 6 in. thick, partly reinforced to resist external pressure. Before the work was commenced trial holes were sunk, and from the information obtained it appeared that the clay would be found about 22 ft. above the bottom of the excavations. It was found, however, when the work was carried out, that in some parts of the site the clay surface was much deeper, and that there was an average depth of 17 ft. of running sand in place of 11 ft. found in the trial

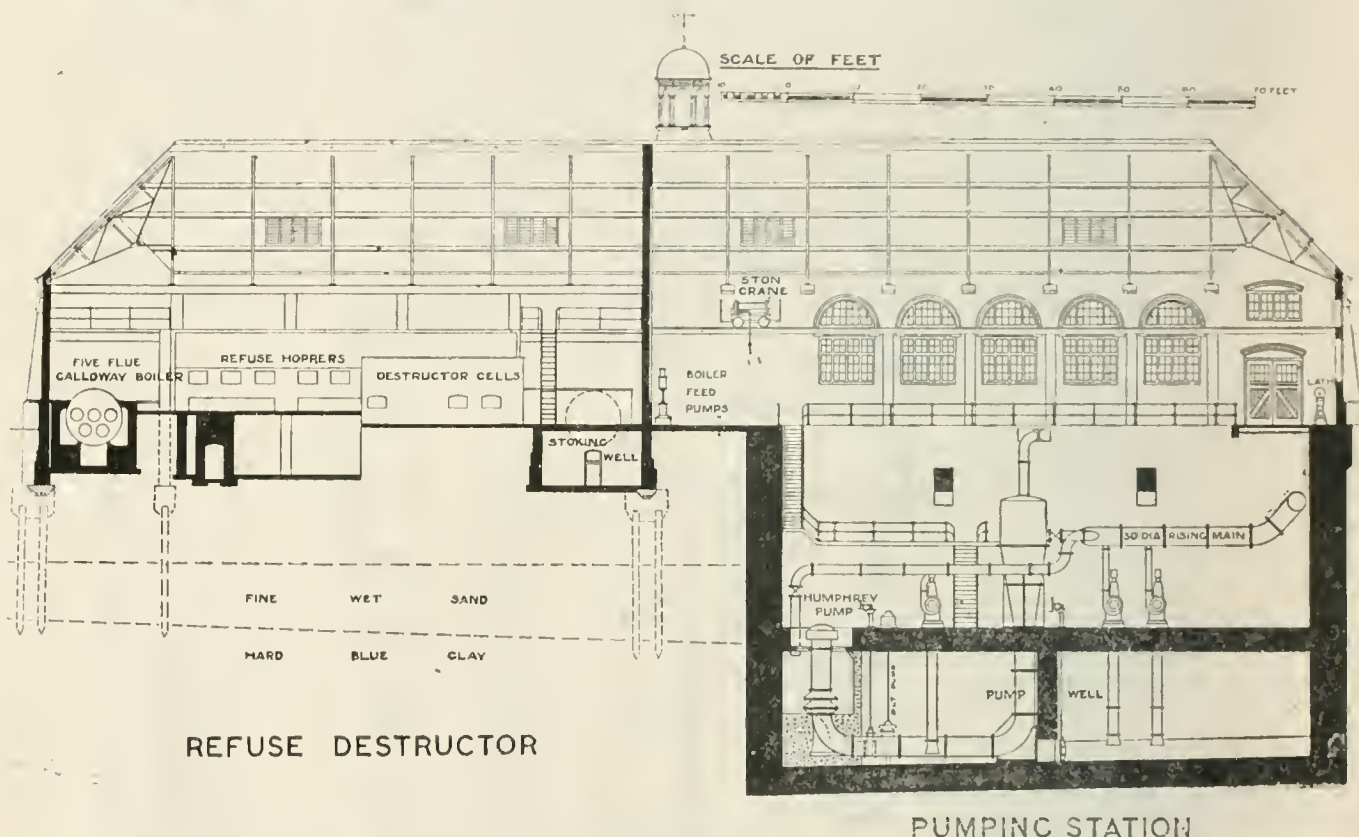
hole. This added greatly to the difficulty of executing the work. The excavation for the external walls was carried out in trench, and just before the full depth was reached an exceptionally heavy rainfall of three days' duration raised the water level in the water-bearing strata to such an extent that a bad leak was started at the north-eastern end of the excavations. Before the damage could be remedied the water reached the dry sand in the "dumping," causing a settlement, and the general collapse of the heavy timbering and the disturbance of the surrounding ground over a considerable area. Fortunately, no loss of life or personal injury resulted, but the progress of the work was considerably delayed. The contractors adopted the only course which appeared open to them, and proceeded to excavate the fallen material and to form the sides of the excavation to a batter, as they could not re-timber. This involved the removal of a large quantity of additional soil, and refilling on the outside of the walls as they were brought up. A considerable amount of work remained unexecuted when the author took over the completion of the works.

Mechanical Equipment.—The pumping plant consists of three centrifugal pumps driven by high-speed

pressure of 120 lb. and vacuum of 26in., and under these conditions at full load are guaranteed not to require more than 21 lb. of steam per brake-horse power per hour. The price of this plant, delivered and fixed, is £1,071.

The engines exhaust through a feed-water heater into a submerged surface condenser, which is placed in a concrete chamber over the screening floor. This chamber is placed on a by-pass from the effluent pipe, and the whole of the effluent water can be passed through for cooling purposes.

The condenser and air pump are designed to deal with 5,000 lb. of exhaust steam per hour, and to produce a vacuum of 26 in. The condenser has a total cooling surface of 500 sq. ft., and is divided into four sections with U-shaped tubes of solid drawn brass 1½ in. external diameter by 16 W.G. The chamber is fitted with Jarrah wood baffle plates to deflect the cooling water round and through the condenser before leaving the chamber. The cost of condenser, air and lift pump, fixed complete, is £370. The feed-water heater is capable of heating 8,000 gallons per hour from 60 to 90 deg. Fahr. The oil separator is guaranteed to remove all grease in excess of ¼ grain per gallon from 5,000 lb. of steam at 2 lb. absolute pres-



REFUSE DESTROYER

PUMPING STATION

SOUTHEND-ON-SEA REFUSE DESTROYER AND PUMPING STATION: LONGITUDINAL SECTION.

(Plate No. 7.)

compound two-crank condensing engines, each equal to 1,600 gallons of screened sewage per minute, and two Humphrey internal combustion pumps, each equal to 3,300 gallons per minute; in each case against a maximum head, including friction, of 65 ft.

The total combined capacity is therefore 11,400 gallons per minute, equal to approximately seven times the average dry-weather flow from a residential population of 100,000, with due allowance for visitors. It is estimated that sufficient steam will be supplied from the refuse destructor to pump the dry-weather flow for five and a-half to six days in each week, and that the Humphrey pumps will be required to deal with one day's flow in each week and storm-water.

In addition to the above pumping plant a small Stereophagus pump is provided for clearing the pump well of deposit.

The centrifugal pumps were supplied by the Worthington Pump Company, and are direct-coupled to Sisson high-speed steam engines of 50-h.p., working at a speed of 550 revolutions per minute. The pumps have 10-in. delivery and suction openings, and the guaranteed efficiency is 72 per cent. Steam ejectors are provided for charging purposes. The engines have forced lubrication, and are designed for a steam

sure per hour, with a maximum drop in pressure between inlet and outlet of ¼ in. of mercury. The cost of feed-water heater and oil separator, fixed complete, is £82 10s.

The condenser, &c., above mentioned were supplied by Messrs. Isaac Storey & Sons, Limited.

Humphrey Pumps.—It was originally intended to provide oil or gas engines coupled to centrifugal pumps for raising the surplus sewage during storm time and other sewage which could not be dealt with by the steam pumps, but early in 1910, before any tenders for this plant had been accepted, the author had the opportunity to peruse a paper read before the Institution of Mechanical Engineers by Mr. Herbert A. Humphrey, in which he described his recently invented internal combustion pump.

The author was much impressed with the possibilities of this invention for dealing with large volumes of water sewage, and at interviews subsequently with Mr. Humphrey discussed the practicability of providing pumps of this type for the Southend sewage works. After inspecting the experimental pumps erected by Mr. Humphrey at Dudley Port, and prolonged negotiations with the licensees, Messrs. Siemens Brothers, Limited, he obtained from the latter a tender for the supply of

two large pumps at a price which compared favourably with that of the plant originally proposed. One important condition attached to the tender was that one pump should be first constructed and thoroughly tested under ordinary working conditions, and that, should this be found deficient in capacity, but satisfactory to the engineer in other respects, the second pump should be made so much larger as to yield with the first pump the total capacity required, but that should either or both pumps fail to yield, under

ing the "play-pipe," but the Southend pumps are provided with what is described as an "intensifier," through which the sewage passes into the rising main, and between which and the combustion chamber a short "play-pipe" is provided, these pumps being therefore less simple in construction.

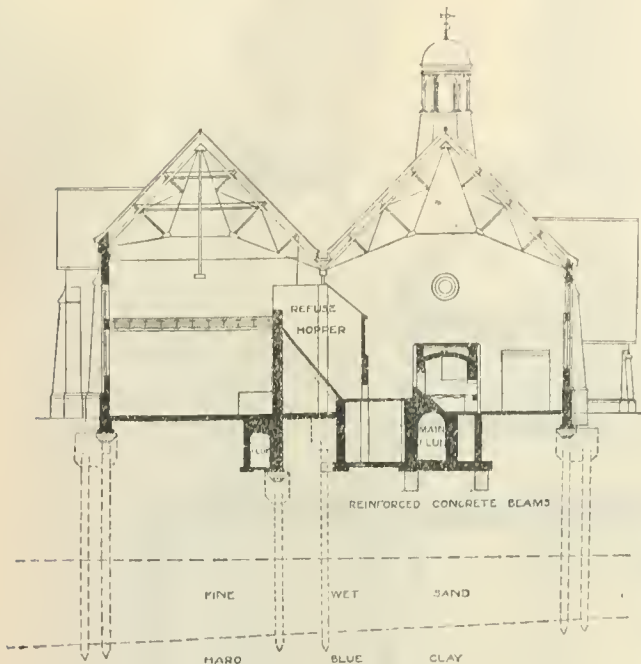
At the time of writing one pump has been installed, and has been run for short periods with clean water and a number of adjustments made. It is probable that before the date of the meeting it will be pumping sewage under ordinary working conditions. The author is, of course, unable to express any opinion until after the completion of the official trials, but he thinks it may reasonably be expected that the results of the tests will be quite satisfactory.

The pump is 3 ft. internal diameter, the length of play-pipe being 48 ft. 6 in., and the height of the intensifier is 20 ft. above floor level. The specified capacity of each pump is 198,000 gallons per hour, with a consumption of not more than 170 cub. ft. of producer gas of 130 British thermal units calorific value per pump horse power per hour.

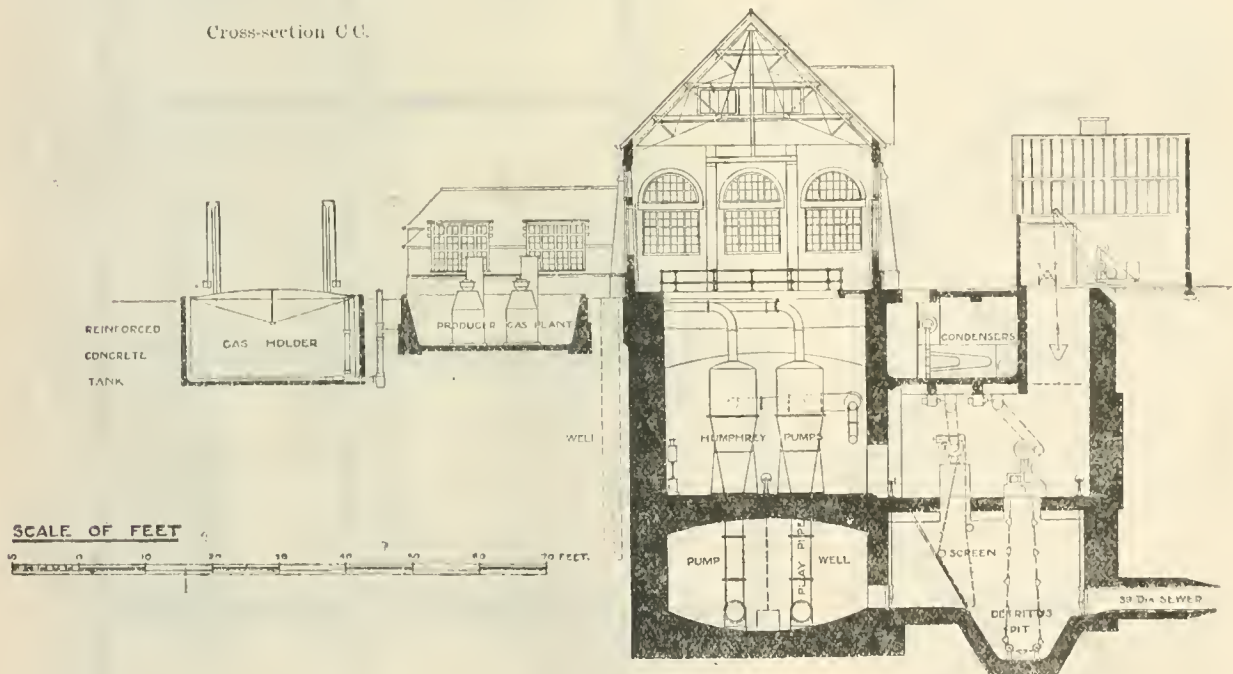
The sewage valves are made of "Duralumin" plates faced and hinged with "Dermatine."

The valves are arranged in two rings, one above the other, carried on steel castings, to both the suction and intensifier. The suction chamber was originally intended to be a sheet steel, but, having regard to the liability of this material to rapid corrosion, the author arranged to omit this from the contract and himself construct the chamber in reinforced concrete. The irregular shape of the chamber and the fact that it must be airtight rendered its construction somewhat difficult, but it was completed quite satisfactorily.

The producer-gas plant (Dowson & Mason) is supplied with the pumps, and comprises two sets of producers, designed to use either anthracite coal or coke, and each having a capacity of 5,535 cub. ft. of gas per



Cross-section C.C.



Cross-section B.B.

SOUTHEND-ON-SEA SEWAGE DISPOSAL WORKS, PUMPING STATION AND REFUSE DESTROYER: CROSS-SECTIONS. (Plate No. 8.)

test, results satisfactory to the engineer, the corporation were to be entitled to call upon the contractors to remove them at their own expense and without any charge. At this time the only pumps that had been made were comparatively small experimental sets, but the author felt no hesitation in advising the corporation to accept Messrs. Siemens Brothers' tender, and a contract was entered into.

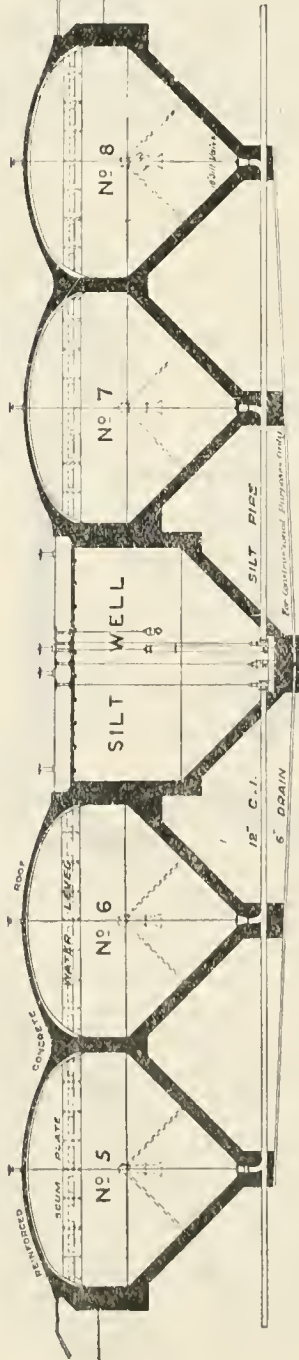
Since then the large Humphrey pumps for the Chingford reservoir have been installed, and have given results of a highly satisfactory character.

These, however, are of the low-lift type, pumping clean water against a total head of from 25 ft. to 30 ft., whereas the Southend pumps are of the high-lift type, pumping screened sewage against a head of 65 ft. The main difference in the design is that the Chingford pumps are so constructed that the rising main and pump are one, the former constitut-

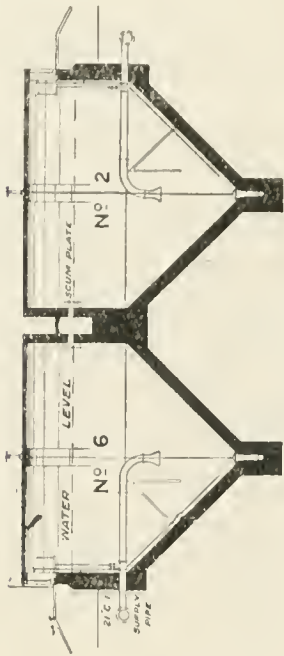
hour. A gasholder of a capacity of 5,535 cub. ft. is also supplied.

Stercophagus Pump.—This pump has inlet and outlet of 5-in. diameter, with a vertical spindle, through which it is driven by a 15-h.p. motor. The normal speed is 1,860 revolutions per minute, at which it is guaranteed to pump 18,000 gallons of sewage per hour against a total head of 65 ft. The pump is submerged in the pump well, and is provided for the purpose of removing accumulations of deposit from the invert. The suction terminates in a sump at the lowest point in the pump-well floor. This type of pump was designed by the Hon. R. C. Parsons for raising liquids containing large quantities of solids. It is provided with a cutter which, it is claimed, breaks up solid matters, such as wood, coal, coke, rags, &c., which may find their way into the pump, and so enables it to deal with sewage sludge and other substances of

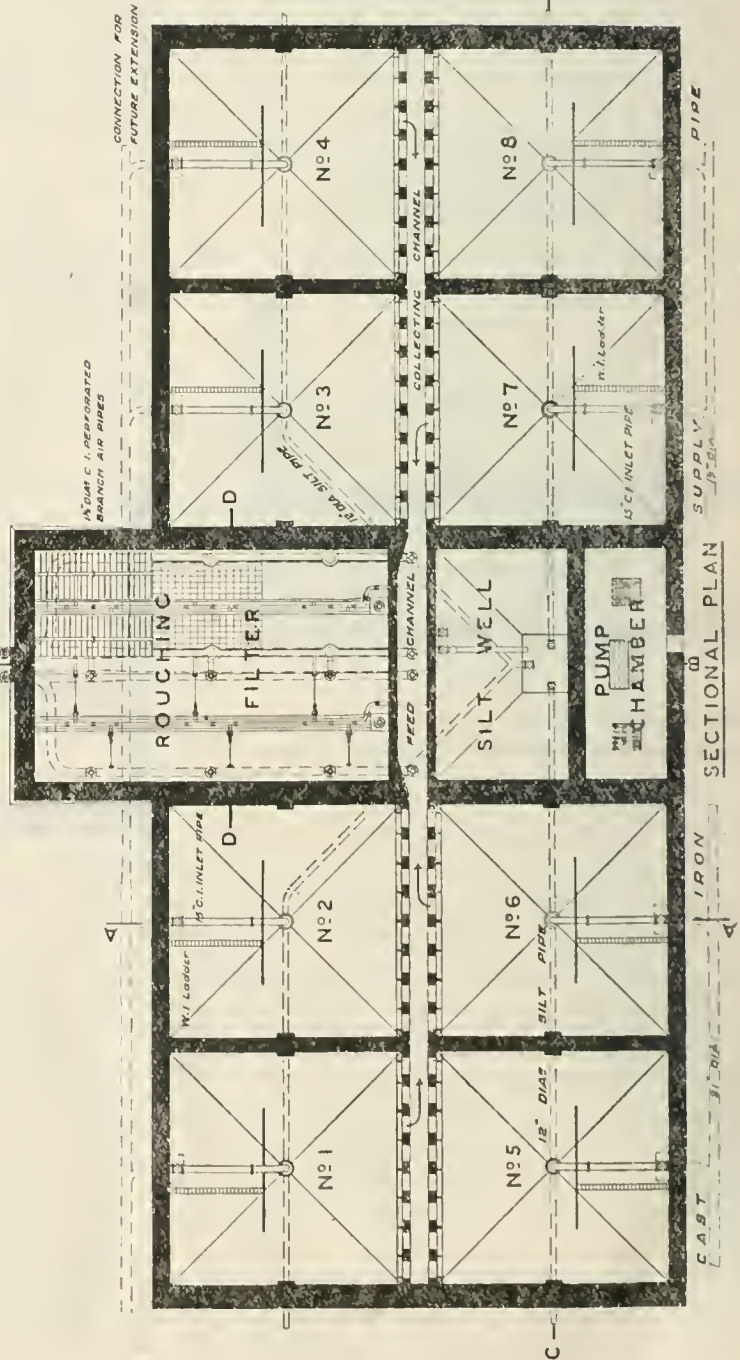
SCALE OF FEET



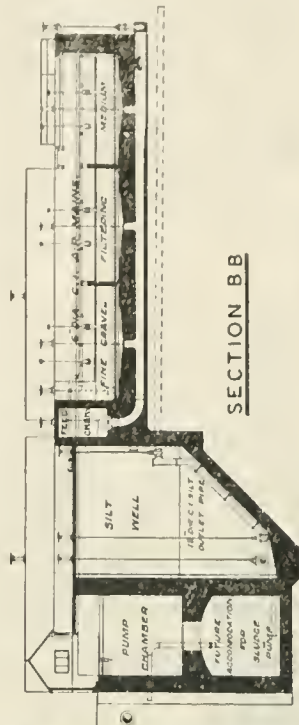
SECTION C.C.



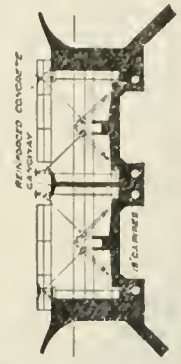
SECTION A.A.



SECTIONAL PLAN

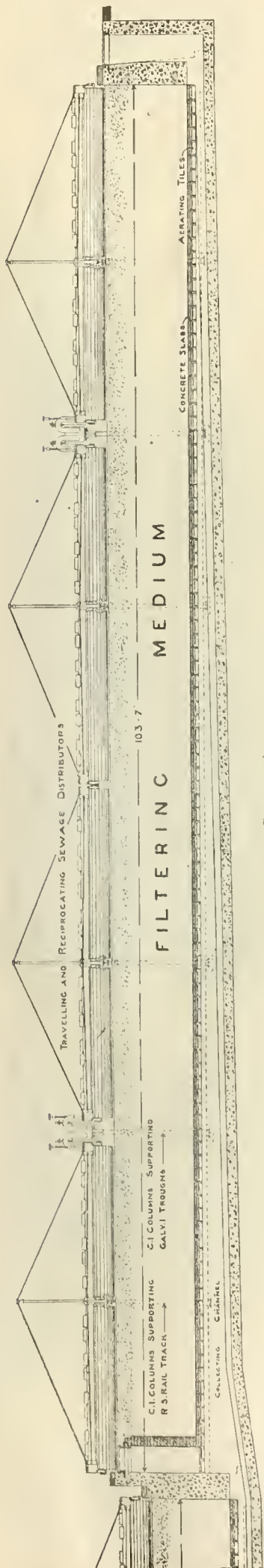


SECTION B.B.

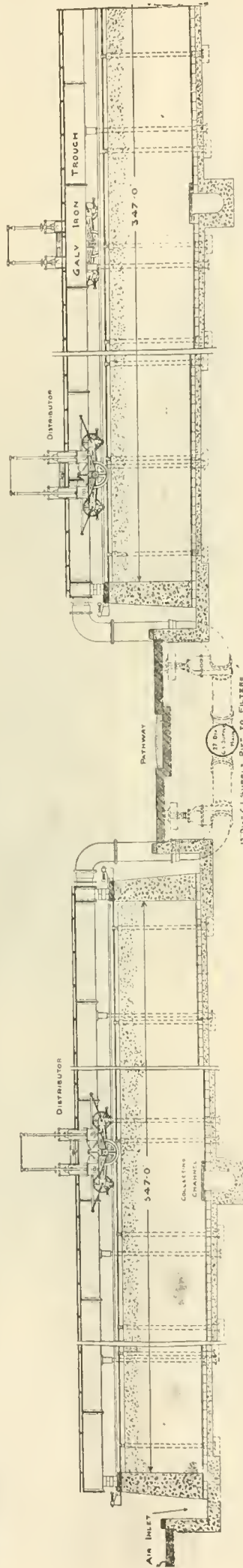


SECTION D.D.

SOUTHEND-ON-SEA SEWAGE DISPOSAL WORKS: SILT TANKS AND ROUGHING FILTER. (Plate No. 9.)



Cross-section.



Longitudinal Section.

SOUTHEND-ON-SEA SEWAGE DISPOSAL WORKS: SECTIONS OF BACTERIA BEDS. (Plate No. 10.)

similar character without risk of blockage. The efficiency is slightly less than that of an ordinary centrifugal pump of similar capacity, but under some conditions the small amount of additional power required is more than compensated for by greater reliability and more regular working. This pump was supplied by the Pulsometer Engineering Company, Limited.

Electrical Plant.—The generating plant comprises one steam-driven generator, consisting of a vertical tandem compound high-speed "Sisson" engine, coupled to a 15 - k.w. continuous - current dynamo, and as a stand-by a similar dynamo, driven by a horizontal oil engine, previously used for driving a sewage pump. This plant is required to supply current for lighting the works and cottages, and for driving a 1-h.p. motor for air compressor, a 3-h.p. motor for the screens and silt elevator, a 2-h.p. motor for economiser in refuse destructor, and motors for silt tanks, humus tanks, &c., aggregating 7-h.p.

The switchboard is on the pump floor, and the current is conveyed to the different parts of the works by bare copper overhead wire on creosoted poles.

Overhead Crane.— This is arranged to travel the whole length of the pumping station, and has a span of 35 ft. and a capacity of 5 tons. Cost, £105.

Lathes, &c.— The station is equipped with one large and one small gap bed lathe, a radial drill, and other tools; all are electrically driven.

Rising Main.—The pumps are connected to a cast-iron rising main, 30 in. in diameter, carried on brackets above the pump floor. Additional branches are provided in this main for further pumps as required.

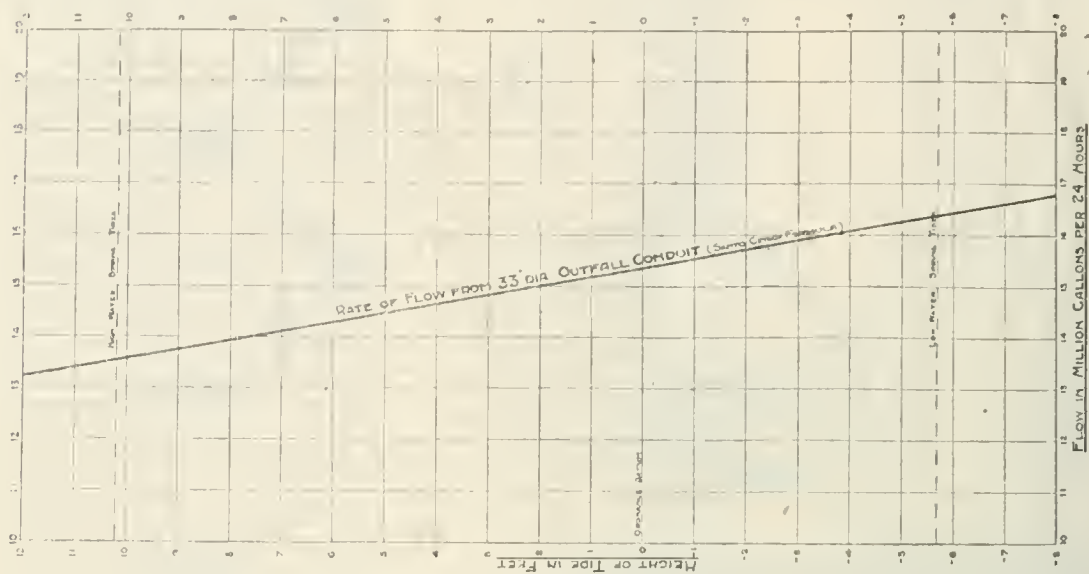
Silt Tanks (Plate No. 9).—These are of the upward-flow type, eight in number, and have a combined capacity of 1,150,000 gallons, or half the ordinary daily dry-weather flow. The tanks are 40 ft. by 40 ft. on plan, with a depth of 23 ft. from water level to invert. The lower part is in the form of a hollow inverted pyramid from which rise vertical walls.

The tanks are arranged in two groups of four, with the roughing filter and sludge well between. A conduit runs through the centre of each group, into which the tank effluent overflows through a number of rectangular openings. The tanks are constructed of concrete (6 to 1), and covered with light arched reinforced-concrete roofs, and rendered to above water level. It was at first intended to provide galvanised-iron scum plates, but after making a few experimental reinforced-concrete slabs the author decided to substitute these. The slabs are 5 ft. by 3 ft. by 1½ in. thick, reinforced with Hy-rib metal lathing, and carried in cast-iron brackets. They have been found to be good and cheap, and are practically everlasting. The cost is about 1s. 6d. per super. foot unfixed. The sewage enters the tanks, which work in parallel, through a cast-iron bell-mouthed bend turned downwards in the

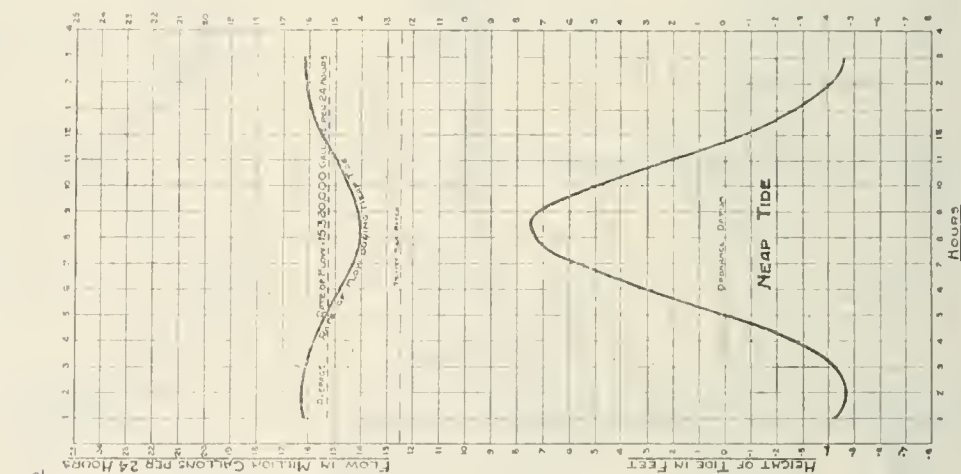
centre of each tank, and at a point about 18 ft. below water level. The normal average rate of upward flow is 1.2 ft. per hour, and the maximum rate 3.6 ft. per hour, the latter being on the basis of three times the dry-weather flow. An alternative arrangement, consisting of a Jarrah wood box outlet, is being tried in one of the tanks. This is expected to increase the deposit of suspended matter by effecting greater diffu-

An ejector chamber is provided alongside the silt well, so that the silt, when found necessary in the future, may be delivered to the higher land and to a greater distance than is required at present.

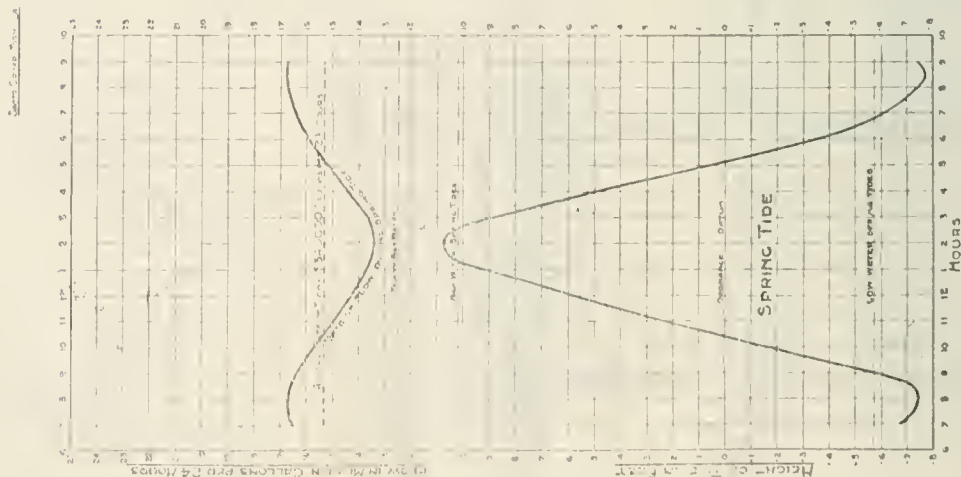
Straining and Roughing Filters (Plate No. 9).—These filters are in two parts, have a total area of 230 super. yds., and a depth of medium of 3 ft. They are intended to act as screens between the silt tanks and



RATE OF FLOW DURING ALL STATES OF THE TIDE
DIAMETER 33-IN. OUTFALL CONDUIT.



RATE OF FLOW DURING NEAP TIDE



RATE OF FLOW DURING SPRING TIDE

SOUTHEND-ON-SEA SEWAGE DISPOSAL WORKS: RATE OF FLOW DIAGRAMS OF 33-IN. DIAMETER OUTFALL CONDUIT.

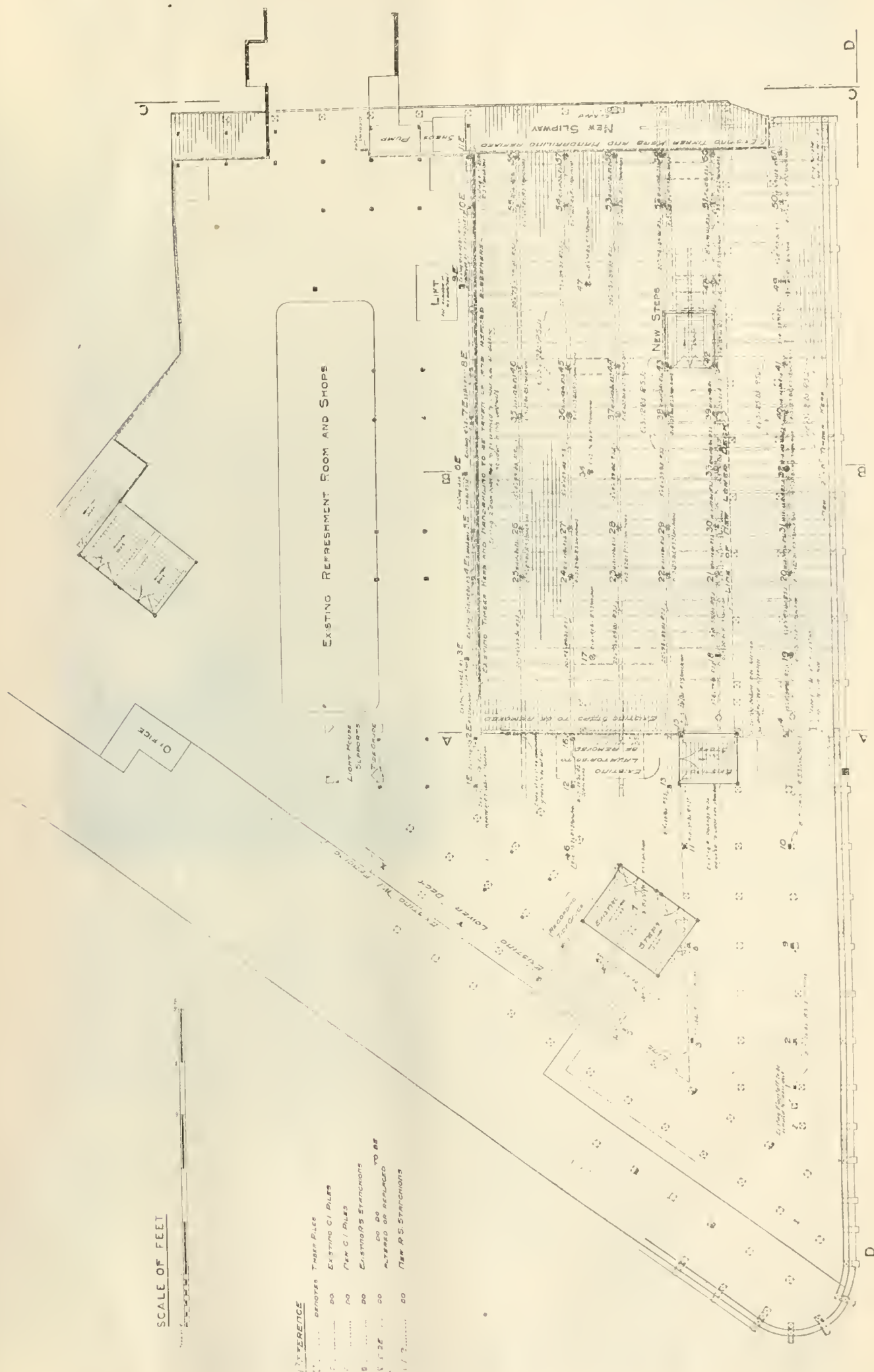
(Plate No. 11.)

sion of the entering sewage. A mushroom valve, 18 in. diameter, is provided in the invert of each tank, through which the silt is forced by the hydrostatic head in the tank, the latter therefore being self-cleansing.

A storage silt well is provided into which the silt is discharged from the different tanks, and from which it can be delivered to the drying beds.

bacteria beds, their duty being to arrest any colloidal matter in suspension in the tank effluent.

To maintain their efficiency frequent cleansing is necessary, and this is effected by reversing the flow of water through the filters and at the same time blowing a quantity of air through the medium. The washings resulting from these operations are delivered into the silt well. Compressed air for the second



SOUTH-END-ON-SEA PIER IMPROVEMENT: EXTENSION OF OUTER HEAD PLAN OF MAIN DECK. (Plate No. 12.)

operation is provided by a positive pressure blower worked from an oil engine of 12½-h.p. in the small pump chamber adjacent to the filters.

The medium is composed of washed gravel ¼-in. to ½-in. gauge.

By-pass pipes enable sections of the filters to be isolated and the tank effluent conveyed direct to the bacteria beds.

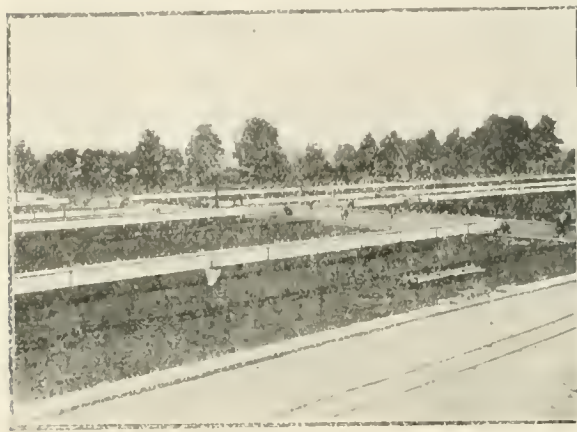
Reinforced concrete has been used in the construction of the division walls, channels, &c.

This type of filter was introduced by the late Mr. Joseph Corbett, borough engineer, Salford, who kindly gave the author full particulars of the construction and method and results of working his roughing filters, which have been of much assistance.

Bacteria Beds (Plate No. 10).—These are rectangular, and have a total area of about 3 acres, divided into four sections, each about 105 ft. by 350 ft.

The walls and floor are of concrete (6 to 1), the latter 5 in. thick. The medium is of washed clinker varying in size from 3 in. to 1 in., and is 6 ft. in depth, carried on a false bottom of salt glazed tiles. The effluent drains to channels running through the centre of the beds.

The distribution is by sixteen travelling and reciprocating sewage-wheel distributors, of the mono-



PERCOLATING BEDS, SOUTHEND SEWAGE WORKS.

rail type, running on 55 lb. steel rail track carried by light cast-iron columns, and taking the tank effluent from 13 in. by 13 in. galvanised steel troughs. The distributors are capable of sprinkling the tank effluent at varying rates of flow up to 450 gallons per super. yard per day, travelling at the rate of from 40 ft. to 80 ft. per minute, and giving average rest intervals of five minutes and upwards. They were supplied and erected by Messrs. Jones & Attwood at a total cost of £3,754.

Humus Tanks.—These are designed on the same principle and worked in the same way as the silt tanks. There are two tanks, each 58 ft. 3 in. by 22 ft. 9 in., the bottom of each being divided into three inverted pyramids, with three inlet pipes discharging at a depth of 8 ft. below top-water level. The normal rate of upward flow is 7 ft. per hour, which increases to 21 ft. per hour at three times the dry-weather flow. The humus is pumped from the invert of the tanks by a small centrifugal pump, electrically driven.

Gauge Basin.—A gauge basin is provided on the effluent pipe near the humus tanks. This contains a rectangular weir 7 ft. wide, the flow over which is recorded by a Lea recorder.

Sludge Disposal.—It was at first intended to dispose of the sludge on the low-lying ground on the north of the site of the pumping station, but when it was found that the quantity of gravel required would involve the excavation of a very large pit, the author decided to under-drain the bottom of the pit and utilise it for dealing with the sludge. About half the area has been under-drained back into the gravitation sewer to the pump well, and divided into sludge lagoons by means of earth embankments.

The sludge gravitates to these lagoons, and is distributed by means of timber troughs.

The soil overlying the bed of gravel is light in character, varying in thickness from 3 ft. to 5 ft., and this together with quantities of foamy sand found in some parts of the pit will be used for covering over and mixing with the sludge. The author is hopeful that after a time this mixture may be

found of value to farmers in the neighbourhood, particularly those cultivating heavy land.

It is proposed to continue excavating gravel and sand, for which there is a constant demand both for corporation works and by builders and contractors, so that the pit will probably be capable of accommodating the sludge for many years, even if none is removed, and there will be available a constant supply of surplus soil. This method of dealing with the sludge has several advantages, including the avoidance of pumping, less risk of nuisance, low cost, and the hiding from view of the sludge lagoons.

Storm Water.—About half the borough is provided with a system of storm-water sewers, which take the storm water from the roads and fronts of the houses. The corporation Act requires the treatment of three times the dry-weather flow, beyond which the storm water may overflow into the two existing tanks. After these become full it overflows from them and discharges through the existing outfalls, the tanks then acting as continuous settlement tanks. They may be emptied only between the times of high and low water. It has been found by actual measurement that the ordinary daily dry-weather flow is about 23 gallons per head of the permanent population during the winter and 23½ gallons during the month of August, when the greatest number of visitors and trippers are in the town, and on this basis it is anticipated that overflow from the tanks between the times of low and high water will take place at rare intervals, and only when the overflowing storm water is practically innocuous.

In addition to the completion of the pump well and deep-level sewers, the whole of the bacteria beds, silt tanks, humus tanks, and other important parts of the works have been carried out by administration. The pumping station and refuse destructor buildings were erected by Messrs. E. & B. H. Davey, Southend-on-



SOUTHCHURCH AND THORPE BAY BOULEVARD.

Sea. The concrete tubes were supplied by Messrs. Ellis & Sons, Leicester, and the British Improved Construction Company, London, and the electrical plant by Messrs. Crompton & Co., Chelmsford. Mr. E. J. Messent, Assoc. M. Inst. C.E., acted as resident engineer, and Mr. A. Snodgrass as works manager, to both of whom the author is indebted for whole-hearted thoroughly efficient service.

This paper having already reached a greater length than the author intended, he will confine his further remarks to a condensed description of the refuse destructor, pier extensions, loading pier, tramway boulevard and open-air bath.

REFUSE DESTRUCTOR.

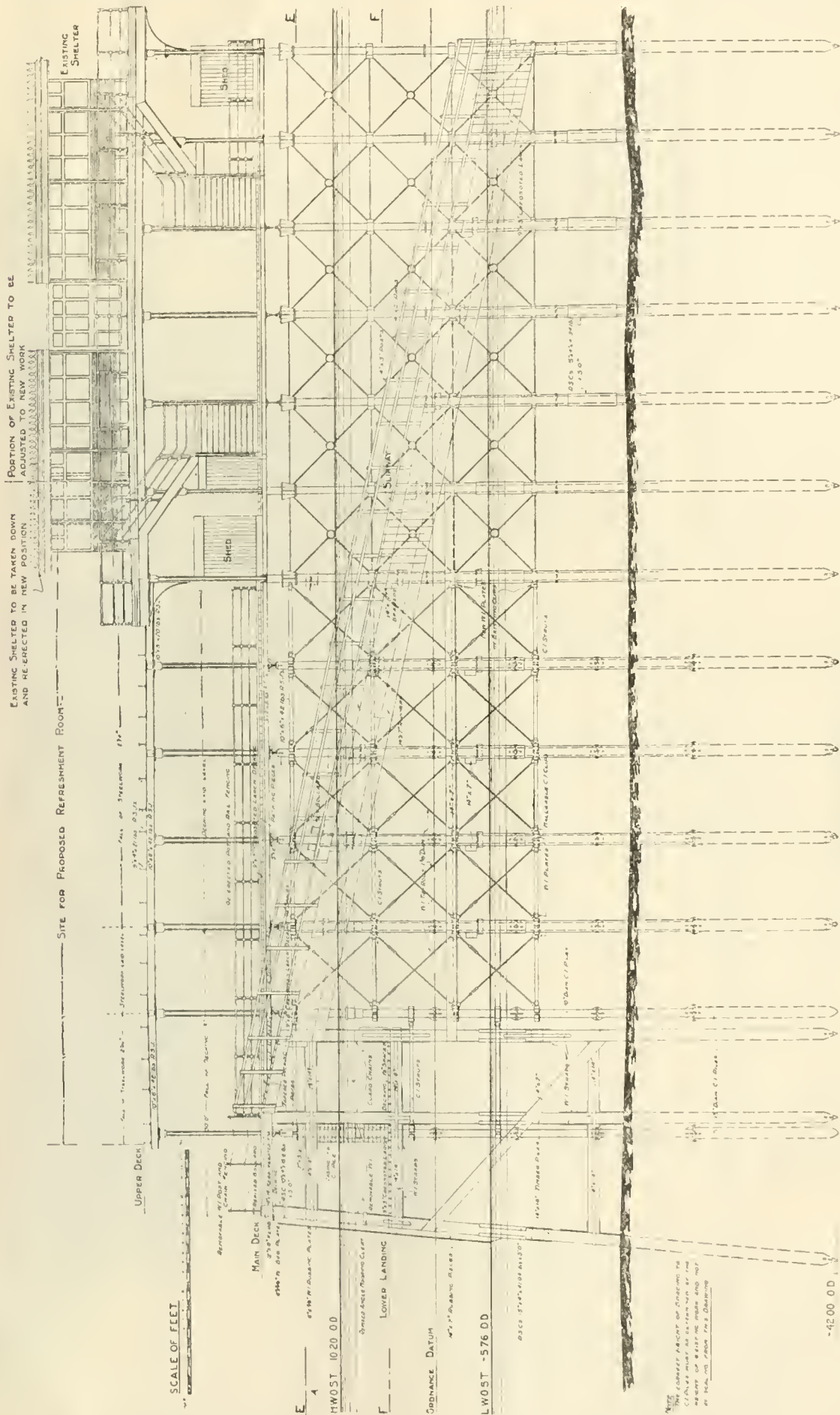
(Plates Nos. 5, 6 and 7.)

The main building is 91 ft. by 68 ft., with a tipping floor at the rear 91 ft. by 25 ft. The refuse is delivered into three reinforced-concrete hoppers, of a total capacity of 150 cub. yds., equal at the present time to about one-fourth the weekly supply. The cells are back feed, six in number, arranged in pairs, each pair having a continuous grate of 50 super. ft. The feeding is by hand, but the author is experimenting with a tipping truck, the principal object of which is to reduce labour and facilitate the conveyance of refuse from either hopper to either cell. Forced draught is provided by steam blast, the air being drawn from a space between the top of the main fire arch and the reinforced slabs covering the cells.

The two boilers are five-flue Galloways, one being

arranged for coal firing when required. They are 8½ ft. diameter by 26 ft. long, have ample steam capacity, and are constructed for a working pressure of 200 lb. per square inch, this pressure being reduced to 120 lb.

The chimney shaft is 125 ft. high, 7 ft. diameter at the base and 6 ft. at the top, lined its whole height with firebricks. It was erected by the Alphons Custodis Company, Limited, at a cost, excluding concrete



SOUTHEND-ON-SEA PIER IMPROVEMENT: ELEVATION C.C.
(Plate No. 13.)

before reaching the engines. Each boiler is provided with a superheater having a heating surface of 235 sq. ft. A 240-tube Green's economiser is provided on the main flue.

foundation, of £660. A dust catcher is provided beyond the economiser, and ample provision is made for obtaining access to every part of the plant and flues for the removal of dust.

The cells were constructed by Messrs. Dawson & Manfield, Manchester, at a total cost of £1,850. The boilers cost £1,370, the superheaters £150, and the economiser £490. The flues, boiler settings, and dust catcher were constructed by Messrs. Poulton & Timmis, Reading, at a cost of £1,250.

Lavatory accommodation and baths are provided for the use of the staff.

ESPLANADE WORKS.

These works comprise the final section of the Esplanade improvement works, which were commenced by the author about eleven years ago, the total cost of which will be about £160,000. Originally the Esplanade consisted of a footpath only, of an average width of about 15 ft., and this has been extended to a total width varying from 60 ft. to 100 ft. A footpath 12 ft. wide on the north side, a promenade 20 ft. wide on the southern side, in some parts one and in others two carriageways, and generally throughout the whole length plantations and ornamental gardens have now been provided. The greater portion of the sea wall is formed to a slope of 4 to 1, and constructed of concrete faced with Kentish ragstone. At the western end the wall is vertical and faced with basalt, and on the Marine-parade section is sloping, with moulded granite concrete rock-faced blocks on concrete bed. These blocks are somewhat too expensive for large areas, but are of exceptionally good appearance and very satisfactory. Immediately west of the pier the widening is extended so as to include an area of about 3 acres which it is proposed to lay out as a sunk garden.

About 270,000 cub. yds. of earth filling and about 30,000 cub. yds. of concrete have been used in carrying out the esplanade works. When these are completed they will provide a marine drive of 4½ miles. Messrs. W. Muirhead & Co., Limited, are the contractors for the works now in hand.

SWIMMING BATH.

For some years there has been a demand for a bathing pool or other bathing facilities on the foreshore, and several schemes have been proposed, but have met with considerable opposition, principally because the adoption of either would have involved the erection of buildings which would have obstructed the view from the promenade.

When, however, the completion of the last section of the esplanade improvement works was under consideration, it was suggested that the objections might be removed by constructing an open-air bath as part of these works, below the promenade level, and this proposal is now being carried out.

The bath pond is 300 ft. by 70 ft., surrounded by gangways and dressing boxes, &c., over which the promenade is carried on cast-iron columns. The main walls are of concrete, those at each end and on the sea side being faced with Kentish ragstone. The pond walls and floor are also of concrete, and will be lined with white glazed vitreous tiles. The bath will be approached by a staircase from the promenade, and will be provided with 130 dressing boxes, diving boards at various heights, shower baths, &c. The depth of water will vary from 2 ft. 6 in. to 6 ft., with a diving pool 8 ft. 6 in. deep across one end. The water will be admitted into the bath through sluice valves in the sea wall, and will pass through a series of coarse and fine screens. It will be discharged at low water, a small portion having to be pumped. The cost of the bath, beyond the cost of the esplanade works, is £8,200. The main walls were constructed under contract by Messrs. Muirhead & Co., Limited, the tiling is being executed by Messrs. Carter & Co., Poole, and the remainder of the work by Messrs. Davey & Armitage, Southend-on-Sea.

LOADING PIER.

Some thirty years ago the old timber promenade pier was replaced by the present iron structure, and some of the timber removed was utilised for the erection of a small jetty for unloading barges. The use of this jetty has increased to such an extent during recent years that, although it is equipped with three electric cranes, the accommodation has for some time been quite inadequate, and in consequence the corporation obtained powers under a Provisional Order to erect a new loading pier near the gasworks. This pier is 580 ft. in length, and provides eight berths, accommodation for storage of goods, weighbridge office, &c. Tenders were invited for alternative forms of construction—viz.:—

(a) Cast-iron piles with framed steel and concrete superstructure, and

(b) Reinforced concrete.

The lowest tender for (b) was found to be about 20 per cent lower than the lowest tender for (a), and the corporation decided to accept the former.

The drawings, specification, and bill of quantities for the reinforced concrete structure containing general particulars of work and materials and conditions to be complied with were issued to contractors with the forms of tender. The specification required that the stresses in the structure should not exceed the following:—

Concrete in compression in beams and slabs subjected to bending (extreme fibre stress) 600 lb. per square inch.

Concrete in piles and columns under simple compression, 500 lb. per square inch.

Concrete in shear in beams, 60 lb. per square inch.

Adhesion of concrete to metal, 400 lb. per square inch.

Steel in tension, 16,000 lb. per square inch.

Steel in compression, 15 x (stress in surrounding concrete).

Steel in shear, 12,000 lb. per square inch.

The loads to be carried by the different parts of the structure were shown upon the plan, and the specification stipulated that the engineer should be entitled to load to one and a-half times the specified loads any parts of the works, after the same had been completed at least eight weeks. The space at the author's disposal will not permit him to describe the work in further detail, but he will be pleased to give any further information to any member to whom it may be of interest.

The tender of Mr. T. W. Pedrette, of Enfield, which provided for reinforcement on the Piketty system, was accepted. The total cost is about £11,000.

PIER IMPROVEMENT.

(Plates Nos. 12, 13 and 14.)

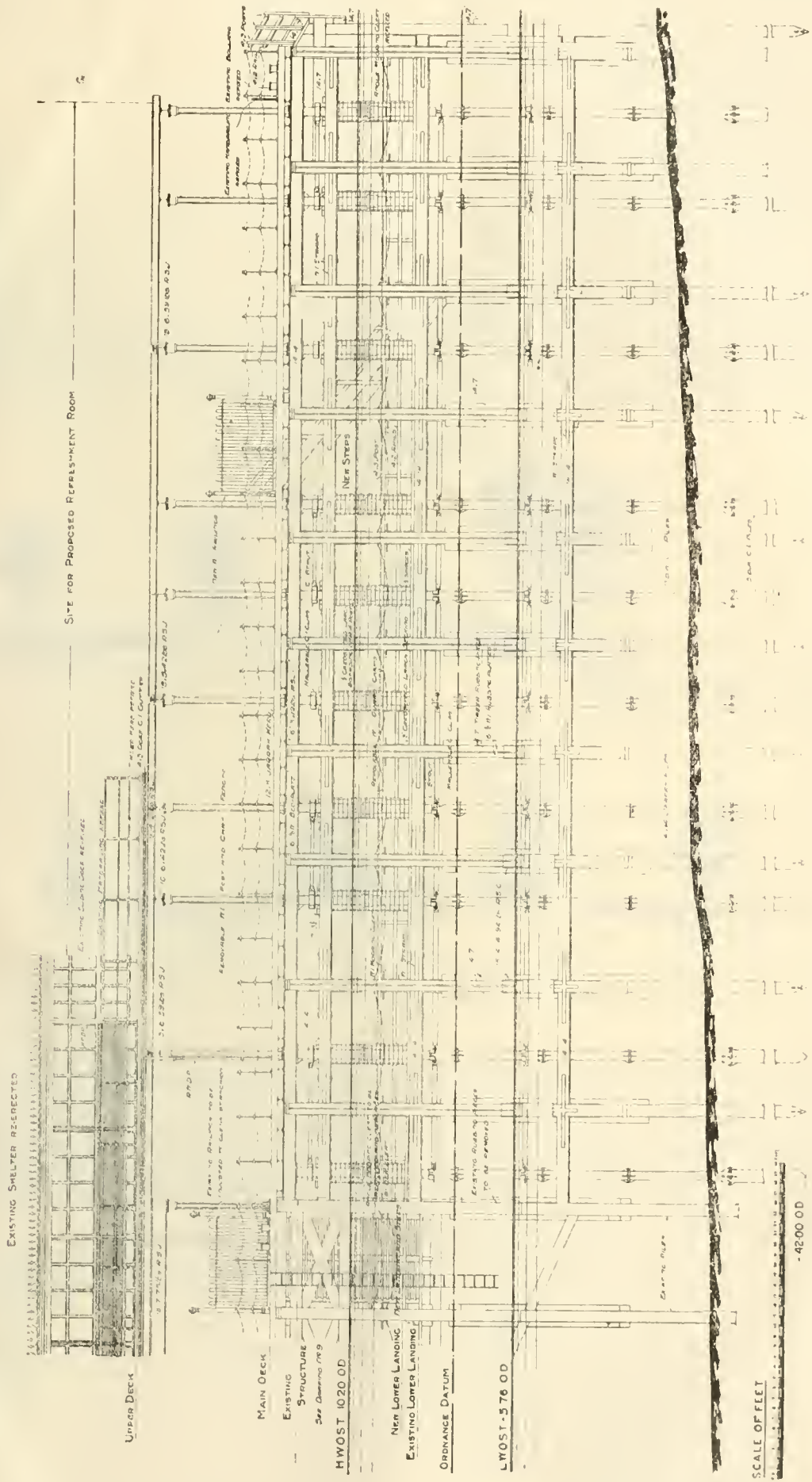
The Southend-on-Sea Pier is about 1½ miles in length, and is equipped with an electric tramway for conveying passengers from end to end. About eight years ago the author carried out extensions to the pier head, which included the provision of an upper deck with shelters and bandstand. This has been very popular, and further works are now being executed which will increase the area of the main deck and upper deck by 1,800 sq. yds. A large café is to be constructed on the upper deck, the roof of which will provide a promenade at a still higher level. The original structure is carried on cast-iron screw piles, but the author has adopted pointed iron piles. These are built up of 10-in. diameter flanged castings 8 ft. 6 in. long, upon a bottom pointed casting 15 in. diameter, 15 ft. long. The thickness of metal is 1 in., and all flanges are heavily bracketed.

The maximum calculated dead load to be carried by any of the piles is 65 tons, and the specification requires that they be driven until the set does not exceed 2 in. in ten blows from a 50-cwt. tup falling 4 ft. The piles driven up to the time of writing have not complied with this requirement until they have reached an average depth of 45 ft. below ground level, which will result in some of the piles having a total length when completed of 83 ft. Jarrah wood piles 14 in. square and 60 ft. long are used for forming the landing stage for steamboats outside the metal structure. These are heavily braced and strutted, as the stage is disconnected from the other portion of the pier and intended to withstand the full shock from boats alongside. The cast-iron piles are provided with wrought-iron stays and cast-iron struts. In the previous alterations the original design of the pier was followed, but it was found that the connections of the various members, especially where under water, was so difficult and expensive that in the present scheme the design has been entirely altered with the object of simplifying and expediting as much as possible this part of the work. The result has been quite satisfactory.

The main and lower decking is of creosoted larch, 3 in. in thickness, and the floor of the upper deck is constructed of 3-in. pitch pine in 5-in. widths, the edges being bevelled and the joints caulked similar to a ship's deck. The shelters are arranged to form an enclosure for the bandstand and to accommodate an audience of about 1,300, and have seats outside which are so arranged as to provide shelter whatever the direction of the wind. The café will have accommodation for seating 170. The kitchen will be in a large dome forming part of the roof; the remainder of the roof will be available as a promenade 50 ft. above sea level. Cloak rooms and ample lavatory

accommodation are included in the scheme, and a lift between the decks. The estimated cost of the work is £20,000. The contractors are Messrs. Wall, Limited, of Grays.

the same character constructed ten or more years ago, especially in connection with the permanent way, most of which has been relaid since it was constructed in 1900.



SOUTHEND-ON-SEA PIER IMPROVEMENT: PART ELEVATION DD.
(Plate No. 14.)

TRAMWAY BOULEVARD: TYPICAL CROSS SECTIONS.
(Plate No. 15.)

The Southend tramways—or, more correctly, light railways—have experienced difficulties similar to those associated with most other undertakings of

The principal difficulties have been rail movements—which have resulted in movements of the paving—hammering and loosening of the joints, and corrugation. In relaid and new track the rail movements have been practically eliminated by forming a shallow

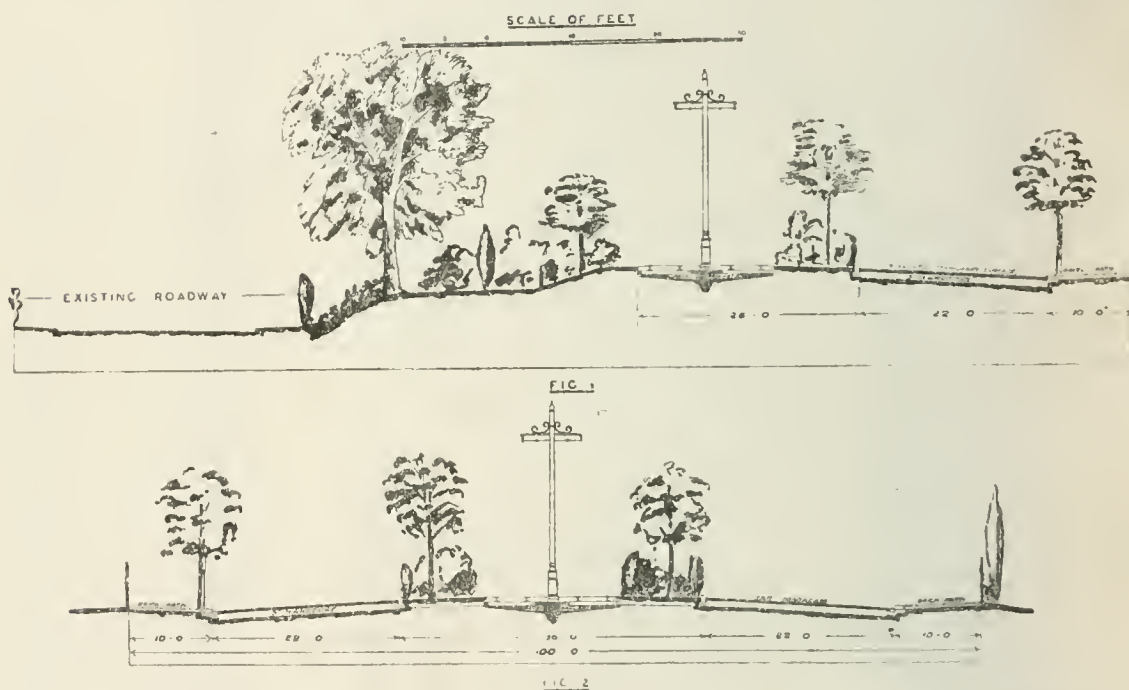
depression in the concrete bed below the rail flange, and lightly packing the rail with granite clippings, and running the depression with Plac-com. The effect of this process is to form an elastic bed to the rail, a water-tight joint between the flange and the concrete, and to effectually hold the rail in position. The joint hammering has been overcome by the provision of Thermit welded joints which, although expensive, give excellent results. Notwithstanding these improvements, corrugation and other difficulties appear to be more or less unavoidable in connection with ordinary street tramway construction, and, in the author's opinion, the primary cause is the rigid, unyielding form of construction necessary to provide, at the same time, for the requirements of electric traction and ordinary vehicular traffic.

When, therefore, the author was instructed in 1910 to prepare a scheme for an extension of the tramway system in the eastern part of the borough, he endeavoured to make arrangements which would avoid the necessity of laying the track in the public highways. After prolonged negotiation, the co-operation of the landowners on the proposed route was secured, and they ultimately agreed to convey to the corporation sufficient land to enable a separate track, with shrubberies on either side, to be provided for the tramways, and for a road on each side of same. The corporation were to lay the track, plant and maintain

tion in cost. The total length of new double track is about 2 miles, of which $\frac{1}{2}$ mile has been in use since July, 1913, and the remainder is now nearing completion.

The rails are laid on sleepers throughout, except where they cross existing highways. The foundation is of screened gravel, the ground level below which is sloped from each side to a rubble drain in the centre of the track. The ballast is brought to the top of the sleepers, and it is intended to cover this with soil, level with the top of the rails, and sow the surface with grass, after the track has taken its bearings.

Having regard to the fact that the track will be soiled over, the author was inclined at first to adopt reinforced-concrete sleepers, but ultimately decided to use Jarrah as being less expensive, more resilient, more easily packed, and likely to be less noisy, although possibly having a somewhat shorter life. A short length of track is laid with reinforced-concrete sleepers for trial, and may be inspected by those interested. The first section of the track was laid with 90-lb. grooved rails removed when relaying and doubling a portion of the original tramways, but which were not badly worn, and should, under the more favourable conditions now provided, give useful service for some years. The remainder of the new track is laid with 70-lb. flat-bottom railway rails. The formation work



SOUTHEND-ON-SEA LIGHT RAILWAYS EXTENSION—THORPE HALL BOULEVARD: TYPICAL CROSS-SECTIONS. (Plate No. 15.)

the shrubberies, lay out as "estate" roads, and thereafter maintain, one of the proposed roads referred to for a portion of the length, and construct a new railway bridge of 100-ft. span over the boulevard in place of an existing bridge of 20 ft. They were, in one case, to pay an agreed sum as compensation to tenants, and in respect of land taken from the golf course were to acquire and convey to the golf club an equivalent area, and pay the cost of the necessary alterations. Other landowners agreed to contribute a sum exceeding £5,000 on condition that the corporation made up completely and took over the roads on each side of the track where it passed through their estate. The total area of land required for the proposed track and roads was, approximately, 15 acres. The terms having been provisionally agreed, application was made to the Light Railway Commissioners for powers to carry out the scheme, and a local inquiry was held. The commissioners appeared at first to hesitate to approve the proposals because of their novelty, but ultimately they were satisfied that the scheme was likely to yield satisfactory results, and the chairman, in stating their decision to make the Order, expressed the hope that the interesting proposals of the corporation might be found of great advantage to the town.

Some difficulty was experienced in obtaining the confirmation of the Order by the Board of Trade, who withheld it until they were convinced that the carrying out of the works as proposed would effect a reduc-

tion in cost. The total length of new double track is about 2 miles, of which $\frac{1}{2}$ mile has been in use since July, 1913, and the remainder is now nearing completion.

In conclusion the author would like to acknowledge his indebtedness to the members of his staff, for whose loyalty, zeal and efficiency he is deeply grateful, and to specially mention his deputy, Mr. R. H. Dyer, and chief engineering assistant, Mr. H. C. Whitehead. ASSOC. M. INST. C. E.

Wrexham's Bowling Greens.—Two municipal bowling greens, which have been provided in the new park at Wrexham, were opened on Saturday by the mayor, Mr. S. G. Jarman.

Worcester Sewage Works.—In their letter intimating that a Provisional Order had been granted for the extension of Worcester, the Local Government Board refer to the question of the sewage disposal arrangements of the city, and state that, on the evidence before them and in view of the short time the completed works have been in operation, they do not feel they are yet in a position to regard this matter as satisfactorily settled. The board understand that the works have been stopped on two occasions since the beginning of the year, and from this it would appear that they are hardly yet in a reliable condition.

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